THE POTENTIAL OF A MUSEUM-SCHOOL PARTNERSHIP TO SUPPORT DIVERSITY AND MULTILITERACIES-BASED PEDAGOGY FOR THE 21st CENTURY

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Stefania Savva

School of Museum Studies

University of Leicester

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Abstract

This thesis has two aims equally significant: firstly to explore the potential of an instructional approach for developing museum-school partnerships that would empower the multiliteracies experiences of diverse students; second to reveal the fine details of the performances deriving from these experiences.

The focus is on the experiences of 4 schoolteachers, 2 museum educators and 36 primary students aged 10-12 years old in the island of Cyprus. The conceptual backdrop draws from the field of New Literacy Studies, the proposed Museum Multiliteracies Practice (MMP) framework derived from the multiliteracies pedagogy of the New London Group, the Learning by Design Model adapted from Cope and Kalantzis and Schwartz's museum based pedagogy.

A design-based research (DBR) methodology was utilised to undertake the research using both qualitative and quantitative data collection methods and analysis. The research unfolded in three phases: the preliminary stage, the prototyping stage and the assessment stage.

The thesis presents the design, enactment and evaluation of the Living Museum Partnership (LMP), a programme unfolded in 13 weeks for the construction of a student-generated virtual museum to support environmental education curriculum.

The study contributes to an underexplored area of theory, research and practice towards fulfilling the vision of designing, implementing and evaluating museum-school partnerships for the 21st-century. Also, the research contributes to a growing field of study on theory-based museum learning practice that draws on inclusive pedagogies, in particular for culturally and linguistically diverse students. Finally, the research contributes to developing multimodal tools for empirical research.

Findings from classroom observations as a participant observer and action researcher as the museum educator implementing the programme, semi-structured and focus group interviews, and questionnaires indicated that the LMP unfolded in an effective manner. Students' repertoires of literacy were enhanced as they engaged in the learning process as active designers and multimodal learners.

Acknowledgments

At times our own light goes out and is rekindled by a spark from another person. Each of us has cause to think with deep gratitude of those who have lighted the flame within us (Schweitzer, 1993)

It has been a great privilege to be part of the School of Museum Studies at the University of Leicester during my tenure as a doctoral student. Pursuing this doctorate would not have been possible without the interest and enthusiasm shown towards my work from the very beginning by Dr Viv Golding. She encouraged me to apply for this programme and I have had the joy of having her as my supervisor. I am indebted to her for being there every step of the way, to advise me and support me whenever needed. I am forever thankful! My sincere thanks go also to my secondary supervisor, Dr Ross Parry, for his expertise and feedback offered invaluable direction to my dissertation.

This research would not have been possible without the support and voluntary participation of various individuals and institutions. Special thanks go to the other doctoral students at the School (past and new), for their unselfish and continuous feedback and insights which contributed the most to the completion of my studies. I am proud to have been among you guys and wish you all the best personally and professionally. In particular, I would like to thank Elee Kirk, who has sadly left us shortly ago and has been a true inspiration to me. You will be dearly missed. Thanks to Ms Christine Cheesman, Course Administrator for her support during the course of my studies. I would also like to thank Dr Nicos Souleles, from the Department of Multimedia and Graphic Arts at Cyprus University of Technology who I consider a mentor. Thank you for the first professional opportunity related to research and for sharing your knowledge and expertise all these years.

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PREFACE: "Of the fierce urgency of now"

You only fight well for causes you yourself have shaped, with which you identify—and burn.

René Char, 1973, N.D.

This study revolves around the museum multiliteracies experiences of diverse learners coming from different cultural and linguistic backgrounds. As a prologue to this museum studies thesis I would like to share my personal background as a backdrop to how I came to this journey. Although with regards to my doctoral study, I am referred to as a museum researcher, I have worn many hats in my life all of which interwoven to form the scope, the design and assist the interpretation of this research.

I am of Greek and Cypriot descent[1] but I was born and raised in Cyprus,[2] in a highly homogenous environment; throughout my school years all of my classmates minor a few exceptions were Cypriots. Therefore, I was considered different. I talked differently,[3] and I was raised somewhat differently than my classmates. No misunderstandings, I was never treated differently, nor in school or outside. Yet, I felt 'different'. And this is still the case in my everyday life in Cyprus in many occasions.

Whilst, my experience as a student as discussed earlier in this preface, was one of coexisting with students coming from the dominant culture, now as a teacher in schools the situation is changed. Demographics indicate an increasingly multicultural student population where almost half of the students come from Middle Eastern countries and some of European descent. In addition, I work in a university where 30% of the student population are immigrants or of foreign descent and I volunteer in a city museum where

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[1] My mother is of Greek origin whilst my dad is Cypriot.
[2] Cyprus is an island country in the Eastern Mediterranean Sea, off the coasts of Syria and Turkey, the third largest and most populous island in the Mediterranean, a member state of the European Union since 2004.
[3] The everyday language spoken in Cyprus is a variety of Modern Greek that is different from standard Modern Greek in many of its structural aspects. It derives from Byzantine Medieval Greek and although regarded as a dialect by its speakers, it cannot be comprehended by speakers of Standard Modern Greek who have not been adequately exposed to it. Whilst most Greek Cypriots speak the dialect, I would speak Standard Modern Greek which was notably different.

most of the visitors are of foreign origin. In these surroundings, I witness numerous obstacles for students who might enter the school ground different from others in terms of cultural, linguistic or other background. I can see the eagerness to learn in them and the desire of the teacher to help but these are lost somewhere in the way of standardised tests and the pressure of the curriculum to be delivered. I do not to wish to level everything or to suggest this is always the case. However, my six years of teaching in different primary schools in Cyprus demonstrate that this situation prevails.

My approach to teaching is one where I feel I cannot expect people to know my cultural traditions, my native language; I must facilitate their needs and try to create links between their language and mine; for the most part, I use pictures and objects, I use space and gestures, I use music to communicate my experience with them. And I practice these mainly through means of technology. Importantly, I must learn to 'dance' their 'dances' first and then show them mine. Every meaning exchange is cross-cultural to a certain degree (Cope and Kalantzis, 2015, p.1). In this sense, it is deeply rooted in my heart as a person, as a teacher and as a researcher that we cannot progress without looking at the different subjectivities of the learners, it is only imperative to pursue learning that is meaningful for every single set of eyes that comes to us to learn. And my belief is that through museum learning this is possible.

I bring my knowledge, experiences and perceptions about museums, schools and learning in this doctoral research as encompassing parts to the development of the research scope and to add value to my reflexivity as a researcher. The qualitative look of the study allows such an endeavor. Despite this, I believe I pursued a fair and realistic look at my investigation and findings in an attempt to explore how we can create meaningful museum-school synergies for students coming from different cultural and linguistic backgrounds.

I am a dreamer. I have always approached life from the perspective that we can never stop dreaming and strive to fulfill our goals. I dream the future that I long for, the dreams that have not yet been realised. I see the possibility of museums and schools to nurture learning for all regardless of their differences as a consequence of any number of

factors, including culture, gender, life experience, subject matter, social or subject domain and the like (Cope and Kalantzis, 2000a). There is no better time than now to address the former in the context of an illustrative theory-based museum-school synergy because "of the fierce urgency of now" (King, 1963, p.1).

Chapter One – Introduction to the Research

> Museums and schools are natural partners…together they can present students with an enriching partnership of ideas, discovery, challenge and fun, a partnership well worth developing and sustaining (Sheppard, 1993, p.2)

This thesis uncovers the story of how I engaged towards the design, implementation and evaluation of a museum-school partnership programme to support diversity and multiliteracies teaching and learning for the 21st century[4], with a particular emphasis on Cypriot primary schools. The Institute for Museums and Library Services (IMLS, 2009) -one of the primary sources for federal support for museums and libraries in the USA-has released a report in 2009 based on a "21st Century Skills initiative [that] underscores the critical role of museums and libraries to help citizens enhance their 21st century skills such as information, communications and technology literacy, critical thinking, problem solving, creativity, civic literacy, and global awareness. At the same time, it has been claimed that museums should transform to respond to 21st century demands for their visitors (Black, 2012). Confronted with the challenges of teaching culturally and linguistically diverse students on a daily basis, I was intrigued by the prospects of the unique nature of museums to potentially enhance the literacy learning experiences of students, especially those who are culturally and linguistically diverse (CLD).

There are a few key concepts that I used as my touchstones in this investigation. Throughout this thesis, I use the term literacy to refer to 'the flexible and sustainable mastery of a repertoire of practices with the texts of traditional and new communication technologies via spoken, print, and multimedia' (Luke and Freebody, 2000, p.9). Nevertheless, in this definition I incorporate a key proposition concerning the nature of literacy (adapted from Barton and Hamilton, 2000, p.7): that literacy is productively understood as an open-textured category of sociocultural practice. A more in-depth

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[4] A more detailed explanation of the context of 21st century learning is provided in Section 1.2 of this Chapter, p.15.

discussion of the concept of literacy is found in Section 1.2.1 of this Chapter (p.15). Such an investigation comprises a compelling area of investigation for which little research has been conducted at the crossroads of museum and educational literature.

Concurrently, it is of equal importance to delimit how the term museum-school partnership is used in this research, to allow for a better understanding of the objectives and relationship developed between the museums and schools involved. The concept and its implementation is not new; on the contrary there has been a strong connection between the two institutions based on their educational mission.What has changed in the past decades is a shift towards the goals and practices of museum-school partnerships as a result of three trends: respect between museum and school educators, teachers needing to find multiple ways to reach students, and museum leadership embracing education as a core principle of museums (Peressut, Lanz and Postiglione, 2013). It is considered that museum-school partnerships by nature vary greatly in terms of what is offered (Melber 2003; Price and Hein 1991; Blackford, 2009). At its most common use, a partnership is defined as an agreement where two or more people or groups work together towards mutual goals, yet on a deeper level. For instance, the IMLS (2004, p.28) defined partnership as, "A relationship between individuals or groups that has been characterized by mutual cooperation and responsibility for the achievement of a specified goal. Sheppard (1993, p.4) added to this definition, "There is no substitute for inspired teaching and effective collaboration. The museum and school partnership is the product of educators working together to realize the common goals of presenting students with vibrant, meaningful and engaging learning". This more durable relationship can be formal, informal or even unspoken, yet it must work to create a mutually created product (Wolton, 2009) which is of benefit to both sides for it to be considered truly beneficial.

For the purposes of this thesis, the term museum-school partnership will be used to refer to the goal towards which the programme implemented aspires to reach, rather than the completed product of a fully formed partnership in a Cypriot context. This research therefore describes the journey towards the ideal of collaboration and partnership through the programme implemented as an enactment of the theoretical framework of the research.

In this programme, both myself as the museum educator[5] and classroom teachers have contributed to the structure and content (Freedman, 2011) as a result of adhering to The School-Directed Model proposed by Liu (See Chapter Four, Section 4.4, p.118).

Importantly, the practical aspect of the activities involved in the partnership programme implemented during the fieldwork entailed the use of the concept of virtual museums[6] and how students engaged in designing their own virtual museum. It is therefore meaningful to explain the term as it has been overly used since its inception with controversial definitions available. Virtual Museums are perceived as a multidisciplinary research field which is often linked with Technology Enhanced Learning (TEL) (Christal, Montano, Resta and Roy 2001; Goodyear and Retalis, 2010; Jackson and Adamson, 2009; Prosser and Eddisford, 2004). The former is increasingly favourable among researchers, given that new technologies have become increasingly "popular tools" in education (Doering, Beach and O'Brien 2007; Miller, 2008). In fact, there exists an inseparable link between virtual museums and multimedia (Payne et al., 2009, p.292). These environments through their multimodal technologies provide new and fresh experiences of digital cultural heritage, or connect different museum collections (Giaccardi, 2006; Cilasun, 2012, pp.2-3). Digital cultural heritage has emerged in museum studies literature to denote a 'cultural turn' in museum computing (Parry, 2005, p.340) which was recast as digital heritage or digital cultural heritage. The term was introduced in the UK in 1997 following the election of the Labour Party as it was considered "an important agent both within the government's learning agenda and its policy on social inclusion" (Parry, 2005, p.341). Incorporating new media technologies to fulfill the museums' educational provision has been widely acknowledged by practitioners and museum educationalists (Anderson, 1999,

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[5] In particular, in this thesis, I am undertaking the role of museum educator representing the museum sites collaborating with the participating schools and their teachers. I was working on a voluntary basis as all museum staff did at one of the two museums where the research took place for a year and a half prior to the investigation. Concurrently, I was collaborating with the second museum to design their educational programme. More details on the two institutions are found in Section 6.1 of Chapter Six, p.203.
[6] In this thesis the term virtual museum draws from the research of Andrews and Schweibenz (1998) and Scheweibenz (2004, p.1) who argued that the "virtual museum" can be defined as follows: "virtual museum" is a logically related collection of digital objects composed in a variety of media, and, because of its capacity to provide connectedness and various points of access, it lends itself to transcending traditional methods of communicating and interacting with the visitors being flexible toward their needs and interests; it has no real place or space, its objects and the related information can be disseminated all over the world.

p. 2; Dierking and Falk, 1998), yet it wasn't until the early 2000s that it gradually became part of constant dialogues in a European context for developing practice that meets the challenge of the digital divide (Parry, 2001) and cultivating the individual empowerment which derives from the free and equitable access to information (Abid, 2002).

Part of the more widespread use of the Internet in the context of digital heritage was the rise of text-based and online image collections (Terras, 2015) as information repositories by museums followed by a generic appellation of the term 'virtual museum' to be applied to these digital reflections of physical exhibitions (Karp, 2014). In this sense, a virtual museum is considered as a means to bring together similar objects physically distant in reality (Cilasun, 2012, p.3). Djindjian (2007, p.9) suggests that:

> The virtual museum is dematerializing the object for the benefit of providing much more information on the object: the image in all its manifestations (2D, 3D, details, physico-chemical analyses, facsimiles, etc.) and the knowledge of the image.

Based on these fundamental understandings, the concept of a virtual museum is used throughout this thesis to denote a virtual platform which presents the attributes of a museum specialising in the exhibition of digital material (Karp, 2014), in this case objects, research in text-based form and multimodal and any other artwork in the form of exhibits that was student-generated. A more in-depth explanation of the rationale behind the use and design of the virtual museum for this research is found in Section 4.4.1 of Chapter Four (p.119).

This chapter introduces the research, beginning by stating the research questions, and then outlining the background to the research and statement of the problem that is investigated. The chapter continues by outlining the significance of the thesis with relevance to the global and local context of the research. An overview of the conceptual framework that was applied as this research was completed is then described. The methodological approach to the research is briefly explained and the final section of this chapter provides the structure of the thesis.

1.1 Research questions

This research revolves around the question: How can a museum-school partnership be designed and implemented to enhance the literacy repertoires, in particular, but not exclusively, for culturally and linguistically diverse (CLD) students? To explore this question, I developed additional questions that were informed by the preliminary investigation and literature review:

1) What are the characteristics of an effective museum-school partnership that adequately supports 21st-century multiliteracies learning for CLD primary students in Cyprus?
2) How can a museum-school partnership programme be theoretically and practically designed and implemented to enhance the pedagogical strategies for multiliteracies-based teaching?
3) What is the impact of a museum-school partnership on teaching and learning?
4) How does a museum-school partnership affect students' repertoires of literacy practices?

The core questions of this interdisciplinary research relate to some significant issues at the crossroads of museum learning and literacy education. The first is to address ways to implement theory in museum practice, how school-based educators and museum educators can utilize museum learning for enhancing students' literacy in the 21st century, and, last but not least, how culturally relevant museum teaching and learning can be promoted. The research questions guided the development of the learning framework, the choice of methodology and research design, as well as the data collection, and the analysis process.

1.2 Background to the research

1.2.1 The global context

Teaching and learning in the 21st century has been characterised by a constant process of change. It is undeniable that the new millennium has introduced new tools for communication and it is the educators' responsibility to determine the value of these tools and how the curricula is affected. It is critical to question, therefore, what kind of pedagogies are appropriate for the 21st century (Scott, 2015) and how much traditional approaches appeal to today's learner. What do we need to change and how feasible is it? Anne Wysocki (2004, p.2) highlights in her article 'Opening New Media to Writing: Openings and Justifications':

> [that] writing, like all literate practices, only exists because it functions, circulates, shifts, and has varying value and weight within complexly articulated social, cultural, political, educational, religious, economic, familial, ecological, artistic, affective, and technological webs.

It is within this evolving context of learning that educators need to expand their pedagogical repertoires to nurture 21st century competencies and skills (Saavedra and Opfer, 2012; Scott, 2015; Smith and Hu, 2013). McCoog (2008) in addressing this issue suggests that educators have a new charge: teach the new three r's - "rigor" "relevance" and "real world skills". McCoog (2008, p.1) captures the critical demands of our contemporary societies by stressing that:

> "Today's students are acquiring 21st century skills, and what surprises teachers the most is that they are not the ones teaching them. 21st century learners have taught themselves to network and find solutions. Because of this, they expect to have the same experience at school".

It becomes apparent that the learning demands and needs of students are challenged in an increasingly multimodal and digitally-mediated reality (Fleming, 2005, p.114). In this context, the nature of literacy practice and needs has shifted; no longer is the traditional view of literacy as reading and writing skills acceptable (Fleming, 2005, p.114). Both literacy pedagogy and research now embrace the idea of literacy as more of a plurality, discussing about various 'literacies' (Liddicoat, 2007, p.15). Addressing the complexity of literacy is considered to be one of the incremental goals for education in the new millennium (Leu and Kinzer, 2000, pp.111, 114).

This reshaped notion of literacy is aligned with "the exponential growth and adoption of new media and information and communication technologies (ICTs)" (Day and Lau, 2010, p.111). The latter involve not only spoken and written words, but also images and symbols of all kinds, sounds and music, bodily gestures and movement, and physical and virtual objects. Attention is increasingly paid to these competencies and multimodal literacy practices that students need to acquire and utilize in various contexts in order to succeed in the postmodern world. From the policy makers' and educators' perspective, it is their responsibility to design and enact a curriculum that engages students in experiences that prepare them for this multicultural, multimedia-based world. Yet, contrary to this pervasive need, research has consistently shown that print literacy reading and writing activities still dominate mainstream learning contexts (Winch et al., 2004).

Notably, the challenge for educators is "not only to educate for new breadth and forms of literacy but also to have learners delve into a critical interpretation of these forms and modes" (Thwaites, 2003, p.27). Individuals should consider different perspectives, analyze and problem-solve complex issues, and think critically about social issues. To succeed at the latter requires "meaningful and enjoyable learning experiences that are culturally relevant" (Callow, 2006, p.9) while developing students' repertoires of literacies (Ailwood et al., 2000). Furthermore, this thesis takes a stand which acknowledges and addresses the notion of literacy from a social and cultural perspective (Vasquez, Egawa, Harste, and Thompson, 2004). Such a view considers literacy as "dynamic, culturally and

historically situated practices of using and interpreting diverse written and spoken texts to fulfill particular social purposes" (Kern, 2000, p.6; Gee, 2000).

The above ideas fall within the scope of New Literacy Studies (NLS). New Literacy Studies is a paradigm that has changed conceptualizations of literacy, and what literacy education entails, by acknowledging differences and similarities in the uses and functions of language among members of different social classes and geographical areas. From this perspective, NLS adheres to an "ideological practices-oriented approach of literacy" (Street, 1984, p.4). This approach to literacy considers the varying cultural issues and diverse social situations surrounding every literacy experience, and is of particular importance to this research (Goodman, 1996; Spiro, Bruce, and Brewer, 1980).

One of the most pertinent and influential theories which has shaped the investigation in this thesis is the Multiliteracies Framework (New London Group, 1996, p.63). The term "Multiliteracies" immediately shifts us from the dominant written print text to acknowledge the complexities of practices, modes, technologies and languages which literate people need to engage in the contemporary world. The scholar-members of The New London Group (NLG) (1996, p.64) employed the term multiliteracies in particular to emphasize two major aspects of language use today: the first is the rapid change of new communication media where meaning is made possible in ways that are increasingly multimodal—in which written-linguistic modes of meaning interface with oral, visual, audio, gestural, tactile and spatial patterns of meaning. The second aspect of language use today is the proximity of cultural and linguistic diversity due to migration, multiculturalism and global economic integration (New London Group, 1996, p.64).

Following the New London Group's work, much discussion has arisen on the concept of multiliteracies. Turbill (2002, p.23) speaks of "the age of multiliteracies," in which "meaning making...involves being able to 'read' not only print text but also color, sound, movement, and visual representations". Yet it is important to note that multiliteracies involve more than a change in the modes of communication. Recognition of the dramatically changing nature of what it means to be literate in the so-called

"information age", has seen an increasing interest among the educational research community around the importance of students developing "multiliteracy" skills (Brown, Lockyer, and Caputi, 2010; Cope and Kalantzis, 2000a; Haythornthwaite and Andrews, 2011, p.177). As such, the term multiliteracies is often used interchangeably with new literacies, digital literacies, or media literacies, although in this thesis the use of multiliteracies is preferred due to the particular theoretical framework that informs the research.

Multiliteracies as "new basics" (Kalantzis, Cope and Harvey, 2003, p.16)-contrasted with the "old basics" of traditional literacy- are understood as the metalinguistic ability to understand and apply the multimodal grammar and social uses of emerging technologies and modes combined with print texts (Luke, 2000, p.82; De Lissovoy, 2008). In this sense, the multiliteracies framework, or schema, which has its roots in a sociolinguistic approach to pedagogy and education, seeks to make visible the discourses of power, economics, and technology that shape students, educators and reorder notions of just what counts for literacy. The emphasis in Multiliteracies is on "multiple discourses", "multiple designs", and "multiple metalanguages" to support students and educators as they navigate through changes in their lifeworlds (Clark, 2007, p.35).

Agnello (2001, pp.24-25) refers to multiliteracies in discussing postmodern literacy, and argues that through this approach "reading and writing become enhanced methods for exploring the democratic self and its formation through ideological exposure to knowledge and power relations formulated by educational policy texts. Luke and Luke (2001, pp.92-94) further support this view, arguing that through the use and interaction with new technologies, new kinds of artefacts have emerged requiring new levels of engagement and the development of higher and different mental faculties (i.e. new multiliteracies). Luke (2000, p.71) also employs the term critical multiliteracies - being able to understand, debate, and act upon the material, political, and social consequences of technological change.

The multiliteracies framework of thought is especially important when addressing literacy for an increasingly diverse student population, such as is the case in this research. Effective literacy instruction builds upon the cultural and linguistic backgrounds, ways of making meaning, and prior knowledge that all children bring to the classroom. It is increasingly recognised how it is imperative to develop curricula, teaching strategies, and policies that are inclusive of all students' backgrounds and needs. There should be a systematic approach that welcomes, understands and promotes learning for all students regardless of their cultural and linguistic backgrounds; in fact, these should be used as 'funds of knowledge' to acquire new meanings and develop their repertoires of literacy (González, Moll, and Amanti, 2005, p.3).

Close to this pedagogically changing landscape is the need for museums, as places that nurture learning, to revise their learning approaches to respond to dramatic shifts in the populations that they serve and the roles which they should practice. The 21st century has marked a turning point in their existence, responding to the evolution of the colonial 'west and the rest' model, as well as the effects from globalisation which increased cultural diversity and cosmopolitanism (Peressut et al., 2013, p.x). In this respect, more recent conceptualisations of museum learning acknowledge the sociocultural nature of museum learning experiences. Within the increased discourse of the role of the museum as a place of inclusion, scholars have suggested that "museums may offer important possibilities for engaging in most valuable aspects of literacies, providing additional and alternative cultural capital to that of traditional academic literacy" (Eakle, 2007, p.605; 2009, p.205; Mathewson-Mitchell, 2007, p.3).

This thesis is written from the perspective that museum visiting is a *multiliteracies* practice (Savva and Souleles, 2014); the addition of 'multi' in 'literacies' derives from sociocultural perceptions of the museum which are naturally complemented by a social-constructivist perspective of learning (Rogoff, 1990; Vygotsky, 1986). It is within the latter re-conceptualization of the museum that this research lies: it seeks to address inclusive approaches to the museum learning agenda in terms of its relation to "the multiple and interacting modes, signs and languages of communication found at the museum"

(Mathewson- Mitchell, 2007, p.3), thereby broadening the meaning making process to include multiliteracies (New London Group, 1996, Cope and Kalantzis, 2000a).

1.2.2 The local context

Cyprus is a full member state of the EU. A coup organized by the dictatorial government of Greece against the government of Cyprus led to a Turkish military intervention in 1974, which divided Cyprus into two parts separated by a demilitarized zone called "the Green Line," and guarded by UN peacekeepers until today. However, after an easing of travel restrictions by the Turkish-Cypriot authorities in April 2003, there has been 'unprecedented mobility between the two communities' (Philippou, 2007, p.71).

Figure 1.1 Map of Cyprus (Source: Europa World Yearbook)

Like many parts in the world, Cyprus is becoming increasingly multicultural, as the latest statistics from the Statistical Office of the Republic suggest (Statistical Services of Cyprus,

2012). Cyprus is home to 106,270 nationals of other EU countries and 64,113 nationals of other countries (Statistical Services of Cyprus, 2012). These populations represent a total of 20% of the total population. Cyprus has proved especially attractive to migrants from countries of the Orthodox Christian faith – Russians, Georgians, Bulgarians, Romanians and Serbs. This observation is crucial when shaping an understanding of the social and cultural fabric of Cypriot society today, and of Cyprus as a "multi-diasporic space". This evolving reality results in several emerging issues linked to school and society, such as the need to address the role of pedagogy within the new multicultural reality of Cyprus. This phenomenon in Cypriot schools was first acknowledged in 2002 in a circular sent to primary schools on "intercultural education" (Hajisoteriou and Angelides, 2013, p.105). Ideally there should be a ground for intercultural education, where children of many cultures interact and share their diverse backgrounds (Teerling, and King, 2012, p.38). Nevertheless, intercultural education policy remained limited to primary schools until 2008. The common approach has, until now, mainly involved rectifying the "deficiencies" of the *alloglossoi*,[7] by helping them to learn Greek. However, this approach does little to confront racism and discrimination; instead it often leads to opposite results by students putting students in categories (Gregoriou and Christou, 2011, pp.23-25; Zembylas, 2010).

The Greek Cypriot Ministry of Education and Culture (MOEC) follows a centralized approach to managing schools, leaving little room for issues that relate to the curriculum. School principals mainly manage issues that concern students' and teachers' behaviour in schools (Panayides, 2003, p.34). Following the reform and new curriculum for Primary Education and the official recognition of the necessity for inclusive 21st-century education, there have been attempts to incorporate a multicultural character across schools through appropriate teaching and learning practice. However, the curriculum, explicitly or implicitly, has until now been dominated by nationalistic and Christian Orthodox values, leaving very little space for the recognition or celebration of diversity (Angelides, Stylianou, and Leigh, 2004; Panayiotopoulos and Nicolaidou, 2007; Papadakis, 2008; Trimikliniotis, 2004; Zembylas, 2010). In addition, most teachers do not receive adequate training in multicultural or inclusive education. Appropriate training is

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[7] Speakers of languages other than Greek

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based on the initiatives of the schools themselves or of individual teachers (Papamichael, 2008).

Data are available which indicate the academic under-performance of immigrant-origin children in the Cypriot public education system (Theodosiou-Zipiti, West and Lamprianou, 2011). Teachers' prejudiced attitudes, a lack of appropriate training and a limited sense of responsibility towards the migrant-origin children places the latter in a multiply disadvantaged situation, creating a barrier to their academic success, sense of self-worth, and overall socio-educational inclusion (Theodosiou-Zipiti, West and Muijs, 2010).

Yet there is some evidence of more encouraging results. Studies conducted by Hadjitheodoulou-Loizidou and Symeou (2007) and Partasi (2011) suggested students shared positive stances over having classmates or friends from other national or ethnic backgrounds. Both indigenous and non-indigenous students appreciated the chance to learn about other countries and cultures. These students thought that the language barrier could be a problem (also Panyiotopoulos and Nicolaidou, 2007). Additionally, Papamichael's (2008) and Savva's (2009) research on Greek-Cypriot teachers' understandings of multicultural education indicates that teachers are aware of and reflective upon their own practices and assumptions – acknowledging, amongst other things, how their intercultural activities implemented mainly belong to an "additive approach". It is true that a "celebratory" method of promoting multicultural education focusing on festive events, songs and other entertainment-related activities was common among schoolteachers until recently, yet it actually reinforces the idea of the dominant culture as the "normal" or "standard" one – which does not fundamentally challenge xenophobic ideas.

To engage in teaching and learning that is culturally relevant and inclusive of all students requires different professional training to meet the needs of different cultures, as well as communication between these cultures to reach a fruitful interaction. All of the above call for a shift away from assimilationist tendencies and minimalist approaches to diversity which have been the tradition in public and educational discourses in places like Malta and Cyprus. Ioannidou (2012, p.3) notes in particular with regards to the Greek

Cypriot language policy that there have been tensions between national and pedagogical values. Religious beliefs with regard to national identity further make it somewhat difficult to reconceptualize national identities along more pluralistic lines. In the case of Cypriot education, Theodosiou-Zipiti, West, and Lamprianou (2011), in a quantitative study on Cyprus, showed that ethnic minority students performed significantly worse compared to native students.

Due to the particular political situation in the island, museums in Cyprus as institutions have historically been considered "safekeepers" of the nation; their role being to cherish the heritage and tradition of Greek Cypriots (Makriyianni, 2007). Nevertheless, this notion is obsolete in that it does not take into consideration the evolution of the definition of a museum in line with developments in contemporary societies. The museum is a space that operates "in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment" (ICOM, 2007). In this sense, museums in Cyprus should respond to the demands and needs of the growing number of foreigners who reside in the island, as well as the incoming flow of tourists who are the primary source of income.

Although appearing to attribute great importance to their museums and a large number of the cultural sites which can be found in the island, since its independence in 1960, Cypriot governments have not encouraged at any point the development of research into museology and museum education (Stylianou-Lambert, 2007). This is evident in terms of the education and training around museum studies on the island; until 2011 there were no museum-related departments at the Universities or Colleges in Cyprus, although a history and archaeology department was established in 1996 (UCY, 2013). In addition, based on the literature review for museum education and preliminary fieldwork conducted in the context of primary and secondary education, it was evident that no museum-school partnerships have been undertaken so far in Cyprus. Nevertheless, a more recent trend as part of reforming the curriculum of Art Education in Cyprus where museum education falls within according to the Ministry' policies, involved developing 'creative partnerships' as

they are called with artists visiting schools and undertaking creative activities (Genethliou and Lambrianou, 2012). The only other form of long-term collaborations between museums and schools in Cyprus included initiatives by The Cyprus Educational Mission supporting Greek-Cypriot community schools in the UK to provide with opportunities for students to learn their heritage language and to enhance their knowledge of Greek culture and history (Charitonos, 2014). Based on that reality of the absence of museum-school partnerships in Cyprus, the decision was to introduce this type of collaborations through the enactment of this research.

Despite this situation in tertiary education, museum educational programmes for primary aged pupils have been running in public museums since 1996 (MOEC, 2016a). These programmes are designed by the Ministry Administrators and Museum Advisors appointed by the Ministry of Education and Culture in Cyprus (MOEC, 2016b) with the support of the Cultural Services of the Ministry of Education and Culture. Educational programmes implemented in the public museums are based on the idea that these experiences and interactions with the artefacts in a museum can create positive attitudes towards the environment and the cultural heritage of Cyprus (MOEC, 2016b). These programs are designed and organized "through educational programmes that rely on scientific and interdisciplinary approaches, experiential and active learning, collaborative learning, observation, exploration, discovery, play and cultivation of critical thinking" (MOEC, 2016c).

Currently, 14 educational programmes are implemented by nine schoolteachers appointed by MOEC to work one to two days a week with the museum, outside of their school work. The schoolteachers will usually hold relevant qualifications or experience – however, no provision exists with regards to their training on delivering museum education programmes. The relationship between policy making, planning and implementation of museum educational programmes in Cyprus suggests a strong connection exists between the broader area of education, and museum education in Cyprus, and this was taken into consideration when planning the methodology of this particular research. Contrary to the existence of museum educational programmes run by MOEC for schools, there are no

museum-school partnerships that are systematically implemented in primary schools in Cyprus as it was established during the preliminary context analysis for this research. Therefore, the preliminary research focused on establishing a level of understanding regarding the museum educational programmes implemented.

In particular, in the absence of substantial research in the field of museum education in Cyprus, at the very early stages of this doctoral study I engaged in exploratory fieldwork to examine how museum educators in Cyprus, conceptualise their museum teaching and what are their goals and practices, in relation to the curriculum and multiliteracies in particular. I was interested to know the literacy experiences of primary students in Cyprus as part of guided school visits in museums. Naturalistic observations and interviews took place in an archeological museum and a public art gallery running educational programmes in Limassol, Cyprus on two occasions for each institution in November and December 2011. Semi-structured interviews with the four educators implementing the programmes and focused group interviews with 23 students from two schools out of the 53 students who visited the museum and gallery respectively were conducted prior and following the visit at the schools.

Insights from this fieldwork with educators and students suggested an overall positive learning experience for students. In considering museum educators' teaching practices and responses from their interviews, an important conclusion derived is that these educators pertain to a constructivist approach to learning; their teaching involves connecting the objects and exhibits with the experiences children bring to the museum; to succeed this significant effort is dedicated to creating 'hands on' activities for children. Nevertheless, these museum educators do not implement any form of multiliteracies related content nor customise the programme with respect to the cultural and linguistic differences of the students visiting the museum or gallery. In addition, and in line with other research in the context of Cypriot museum education, these early findings suggested there is limited in-service training for teachers seconded to deliver museum educational programmes (Papanicolaou, 2000). Overall, the data informed the considerations for the type of research that later emerged, indicating that a more systematic collaboration

between museums and schools such as in the form of a museum-school partnership, as well as a clear connection with the curriculum, could motivate teachers to engage in meaningful interactions with museums.

Figure 1.2 Museum Educational Programmes in 2015-16 (Savva, 2016a, Adapted from MOEC, 2016a)

In 2009, the Cypriot Ministry of Education and Culture subscribed to the international trend towards implementing critical literacy and multiliteracies pedagogy in the national curriculum, a shift evident in the sphere of academic content and in the new language curriculum for primary and secondary education (Hadjisavvides, Kostouli, and Tsiplakou, 2010). In the light of the educational reform that was introduced in schools from 2011, following two years of planning and preparation including educators' in-service training, Cypriot teachers are now expected to address multimodal and culturally diverse textual practices in their classrooms. Critical literacy and multiliteracies are now

significant in educational policies that are concerned with remaking teachers'
understandings of literacy and literacy pedagogy (Hatzisavvides, 2011). Educators are
urged to reconsider their own conceptions of literacy and literacy acquisition and
pedagogy, including the "new basics" that are continually changing as society becomes
increasingly multicultural.

In particular, the new curriculum sought to expand the scope and purposes of
education for students "to sustain a compulsory and sufficient body of interdisciplinary
knowledge, to develop their attitudes and behaviours to act as informed and democratic
citizens and to possess to the maximum possible degree the foundation attributes, skills
and competences demanded in 21st century society" (MOEC, 2016a). These objectives
should take place by developing a democratic and humanitarian school for everyone where
no child is excluded, marginalised or stigmatised because of any specialness (Ministry of
Education and Culture, 2010, p. 6). Nevertheless, these conceptualisations and policies for
primary education left the museum education world in Cyprus untouched as it was found
from the very early stages of investigation, and this is one of the drivers that guided the
research.

1.3 Statement of the problem

This thesis addresses issues that have been identified at the intersection of museum
and school learning. These include ineffective methods to implement critical literacy and
multiliteracies, as well as the teaching of culturally and linguistically diverse students.
Importantly, one concern is associated with the level of professional development, such as
quality and quantity of training, supporting materials, equipment and timeframes to
complete the curriculum goals. Significantly, teachers appear to be lacking in confidence to
teach based on technology (Angeli and Valanides, 2006, p.620) and critical literacy,
despite national mandates from policy makers as the in-service training they have received
has been found to be inadequate.

At the same time, it has often been claimed that museum learning, and in particular museum-school partnerships, may not have the expected benefits for students, despite their potential to bring meaningful and relevant experiences to students' lives. The latter is considered as deriving from the lack of theory-based museum learning practice or a particular framework for undertaking museum-school partnerships, which often merely adapt practitioners' experiences and isolated initiatives. Drawing on these challenges, it is vital that this research aims to provide a theory-based framework of practice that utilizes the power of museum-school partnerships. The plan was to design a small scale, locally grounded intervention comprising a museum-school partnership programme to enhance students' learning, and practicing a museum multiliteracies-based approach supported by the Learning by Design Model of Cope and Kalantzis (2000a) (Table 6.1, p.198). Other components included teachers' support curriculum materials (Appendix 1A), a workshop, a museum educational programme, and a Museum Day (Figure 4.3, p.123). A significant challenge that exists both in a museum and school context is with regards to the lack of substantial pedagogical knowledge - i.e. the distinctive body of knowledge for teaching which leads to an understanding of how a particular topic is organized and presented effectively to the diverse interests and abilities of learners (Shulman, 1986; 1987).

1.4 Significance of the research

1.4.1 Significance in a global context

Although there is a growing effort to create formal partnerships between schools and informal learning settings, the documentation of such projects is limited, and generally reported as examples of "best practice" with little discussion of challenges before or during the implementation of the collaboration (Bobick and Hornby, 2013; Pumpian, Fisher, and Wachowiak, 2006). In addition, the Center for the Advancement of Informal Science Education in its report, "Making Science Matter" (2010), suggests that while such collaborations have great potential for creating rich science learning opportunities, the impact of these projects is not sufficiently evident, and nor are the mechanisms by which such collaborations are successfully developed and sustained (CAISE, 2010, p.57). There

have not been systematic frameworks for the design, implementation and evaluation of these collaborations within the context of museum-school partnerships. Nevertheless, there is a need to invest in the capacity to manage these partnerships (CFM, 2014, p.6). Therefore, this research has value in that it contributes to an area in the literature (related to both theory and practice) that is currently limited.

Theoretically speaking, the investigation seeks to address a knowledge gap by adopting a theoretical framework and implementing it in practice to test its feasibility. Few prior studies[8] have looked empirically at the implementation of a multiliteracies-oriented approach to museum learning practice. In this sense, this research contributes to both museum studies and literacy studies as it merges the two through adapting an existing approach, multiliteracies pedagogy and the Learning by Design Model in order to enhance students' literacy learning. While I do not claim that I employ concepts that are particularly new in the context of a school, they are innovative in that they are addressed within the particular context of a museum-school synergy. This thesis seeks to set forward the importance of literacy driven theory to guide museum learning practice and contribute to a more systematic dialogue about how to promote effective 21st century museum-school partnerships.

At the same time, the study contributes to a limited body of knowledge on how museum-school partnership programmes can enhance in particular the literacy repertoires for culturally and linguistically diverse (CLD) students. This quest is increasingly important for museums nowadays as it responds to the calls for an inclusive agenda in the museum (Sandell, 2003, p.45). Although research suggests social inclusion can occur at individual, community and societal levels (Sandell, 2003, p.45), the challenges for an inclusion agenda for museums are demanding, and little empirical evidence exists that indicates the democratic potential of museums is being realized (Mathewson-Mitchell, 2007, p.2).

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[8] See Eakle, 2007, 2009; Schwartz, 2008.

Different challenges have been acknowledged in teaching culturally and linguistically diverse students. Museum learning in the form of museum educational programmes or partnerships could meaningfully engage these students. Such museum learning practice could be an alternative to traditional curriculum teaching and learning within current reconceptualizations of literacy education. The New London Group's ideal that a pedagogy of multiliteracies can potentially "provide access without children having to leave behind or erase their different subjectivities" (New London Group, 2000, p.18) implies it could open possibilities for greater access. Therefore, the infusion of multiliteracies pedagogy into museum learning research and educational praxis could prove meaningful. Explicit teaching of museum multiliteracies could impact learning in and through museums, and museums/schools relationships by recognising the particular demands of developing learning experiences in the museum setting that enable cultural participation[9] (Mathewson-Mitchell, 2007, p.3). However little theoretical and practical work has been carried out to design a museum-school partnership programme that embeds contemporary conceptualizations of literacy with supporting curriculum materials to enhance culturally and linguistically diverse students' learning.

In terms of practice, the chosen methodology allowed me to test the feasibility of the MMP framework, implementation and evaluation which provides practical guidelines for schoolteachers, museum educators and policy makers on how to adopt and enact a multiliteracies-based inclusive museum-school partnership in their respective institution. Taking into consideration the unique nature of the museum learning environment, with its multiple forms of communication, language and practices (Mathewson-Mitchell, 2007, p.8), the need arises for specific models to create opportunities for learning through museum educational programmes that are meaningful and relevant to the visitors and require their active participation in the learning process (Fleming, 2005, p.3). This research responds to these calls with the development, implementation and evaluation of a

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[9] 'Participation' also involves an ability to negotiate the complex dialogic relationship which exists between the written word, the spoken word, images, objects, time and space (Mathewson-Mitchell, 2007, p.3). Arnstein (1969) suggests that there exist eight types of participation which can lead to citizen participation, a categorical term for citizen power. At the core of citizen power, located at the three final rungs of participation according to Anrstein, is the redistribution of power that enables currently excluded citizens to be deliberately included in the future (Arnstein, 1969).

conceptual framework that is museum-based and strives for meaningful learning. I share the belief that museums are potentially places for making meaning that is culturally relevant and consistent with contemporary demands and needs.

The findings of this research could be of use to policy makers and educational stakeholders by providing empirical evidence on how to enhance CLD students' literacy learning through effective multiliteracies driven museum-school partnerships. The hope is that this investigation will stimulate further research, theory and practice in the crossovers of museum and school education. This study will hopefully inspire and guide future research and practice at a time of a re-evaluation of literacy pedagogy and educational affordances in the context of a globalized society.

1.4.2 Significance in a local context

A preliminary investigation into the context of this study indicated that there is limited practical and documented evidence of museum-school partnerships in Cyprus. It is this gap, together with my concern for how museum educators in Cyprus (where the research is located), might refine their scopes and purposes to fulfill the objectives of the major educational reform taking place on the island since 2009, which triggered this doctoral investigation. The intention of this study is to connect these strains and to enhance the connectedness of intellectual and theoretical understanding of museum teaching and learning in Cypriot primary schools.

Apart from the wider benefits this research has, it has a local importance, as multiliteracies is increasingly becoming a curricular and professional development issue for Cypriot teachers. These individuals are the only professionals appointed by the state to teach educational programmes in museums, providing political impetus for this research. Interestingly enough, the field of museum education was left untouched in this process of change, although museum education programmes are under the authority of the Cypriot Ministry of Education and Culture. Until the time of the writing of this thesis, those generalist primary teachers who are assigned to deliver educational programmes in one of

the 11 Public museums in Cyprus running educational programmes, are not in any way encouraged or inclined to integrate aspects of multilitieracies pedagogy into their teaching in the museum. Nor have museum educational programmes changed or altered despite the reform in the greater educational context on the island.

Therefore, the output of the research is of significance to schools and museums in Cyprus, as well as being useful to the broader educational community. The framework is intended to be used as a practical guide with evidence for teachers and museum educators seeking to develop pedagogies that capitalize on the literacy learning that derives from museum-school partnerships through practical guidelines on how to implement literacy related museum learning activities. Further, the research could be of interest to educational stakeholders and policy makers in Cyprus and beyond, who are responsible for designing multiliteracies curricula by blending museum and school practice. The dissemination of the findings from this research is monitored by the Cyprus Educational Institute of Research and Evaluation and could contribute to the design of educational programmes and assist museum professionals in Cyprus who are involved in museum learning decisions, helping them to be more aware of the need for theory-based practice in museums.

1.5 Overview of conceptual framework

Because this research draws on both museum and school educational fields, it cannot be dealt with through a single approach or theory. Therefore, in this thesis I drew from a rich network of theoretical views to develop a conceptual framwork; chief among these views were social constructivism, sociocultural and technology enhanced learning theories, New Literacy Studies and semiotics. Under this network, the research methodology and design of the research unfolded. This model is a pedagogy-driven, theory-led and empirically-based approach, designed to empower 21st-century literacy learning for culturally and linguistically diverse students. The following sections briefly address the theoretical groundings of the study by discussing the social positioning I undertook in this thesis and the sociocultural groundings of the approach to the concept of literacy that informed this thesis.

In discussing the nature of literacy in New Literacy Studies (NLS), a three-pronged model that represents the factors involved in the practice of language has proved helpful to my research. These factors are: literacy practices, literacy events, and text (Barton, Hamilton, and Ivanič, 2000, p.7). Literacy practices are the routines and repeated patterns of behaviour that have developed through the use of written text (Barton and Hamilton, 2000, p.7). Differences exist among literacy practices on the macro-level of cultures and societies as well as on the micro-level of single families and specific situations (Barton and Hamilton, 2000, p.7). Literacy practices may be formal in nature; for example, they may be connected to cultural institutions, such as schools, governments, or businesses. However, literacy practices may also be informal, tied to expectations of family, peers, or small social groups. Practices such as reading a novel, emailing friends, or visiting museums are informal literacy practices. Literacy events, on the other hand, are defined as any event involving a written text (Barton and Hamilton, 2000, p.8).

In my research for a pedagogical model that addresses cultural diversity while encompassing the demands for the competent and flexible learners of the 21st century, I was introduced to multiliteracies pedagogy (New London Group, 1996; 2000). Cope and Kalatzis (1996, refined 2000a, 2005) are among those who introduced the term "multiliteracies," and elaborated on the potentials of a "Pedagogy of Multiliteracies". A pedagogy of multiliteracies is posited as "a teaching and learning relationship that potentially builds learning conditions that lead to full and equitable social participation" (New London Group 1996, p.60). Cope and Kalantzis (2000a, p.239) stress that there is nothing radically new in a multiliteracies pedagogy; prevailing pedagogy has simply been repackaged in order to expand the scope for literacy by viewing many types of expression and communication as literacies, whether formal or informal; spoken, gestured, written or graphic; official or unofficial (Ryan and Anstey, 2003, p.15).

However, within the spectrum of education and learning in general, this broadening of what literacies constitute can redefine the intentions and practices of teachers to include considerations of the students' real world experiences, who they really are and what kind of

literacies they practice. Encompassing students' strengths and interests in popular culture and media literacies could provide a way towards social inclusion and meaningful learning, while also developing more traditional forms of literacy (Rowsell, Kosnik, and Beck, 2008, p.112).

Although a body of research exists that points to approaches and practical applications of multiliteracies pedagogy in formal learning contexts, such as schools, that nurture cultural diversity of students, little empirical evidence is found on how to teach in and through multiliteracies pedagogy in a museum setting. Schwartz (2008) provides a model of museum-based pedagogy which addresses the consideration of multiliteracies in the planning of museum based activities and is utilised in this research.

The consideration of the museum in relation to literacy and multiliteracies is informed by a post-structuralist view of the museum experience, evident in the notions of textuality and intertextuality as a means of empowering museum visitors (Franzak and Noll, 2006; McCarthy, 1990; Roberts, 1997; Silverman, 1995). This introduces a burgeoning consideration of museum objects and the spaces they occupy as textual compositions, and audiences as readers (Franzak and Noll, 2006; Golding, 2007, p.149) engaging in a process of interpretation that facilitates movement from passive consumers to active producers of individual meaning. Such views recognize that, as a literacy practice that occurs within a public institution, museum visiting is situated within broader social relations, is differentially realized and is a social activity that individuals have varying experiences of, as a result of their life histories and personal subjectivities; this fits within the multiliteracies theory of the world. Classifying objects as texts, texts that "speak to the eyes" (Hooper-Greenhill, 2000, p.14), broadens our notion of visual language, which rhetorics, readers, and textbooks tend to define only in terms of images and other graphics (Faigley, et al., 2004). The interpretation of messages is similar to the deciphering of text, using the signs, symbols, objects, etc., of a museum exhibit as part of the process of creating meaning (Roberts, 1997). Seeing museums as texts and museum visiting as a multiliteracies practice could inform consideration of the 'nature of literacy' and requirements of museums as sites for learning (Mathewson-Mitchell, 2007). A detailed

explanation of how the multiliteracies pedagogy is used in the MMP framework alongside contributing theories such as the Four Resources Model developed by Luke and Freebody (1999), and the Learning by Design Model developed by Kalantzis and Cope (2000, 2005), is provided in Chapter Three of this study, Section 3.8 (p.86).

The next section provides an outline of the research followed by a discussion of the significance of the thesis with relevance to the global and local context of study. Then key definitions and conventions used are provided. The final section of this chapter provides an overview of the structure of the thesis.

1.6 Overview of research methodology

Reeves (2006, p.57), in discussing educational research states that there exists "a legacy of ill-conceived and poorly conducted research that results in no significant differences or, at best, in modest effect sizes". In addressing the need for alternative research approaches to succeed an effective educational impact (Plomp, 2013, p.16), I adopted a Design Based Research (DBR) methodology (DBRC, 2003; McKenney and Reeves, 2012; Wang and Hannafin, 2005). DBR is an emerging paradigm of research which involves cycles of iterative development of solutions as applied to pragmatic and complex educational problems in schooling contexts (McKenney and Reeves, 2012). The approach can be characterised as: intervention-centred, theoretically informed, goal oriented, iterative, mixed modality in design, and pragmatic[10] (Reinking and Bradley, 2008, p.17). DBR research is seen as a methodology that blends empirical educational research with the theory driven design of learning environments, to facilitate understanding of how, when and why educational innovations work in practice (DBRC, 2003, p.5). There is a need for adopting DBR as a research approach that will facilitate to move away from traditional research/practice barriers to facilitate the design of interventions that are effective, sustainable, and scalable (Fishman et al., 2013, p.136).

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[10]A more detailed explanation of these characteristics of DBR methodology is provided in Chapter Two, Section 2.3.1, p.42.

I adopted the DBR as a research strategy to create educationally relevant interventions in which design for learning requires iterative refinement and study combining and interweaving design and research activities (Collins, Joseph, and Bielaczyc, 2000; DBRC, 2003). Figure 1.3 demonstrates the three phases of the research, i.e the preliminary analysis, design of the intervention, and implementation and evaluation, (Chapter Two, Section 2.5, p.45) and also includes some anticipated outcomes. While it cannot be claimed that there exists a single design-based research method, the overarching concern acknowledged is to use methods that link processes of enactment to outcomes (Sammel, Weir and Klopper, 2014, p.105). I employed both qualitative and quantitative tools for data collection and analysis which involved classroom and museum-school visits and observations, semi-structured and focus groups interviews, questionnaires, evaluation rubrics, and documentary analysis drawing on a hybrid combination of inductive and deductive approaches.
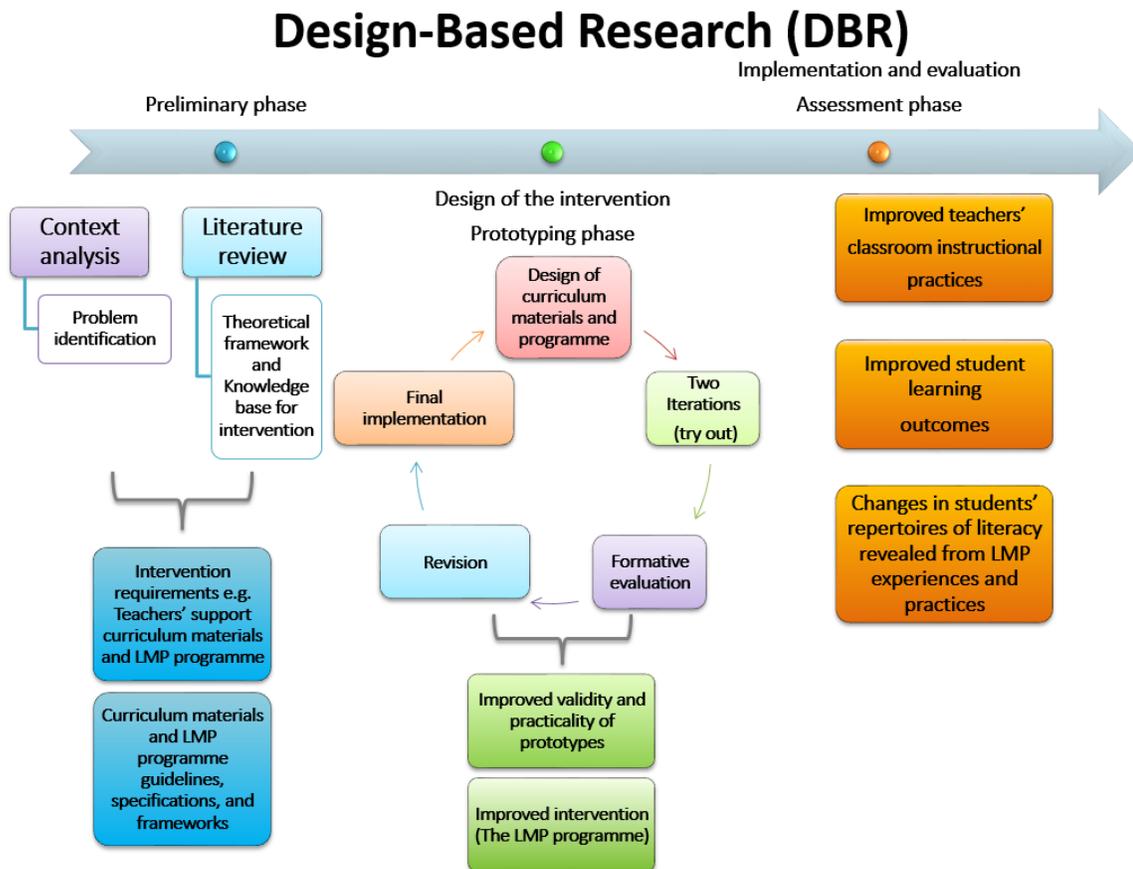
Figure 1.3 Research process strategy (Source: Savva 2016a)

1.7 Structure of the thesis

There are seven further chapters in this thesis.

Chapter Two introduces the research framework of the study that draws on design based research. The theoretical section of the chapter is followed by a more practical discussion of the sample considerations, data collection tools and analysis, as well as addressing issues of validity and the ethical considerations of the study.

Chapter Three sets the theoretical understandings of the study as an alternative framework for museum learning practice. To this end it has drawn on the field of New Literacy Studies (James and Prout, 1990), and more specifically on the educational approaches of Multiliteracies Pedagogy (New London Group), the Learning by Design Model by Cope and Kalantzis (2000a, 2005) and the museum based pedagogy proposed by Schwartz (2008) to provide an alternative approach to museum education that encompasses understandings of the multimodal and multiliteracy nature of museum learning.

Chapter Four introduces the prototyping phase through a brief review of effective museum-school partnerships. This is followed by a description of the development of the museum-school partnership programme of the study which included the design of supporting teaching materials, a workshop and museum educational programme, and resources, as well as prototyping and the formative evaluation of the programme.

Chapter Five discusses the prototyping and formative evaluation of the development of the Living Museum Partnership from the iterative cycles of the curriculum materials, virtual workshop and museum education programme. The evidence substantiated by the multiple forms of data collection suggested that the partnership was feasible in terms of practicality and validity, with minor adjustments made following the advice of experts and users.

Chapters Six and Seven reflect on the implementation and evaluation phase of the final design framework. Chapter Six explores the impact on teaching and learning while Chapter Seven in particular presents the findings on how the LMP affected students' repertoires of literacy with a particular focus on the multiliteracies experience of one group of students. Findings suggested increased motivation and positive feelings on behalf of the CLD students in this research. In particular, students engaged with museum multiliteracies-based activities in meaningful ways which enhanced their learning. An improved conceptual understanding, collaborative work and expanded repertoires of literacy were observed in the majority of students involved.

The concluding chapter of this thesis (Chapter Eight), attempts a synthesis of the findings from the field research and overall investigation. It includes considerations of the limitations of the research, and its contributions to knowledge in terms of local policy and praxis as well as for a wider scale. The thesis ends with a discussion of recommendations for how to proceed with further research, theory and practice relevant to developing 21st century museum-school partnerships in particular for culturally and linguistically diverse students.

Chapter Two - The methodological framework

> Novel ways to research learning in these environments… and to explore how learning could be
> supported with the learning design are needed in order to bring about changes in teaching practices.
>
> (Bergroth-Koskinen and Seppälä, 2012, p.95)

2.1 Introduction

The intention of this thesis addressing the research questions exposed in Chapter One, Section 1.1 (p.14) has been twofold: first to examine the feasibility of a museum-school partnership programme that is taking a multiliteracies perspective into consideration, and secondly to engage in a research process that would reveal the everyday literacy experiences of children who are culturally and linguistically diverse as they engage in the museum-school partnership. Importantly, the research methodology needed to be flexible enough to allow for the participating teachers' and students' own perspectives to emerge and guide the development of the partnership programme.

Based on these requirements, this chapter delves deeper into the research framework that informed the study, namely a three-phase design-based research methodology, as already mentioned in the introductory chapter of this thesis (Section 1.6, p.35). The specific philosophical and practical features of the chosen methodology, and the proposed research strategy, are presented in detail here. A description of the research setting and participants, data collection tools and analysis techniques will be included. Finally, the chapter concludes with a discussion of the limitations of the research, issues of reliability and validity, ethics, and a brief summary.

2.2 Pragmatism as the philosophical underpinning of the research

This research is informed by the paradigm of pragmatism. Pragmatism is a deconstructive paradigm that offers an alternative to the traditional either positivist or interpretivist paradigms in educational research. Pragmatism advocates the use of mixed methods in research, as it "sidesteps the contentious issues of truth and reality" (Feilzer 2010, p.8), and "focuses instead on 'what works' as the truth regarding the research questions under investigation" (Tashakkori and Teddlie 2003b, p.713). In fact, classical pragmatist philosophers like Pierce, James, Dewey and Mead explicitly refer to this and oppose the correspondence theory of truth and the view of knowledge as representation; instead they perceive the acquisition of knowledge within the concept of action (Rorty, 2004; Biesta and Burbules, 2003). The essence of a pragmatist ontology lies in actions and change as it is thought that society is 'in an ongoing process of action' (Blumer, 1969, p.71), 'a constant state of becoming' (Goldkuhl, 2012, p.7).

Creswell (2007) summarises some further distinguishing characteristics of the pragmatic paradigm in relation to other research paradigms:

- The intended consequences determine the 'what' and 'how' to research.
- Research always occurs in social, historical, political, and other contexts.
- Pragmatists agree that the external world is independent of the mind as well as those lodged in the mind. However, they believe that we need to stop asking questions about reality and the laws of nature. (Alghamdi and Li, 2013, p.23).

Pragmatism offers a meaningful theoretical background for educational research since the latter is highly practical in orientation (Biesta and Burbules, 2003). However, there is a difference between practical and pragmatic. In the pragmatic paradigm, as discussed previously, knowledge and actions are considered interlinked. Applying Dewey's notion of knowledge as an organism-environment interaction to research-based design in education, knowledge is understood as a construction that is located in the teacher – the learning environment interaction itself (c.f. Biesta and Burbules, 2003).

Drawing on this active, adaptive, and adjusted process of interaction emphasis is on the ongoing dynamic balance between teachers and learning environment. From this perspective, design-based researchers suggest changes for the learning environment in order to obtain new knowledge about science teaching and learning (cf. Biesta and Burbules, 2003).

2.3 Design-Based Research (DBR)

This study, as already stated, employs a design based research methodology (Schoenfeld, 2006) aiming to "build a stronger connection between educational research and real-world problems" (Amiel and Reeves, 2008, p.34). This is achieved through "supporting design and development of prototypical products to solve complex authentic context specific problems" in a holistic way (Cobb, Confrey, diSessa, Lehrer and Schauble, 2003, p.9; Joseph, 2004; Lai et al., 2009, p.120; Sari and Lim, 2012, p.2). Wang and Hannafin (2005) provide a definition that captures its critical characteristics:

> DBR is a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories (p. 6).

Van den Akker et al (2006) and Wang and Hannafin (2005) notice that the term "design-based research" (DBR) emerged in the 1990s as a new paradigm, following efforts to produce a framework of educational inquiry that would integrate design and research as a more seamless activity (e.g. Brown, 1992; Cobb, 2001). Consequently, this goal oriented research approach involves the development of teaching and learning innovations or the systematic design and study of instructional strategies and tools (Barab and Squire, 2004; Brown, 1992; Collins, 1992; Dede, 2004). In DBR interventions are viewed as "enacted through the interactions between materials, teachers, and learners" (Design-Based Research Collective, 2003, p.5). Characteristic of DBR in this process is how changing and

understanding a situation occur concurrently, which is also common in sociocultural traditions.

2.3.1 Characterizing design-based research

DBR, when compared with other methodologies, is thought of as a complicated, open-ended, creative and challenging process (Edelson, 2002, p.108). Researchers such as Cobb et al., (2003), Kelly (2003) and Van den Akker et al. (2006, p.5) have characterised DBR as being:

i) "Interventionist", since it focuses on designing interventions in real world settings; the intention is to investigate types of learning that are not present in naturalistic settings. These sort of DBR studies exhibit better ecological validity, which implies that the methods measure better what the researchers seek to measure, which is learning in natural situations (Cobb et al., 2003, p.10).

ii) "Iterative", since it consists of cycles of analysis, design/development, evaluation, and revision. The cycles consist of a preparation and design phase, a teaching experiment, and retrospective analysis. The results yielded feed a new design phase while, importantly, changes occur during a teaching experiment or a series of teaching experiments (Cobb et al., 2003, p.37).

iii) "Collaborative", since it incorporates active engagement of practitioners in the various research stages

iv) "Process-oriented", since the focus is on understanding and/or improving interventions, and also shares prospective and reflective components which are not separated by the teaching experiment. When the implementation of designed activities takes place (prospective part), the researchers confront actual learning that they observe (reflective part) (Cobb et al., 2003, p.37).

v) "Utility-oriented", as an important part of evaluating the feasibility of a design is based on its practicality for users in real contexts (Van den Akker et al., 2006, p.5).

vi) "Theory-driven", as the purpose is to develop theories about learning and the means that support that learning through systematic evaluation of consecutive prototypes of the intervention which facilitate theory building. Importantly, the

theory under development in DBR must be general enough to be applicable in other contexts, which refers to the potential transferability of the DBR pursued (Bakker and van Eerde, 2013, p.15).

2.3.2 Locating theory in the research process

Design based research is claimed to have the potential to bridge the gap between educational practice and theory, because it has dual outcomes: a pragmatic goal of solving *complex real-world problems* in authentic situations by cycles of analysis, design, development, evaluation and redesign; and a theoretical goal of generating *contextually-sensitive, sharable design theories*, which should be communicated to practitioners and designers (Wang and Hanaffin, 2005, pp.6-7).

Kelly (2013) concords with other researchers that the question of the "theoretical yield" of design research is not a simple one (p.143). Informed by theory and aiming to contribute to theory (as well as to educational innovation), design based research is a theory oriented approach (Cobb et al., 2003, pp.10-11). Kelly (2013, p.143) suggests that DBR goes beyond merely developing and testing particular interventions, "to allow theory and modeling that accounts for the content, the cognition, and the enactment by real people in real and rich contexts with real limits on resources" (see Zaritsky, Kelly, Flowers, Rogers and O'Neill, 2003). The intention is to create theory about both the process of learning and of the means that are designed to support that learning (Cobb et al., 2003, pp.9–13; The Design-Based Research Collective, 2003, p.5; Wang and Hannafin, 2005, p.5).

2.4 Justifications for DBR methodology

Based on the outline of DBR methodology presented previously, it is considered to be the most suitable framework of scientific inquiry for this research for the following reasons:

Firstly, I ascribe to the view that the objectives of a particular piece of research should inform the choice of methodology and not the other way round. This means that the paradigms and methods used should fit the research purpose, a perspective close to the flexible nature of the DBR through its pragmatic ontological and epistemological orientation (Creswell, 2003). In this study, I perceive educational research at the crossroads of museums and schools as a means for both building theories and improving educational opportunities. The intention in undertaking DBR is to focus on the ever-changing needs of participants, and this is addressed through all four research questions underpinning this thesis.

The flexibility in DBR research further supports the quest for addressing solutions to complicated problems in real contexts, by taking into consideration the specific context and experimenting with preliminary designs in the form of small interventions. In other words, DBR allows researchers to implement a theoretically-designed learning environment in a real life setting, and thus links research with practice (DBRC, 2003; Kelly, 2004; Reeves et al., 2005). DBR is, in other words, "an approach to developing and studying theory-driven pedagogical interventions in situ" (Barab and Squire, 2004, p.3) which reinforces the enactment of the MMP framework in this research.

Further to this, DBR research tests existing theory in real world contexts, which overcomes the limitations of conducting research on learning process in a controlled laboratory environment and challenges related to ecological validity (Van Den Akker et al., 2006, p.49). DBR was appropriate to provide a research-informed design solution to the problem identified in the local context of Cyprus. But it also has broader implications, in the expectation that I can refine elements of the designed intervention so that it allows to test and generate theory "in the context of authentic scientific investigations" (Barab and Leuhmann, 2003, p.457). The integration of design and research as a more seamless activity (e.g. Brown, 1992; Cobb, 2001) during the prototyping phase, described in Chapter Five, involved formative evaluation and revision, essential in design research as to identify

weaknesses in the problem analysis, design solution, or design procedure (Edelson, 2006, p.160).

DBR, when it first emerged, was used for designing ways to address technological innovations (Wang and Hannafin, 2005, p.11) and improve ICT integration (Sandoval and Bell, 2004; Wang and Hannafin, 2005, p.13). It is still considered a meaningful approach for technology-based solutions for educational problems (Kervin et al., 2006). The latter is relevant to this research as the proposed pedagogical framework of multiliteracies addresses the needs and challenges of literacy through multimodal ways of meaning making and communication. I employed technology enhanced learning methods such as the WebQuest, to develop the museum-school partnership.

Developing principles that guide future curriculum design is one of the goals of DBR (Bell and Linn, 2000, p.797) as it allows the researcher to develop detailed design knowledge while also advancing theoretical knowledge of learning (Bell et al., 2004, p.74). This is achieved through the prototyping process in DBR and successive cycles of interventions that address realistic teaching and learning competencies and needs (McKenney et al., 2006, p.125). Museum-school partnerships are an ideal ground for conducting DBR (Cobb et al., 2003, p.9). There, researchers and school and museum educators - practitioners, that is - can collaborate to achieve meaningful connections and learning for their students through taking the best from both worlds. Through the DBR approach, the research contributed to developing design principles, curricular products and enhancing the learning and professional development of participants (McKenney et al., 2006, p.125).

2.5 An overview of the three stages of the research

This section provides an overview of the three main phases of the study informed by Nieveen, N., McKenney, S., and van den Akker (2006), Wademan (2005), Plomp (2007), and Reeves (2006): preliminary analysis, the prototyping stage, and implementation and evaluation or assessment. A diagram of the research framework

undertaken is provided in Figure 2.1. All of the following chapters in this thesis draw on this framework, in particular with regards to data collection and prototyping procedures.

Phase 1. The first phase of the research process involved the preliminary analysis of identifying the problem, diagnosis and the design elements that could lead to a potential solution. I engaged in context analysis, field-based investigation, and a literature review to determine the situation. This phase had both practical and theoretical implications for the research. In terms of theory, it was essential to define the problem, specify long term goals, and identify design requirements and initial guidelines. In terms of practice, the preliminary analysis provided a descriptive and contextualized account of the problem.

Phase 2. This phase consisted of the design and testing, through empirical means, of the desired solutions to the identified problem, in the natural context in which it occurs. This prototyping approach involved successive iterative cycles of prototypes tested, involving design, formative evaluation, analysis, and revision. Outcomes from each cycle were used to inform the next prototype in terms of its validity and practicality. The synthesis of findings from the design and testing stage were incorporated into the final intervention that was implemented and evaluated.

Phase 3. The implementation and evaluation of the programme is the third phase of the research process. The intention of evaluating the enactment of the programme is to determine how effective the refinements made were (Smith and Ragan, 1999, p.5). The practical goal of this phase was to gain ideas of how the enactment of the programme could be undertaken in a broader context. The knowledge and pedagogical skills gained during this stage contributed to the empowerment of the theoretical framework of the intervention.
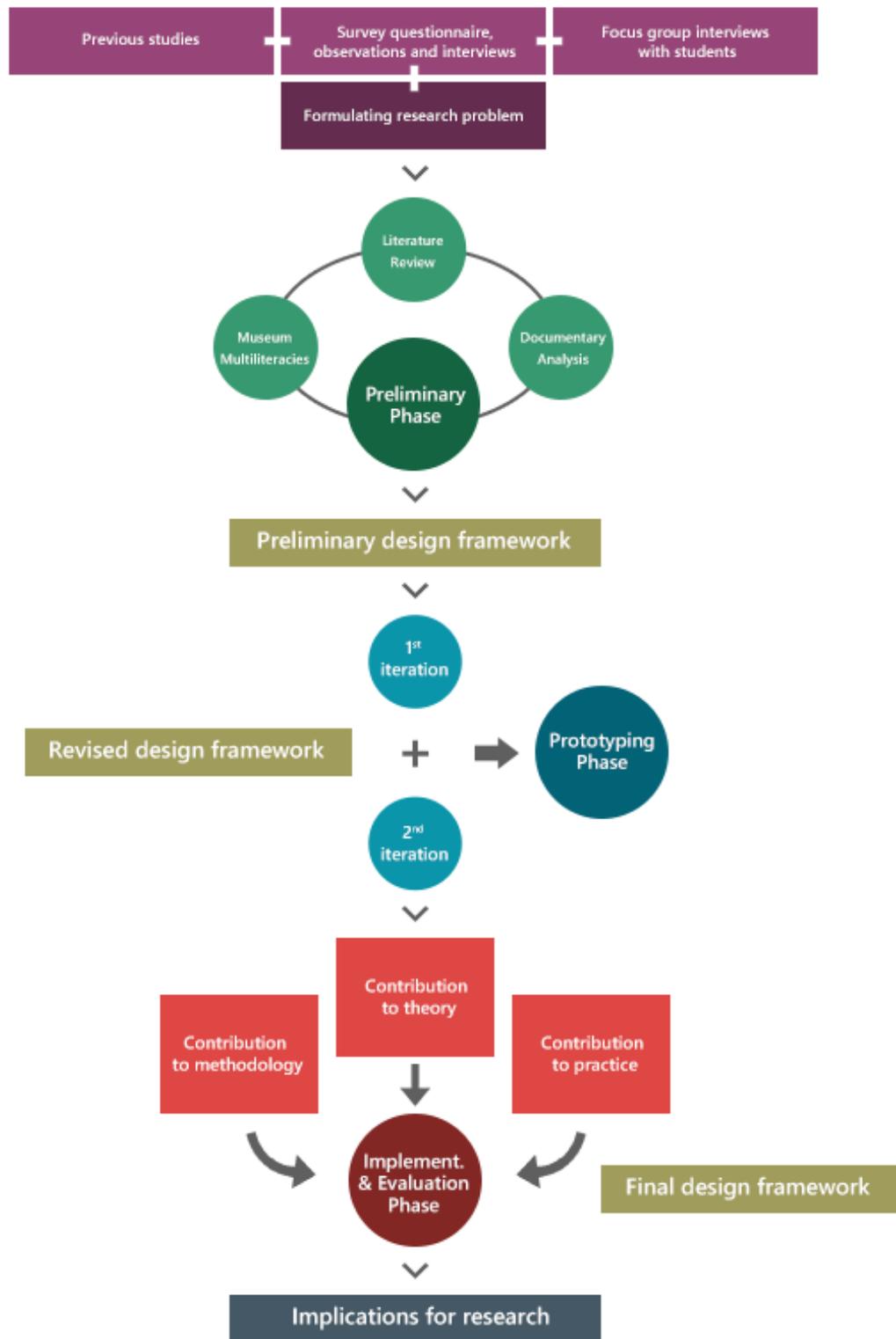
Figure 2.1 The research framework (Savva, 2016a)

2.6 Limitations and challenges

The research undertaken was small scale, which is appropriate for in-depth analysis and reasonable for a lone researcher with considerable limitations in terms of time and resources. Conversely, it was essential in planning this research to identify limitations of the design based approach and the mixed methods utilised with the intention of minimizing these disadvantages. Of these limitations, perhaps the most significant relates to issues of generalizability. This refers to the degree to which the findings can be generalized from the study sample to the entire population (Polit and Hungler, 1991, p.645).

With respect to the previous, efforts to generalize findings from this research were not based on statistical techniques, but rather focused on analytical forms of generalization (cf. Yin, 2003; Van der Akker, 2013, p.68). This approach is closer to the character of DBR which traditionally is not concerned with generalizing from its findings. Nevertheless, there exists "the challenge of flexibly developing research trajectories that meet the dual goals of refining locally valuable innovations and developing more globally usable knowledge for the field" (Design-Based Research Collective, 2003, p.7).

Myers (2000, pp.3-4) suggests that it may be possible however to make partial generalizations to people who share similar characteristics with those in the study population. Any potential transfer of the research findings to theoretical propositions relevant to other settings, however, should be based on adapting to the needs of the particular context intended to implement the intervention (Van der Akker, 2013, p.68). This can be achieved through the task of "analogy reasoning", utilising the clearly defined design principles applied as reported by DBR researchers, and by reflection on the results afterwards. These design principles should entail information on both the (substantive) what and (methodological) how of the intended interventions, but also offer theoretical explanations for the research carried out and the innovations it makes (Van der Akker, 2013, p.67). This research followed Myers by attempting to gain a rich and complex understanding of the specific social context and/or phenomenon: for example, the perceptions, practices and experiences of students in relation to the intervention. It was

also decided to adopt the same criteria for validity: "use of systematic sampling, triangulation and constant comparison, proper audit and documentation, and multi-dimensional theory" (Finfgeld-Connett, 2010, p.246).

There are certain further challenges relating to the use of DBR in this study. The following paragraphs address these challenges with a focus on how to deal with them in the context of the research.

i) *The challenge of context and time span*

One significant challenge in relation to DBR concerns the fact that it is a long-term, time-consuming research endeavour which can cause it to be less favourable among doctoral students. Nevertheless, it is feasible if it is adjusted to the context and particular conditions of the PhD. In this research, a more flexible, simplified format of the DBR was adopted, one that was compatible with the time span of the study and my particular context of employment.

ii) *The challenge of reliability, validity and credibility*

DBR, as already stated in this chapter, is a flexible methodology which utilizes both qualitative and quantitative methods to get data without controlled experimentation. Therefore, the challenge of validity and credibility is persistent. The most poignant question relates to the criteria used to assess the validity and credibility of the design, thus judging it also on the basis of replication. In addressing this challenge, Bowler and Large (2008, p.40), and Collins et al. (2004) contend that the key lies in the contextual nature of DBR. One characteristic of DBR is how its resulting designs are applicable to real local needs and can be of use to practitioners; therefore, the issue of validity is addressed, in part at least, through use. The flexibility to use multiple methods in DBR enhances and confirms the credibility of findings (Wang and Hannafin, 2005, p.8). Mixed methods are thus used as a body of evidence to support theoretical principles, grounded in a particular innovation or intervention as well as refining it in context (Kelly, 2004; Wang and

Hannafin, 2005, p.8). These points refer to the practice of triangulation as a research technique, which scholars perceive as "a powerful way of demonstrating concurrent validity" (Cohen et al., 2007, p.141).

iii) The challenge of adaptability

As noted above, a key characteristic of DBR is that it is a research design that is open to adjustments and modifications, which may become necessary according to the specific context and research conditions (Plomp, 2007). The researcher undertaking design based research is also one who must adapt to other roles beside the fundamental role of the researcher, while remaining loyal to his/her primary role (McKenney et al., 2006; Van den Akker et al., 2006, p.130, 132). In this research, I undertook the role of designer, advisor and facilitator concurrently with being the primary investigator. Although this creates an additional burden for the researcher, it is feasible as soon as balance is achieved on each role at certain stages of the research process. This implies a high level of organizational and communicative capabilities (McKenney et al., 2006, pp.132-133).

iv) The challenge of rigour

One other challenge highlighted in conducting DBR relates to issues of rigour, as it is considered to be an emerging methodology which has not established its unique standards and criteria. For example, Hoadley (2004, p.204) suggests that, in comparison to experimental research, using DBR raises different questions, such as how to ensure that an intervention is appropriately characterized, given that we do not entirely control its parameters, and, in addition, how to generalize outcomes and results to other contexts. Nevertheless, Hoadley (2004, p.204) suggests that "DBR can be more rigorous in certain ways", such as "helping to connect interventions to outcomes and lead to better alignment between theory, treatments and measurement than experimental research, in particular in the complexity of a real classroom". In educational research it is not entirely possible to get everything desired through a set of approaches, tools and methods, since there are particular strengths and weaknesses in each approach. The positive of using DBR is that it

allows us to take advantage also of the benefits from each method, for instance the deeper contextual understanding of a studied phenomenon which participant observation sustains, as well as the objective understanding a quantitative method such as survey provides (see also Cohen et al., 2007; Creswell, 2003; Pring, 2005; Tashakkori and Teddlie, 2003a).

2.7 The research population, sample and sampling procedures

Given the premises of this research for inclusive museum learning practice, the selection of the participants and their individual contexts was significant (Miles and Huberman, 1994). Purposive sampling (Stake, 2003; Patton, 1990) was employed; this is a strategy where participants are recruited according to preselected criteria relevant to a particular research question (Mack et. al., 2005, p.15). The premise was that those selected can provide the necessary data for the research (Parahoo, 2006, p.268). The study's research objectives, resources and limitations of time and convenience determined the characteristics of the sample population; i.e. which and how many people were selected (Burns and Grove, 2011).

The decision to focus on primary schools in Cyprus was taken for two reasons. First, until recently, school groups from Primary Education comprised the only student population for which museum educational programmes accredited by the Ministry of Education and Culture (MOEC) were running in Cyprus. Therefore, to explore Museum Education policy and practice in Cyprus it was thought meaningful to address primary students, and in particular those aged 10-12 (in the fourth to sixth grade of primary school). The particular age group in focus was preferred because it is an age group which I feel comfortable working with, as I am a primary teacher myself.

The school and museum sites finally chosen to conduct this research are to be found in the particular environment of Limassol, the second largest city in Cyprus. I chose Limassol for the following reasons. Limassol is the island's largest port, and one of the biggest ports in the Mediterranean transit trade, with a continuous flow of products and tourists. Major development plans are currently underway, which will further sustain the

town's leading role in the region. Currently the city is the most cosmopolitan in Cyprus. The city's population is estimated at 154000 people and it is developing into a multicultural town, with an intake of immigrants from Greece, Lebanon, the Phillipines and former Soviet countries which has been occurring since the 1980s. Following the Turkish invasion in 1974, the population also consists of Greek Cypriots from all over Cyprus, while there is also a small Turkish Cypriot community (approximately 300 persons), primarily Roma, who began immigrating from the north in the late 1990s and were settled in houses in the old Turkish Cypriot quarter of the city.

Further, Limassol is renowned for its long cultural traditions, with a wide spectrum of activities and a number of museums and archaeological sites available to the interested visitor. The town has seen unprecedented development following the establishment of the Cyprus University of Technology (CUT) in 2007, which is the only public institution in Cyprus offering art-related undergraduate and postgraduate courses as well as museum doctoral studies since 2011. In fact, Limassol will host the first Fine Art and Applied Art School in Cyprus: this has been assigned to the CUT, and is expected to open its doors in September 2016. A practical reason for choosing Limassol as the geographical location for the investigation is that it is the town where the researcher works. This facilitated the conversations necessary to gain permission for conducting the research as the researcher had a working relationship with one of the museum educators in each museum, allowing access to the two museums in Limassol.

This research involved primary general subject teachers and their students from two public primary schools in Limassol, experts, and museum educators appointed to run museum educational programmes in two museums in Limassol. Table 2.2 presents the research sample for different research activities. Chapter Six (p.203) provides more detailed contextual information on the school and museum sites as well as insights drawn from interviews with teachers and students.

2.8 Research strategy

This research utilizes a mixed methods approach to DBR, a common strategy of inquiry used in DBR (Bell, 2004, p.25) and typical of pragmatism (Denscombe, 2010, p.135). The intention of this approach is to strengthen the findings at the various phases and stages of the research process by comparing, connecting or embedding the different data sets (Creswell, 2009, p.4; Denscombe, 2010, p.135; Leedy and Ormrod, 2010, p.144; Teddlie and Tashakkori, 2009, p.339).

In undertaking a mixed methods approach, I was attentive to three issues: timing, weighting, and mixing of the qualitative and quantitative methods (Creswell, 2009, p.206; Denscombe, 2010, p.135, Teddlie and Tashakkori, 2009, p.31). As far as timing, in this research the iterative stages were sequential, with the outputs of the qualitative data being used to refine the quantitative ones, in particular the questionnaires. In terms of the weight of the data, qualitative data - and therefore qualitative analysis - were considered of a higher priority, with a particular focus placed on the interviews with experts, teachers and students.

Finally, it is important to note that I took into consideration the perspective of how and when the mixing of qualitative and quantitative methods relate in terms of data collection and analysis. Following the guidelines by Creswell (2009), the two methods were used simultaneously, although this does not mean the two sets of data were combined in the same database. In addition, triangulation was undertaken by comparing the findings from the quantitative analysis with those of the qualitative one. In this sense, the mixing took place during the analysis and literature phases, to analyze and interpret findings. According to Creswell (2009, p.213) this is a concurrent triangulation design. Further details on the use of the methods chosen can be found in the next two sections of this chapter.

2.8.1 Data collection instruments

An array of data was collected to cross-reference interpretations (Yin, 2012) including:

   i) Researcher-facilitator observations of interactions reported in field notes;
   ii) Questionnaires with teachers and students;
   iii) Semi-structured interviews with teachers prior and after the LMP field study;
   iv) Focus group interviews with students;
   v) Bloom's Digital Taxonomy Activity Analysis Tool;
   vi) Multiliteracies Performance Assessment Zones (MPAZ); and
   vii) Artefact collection and analysis, including samples of students' work both print and online.

Triangulating the wealth of data from the various methods resulted in my overall evaluation of the LMP. Imperative within this process was to allow for the participants' voices to be heard, as Prosser and Trigwell (1999) argue that teaching and learning are closely related and alignment is required between the lecturer's and the student's perceptions of teaching and learning. Therefore, both of these groups of peoples' opinions and experiences were examined to determine the content of the educational materials and establish the appropriate teaching methods, guidelines and resources.

Participant observations

Cohen and Manion (1994, p.122) describe observations as "*a methodological approach rather than one specific method*". Grounded in the principles of ethnography, naturalistic observations were prominent in this research to contextualize the students' experiences. My approach was that of a participant observer in the research. In participant observation, the researcher is not merely a passive observer. According to Yin (1988) they may take on a variety of roles in the duration of the study and may even participate in the event under study.

Silverman (1993) and Huberman and Miles (1998), emphasized the importance of writing field notes, and using these in developing coding frames. As being both the researcher and facilitator created a challenge to taking field notes during the sessions, I completed notes immediately after each lesson translating from Greek to English. Following Diamond's (1999) advice, observations involved systematic collections of data through tracking pupils' pathways and behaviour during the project, noting how and what people (educators and pupils) are doing. In particular, I decided I would make use of a visual observation tool (Griffin, 1999) created for determining school children's engagement in learning in a museum and school setting. In this research, this was structured as a double entry journal, in a way that it would allow recording of interesting parts or facts from the text/activity/talk in relation to the teacher role. Thus, in my researcher notes I sought for learning behaviours that exhibited a level of meaningful engagement and positive outcomes for my students (Appendix 2A). For example, I was looking to see if students initiate their own learning activities, are actively involved with the activities, purposefully manipulate the tools available, share ideas with others, help others to use the resources available, and show emotive reactions. Behaviours exhibiting non-learning were also recorded, such as watching other visitors, walking quickly through an exhibit etc. With regards to the core teaching of multiliteracies, I would report on children's engagement with the basic literacies or the knowledge processes derived by the Learning by Design Model through use of classroom observation checklists (Appendix 2B).

Questionnaires

This research made use of questionnaires as a quantitative method of data collection which is quite popular for collecting information in a structured, numerical way and can be administered without the presence of the researcher (Oppenheim, 1996; Cohen et al., 2007). The type of a questionnaire, such as whether it will be "structured, semi-structured or unstructured" (Cohen et al., 2007, p.320) depends on the sample size. For a smaller sample of participants, such as in this research, less structured, more open and word-based questionnaires are preferred. In this respect, a semi-structured questionnaire

with open-ended questions was developed and employed to supplement findings from teachers' and students' interviews. Open-ended questions are best when the possible answers are unknown, or when a closed question would result in an extremely long list of options (Bailey, 1992). In addition, open questions allow for richness of responses, which at times can be unexpected (Cohen et al., 2007). On the other hand, a disadvantage of open questions is that they might be too open for the respondents to know how to answer them, and require more time to complete and analyze (Oppenheim, 1996). Nevertheless, it was thought appropriate to incorporate them in the questionnaires.

The questionnaires designed and administered in this research were:

i)   Students' expectation questionnaire (Appendix 2C), used to explore students' prior experiences with museums, and their expectations about participating in the museum-school partnership workshop;

ii)   A teacher evaluation questionnaire (Appendix 2D), which examined teachers' opinions and experiences regarding the museum-school partnership activities, including what they learned and practiced, and the impact of this on students' learning and affective outcomes;

iii)   A student evaluation questionnaire (Appendix 2Ea), which provided information about students' perceptions and experiences relating to the museum multiliteracies-based approach used during the intervention; and a student workshop evaluation questionnaire (Appendix 2Eb);

iv)   Students' attitude questionnaire, which examined students' attitudes towards museums and the teaching and learning methods before (Appendix 2Fa) and after (Appendix 2Fb) the implementation of the intervention;

v)   A follow-up questionnaire (Appendix 2G) for the assessment of teachers' perceptions and experiences following their participation in the partnership.

The in-depth interview is a technique particularly favourable as it is considered capable of providing a vivid picture of the participant's perspective on the research topic (Mack et. al., 2005, p.29). Semi-structured interviews were thought to be more appropriate to investigate teachers' perceptions regarding their experiences and practices in relation to multiliteracies pedagogy, culturally responsive teaching, and museum learning, prior and after the implementation of the intervention. The aim is to understand the complex behaviour of members of society without imposing any a priori categorisation that may limit the field of inquiry (Fontana and Frey, 2005, p.706).

The reflective interviews took place during the Summer-Autumn of 2012 prior and after the intervention. Each interview lasted between 25 and 45 minutes, depending on the person's willingness and availability. The educators were approached as experts in their field, the goal being to "establish the subject as the one who knows and the researcher as the one who has come to learn" (Bogdan and Biklen, 1998, p.97). Also, care was taken to make participants feel welcome to share their experiences and be confident that their voices were heard and that their responses were not influenced by feedback from the researcher, acting to achieve a "balanced rapport" (Denzin and Lincoln, 2000, p.650).

A downside with interviews, even ones which are audio recorded and transcribed, is that the reliability of the interpretation of transcripts may be gravely weakened by a failure to note apparently trivial, but often crucial, pauses, overlaps or body movements (Silverman, 2006, p.46). This was taken into consideration in this research by noting changes (verbally after the interview) such as being emotional or reluctance to discuss a subject area, even moments when the interviewee did not seem truthful, and why this happened (Mack et al., 2005, p.33).

An interview guide provided a means to systematically gain information about predetermined areas (Denzin and Lincoln, 2000), those being in this case the students' performances and the activities of the intervention. Having "key themes and sub-questions

in advance lies in giving the researcher a sense of order from which to draw questions from unplanned encounters" (David and Sutton, 2004, p.87). However, one of the strengths of the semi-structured interview type is that it can allow for the flexibility to use probing questions to illuminate particular pieces of information (Patton, 2002, p.343). The aim was to address all questions or topics listed in the interview guide, ask follow-up questions (some of which may be scripted in the interview guide) and/or probe participants for an elaboration of their responses in order to elicit participants' complete knowledge and experience related to the research topic.

The creation of the interview guide was a process of considerable thought based on previous research and literature as will be discussed below. The interview guide used for semi structured reflective interviews with teachers prior to the intervention (Appendix 2Ha) and post-intervention (Appendix 2Hb) consisted of a set of questions that covered the following questions:

1. What are the existing programs/practices at the school and how are they aligned with calls for a 21st-century education, and, in particular, culturally responsive teaching and multiliteracies?

2. What are the schoolteachers' attitudes and strategies to support these practices?

3. What are the teachers' perceptions, beliefs and attitudes towards museum-school partnerships and the museum multiliteracies-based approach after the completion of the intervention?

4. What are the teachers' perceptions, beliefs and attitudes on students' learning and reactions following the enactment of the intervention?

Focus group interviews with students

The research began and ended with semi-structured focus groups (Patton, 2002). For the focus group interviews, three groups of 3-4 mixed-sex students formed the population. This group size is considered manageable and is productive in revealing intra-group dynamics (Cohen et al., 2007; Krueger, 1994; Lewis, 1992). The decision to employ

a focused type of interview with students instead of semi-structured interviews aimed to allow discussion in a non-directive way and delve into the evaluation of an emerging framework.

The philosophical and theoretical groundings of the MMP and the notion of multiliteracies informed the design of the focus group interviews, in that it was considered more appropriate to adopt an alternative approach that would suit the participants' needs and interests. The method was unique in that an online software which allows for the creation of audiovisual comics – considered as a multimodal text – was employed for the design of the focused groups prior the intervention (Appendix 2Ia and 2Ib) and post-intervention (Appendix 2Ic). I hypothesized that the nature of group interviews using the audiovisual tool would motivate participants, in this case minors, to feel relaxed talking to each other and overcome anxiety or hesitation about offering views, opinions, or thoughts. It was anticipated that interaction in the group discussion - a basic characteristic of focus group interviews - would provide valuable information or insights, as the memories, ideas and experiences of individual members are stimulated when listening to others verbalizing their experiences.

Bloom's Digital Taxonomy Activity Analysis Tool

This is an instrument used to measure student learning and understanding in relation to Bloom's Revised Taxonomy, which accounts for the behaviours, actions and learning emerging as a result of engagement with technologies. The original taxonomy, and the revised taxonomy by Anderson and Krathwohl (2001), were adapted by Churches (2009), who devised Bloom's Digital Taxonomy Activity Analysis Tool. In this study, students' performance on the topic "ecosystems and endangered species" was measured against the six levels in Bloom's digital taxonomy: namely, remembering, understanding, applying, analysing, evaluating, and creating (Anderson and Krathwohl, 2001) (Appendix 2K). This type of assessment of the students' attained performance was considered more appropriate than standardized tests, as the span of the digital taxonomy begins with lower-order thinking skills (LOTS), starting from remembering and moving on to Creating and

higher-order thinking skills (HOTS). This is close to the theoretical understanding of the conceptual framework of this study.

MPAZ (Multiliteracies Performance Assessment Zones)

To assess how each student meets the criteria in each of the knowledge processes from the Learning by Design Model and define their level of performance, I developed the Multiliteracies Performance Assessment Zones (MPAZ) (Appendix 2L). This tool incorporates the following schemes of formative assessment:

i) An Assessment Schema, derived from the "Learning by Design Criteria for Measuring Learning" (Kalantzis and Cope et al., 2005, pp. 95-97). According to Cope and Kalantzis, the assessment schema uses a teacher rating sheet (TLS) (Appendix 2La). Cope and Kalantzis posit that the TRS allows for the tracking of students' performance in each of the knowledge processes.

ii) The Four Resources Model adapted by Luke and Freebody (1990); these resources being the functional dimension, the meaning making dimension, the critical dimension and the transformative dimension (Explained in detail in Chapter Three, Section 3.8.1, p.89) (Appendix 2Lb). These dimensions correspond respectively to each of the knowledge processes on the Assessment Schema by Cope and Kalantzis, and together reflect a zone of multiliteracies competence.

2.9 Validity and reliability

In undertaking research, it is imperative, regardless of the paradigm researchers choose to work within and methods used, to deal with reliability and validity issues. Although some researchers prefer to use terms like credibility and dependability instead of validity and reliability (Denzin and Lincoln, 2003; Riley, 1996), the latter terms were preferred here as they are more widely used. Validity relates to how well the analysis actually represents the phenomena it purports to represent: "to know [that] the means of

assessment you have developed is accurate and appropriate" (Diamond, 1999, p.75). In other words, it refers to whether or not the researcher is actually investigating what they claim to be investigating (Arksey and Knight, 1999).

DBR as already addressed in this chapter, is a research methodology which inherently does not look to generalize from its outcomes, and therefore ignores rules connected to external validity. Hoadley (2004, p.205), in discussing the latter, stresses that "universality is rare in educational phenomenon and because methods take tentative steps by first examining individual context, design based researchers generalise their findings only tentatively" since the design researcher is involved in the intervention as a participant observer and also has an active role in manipulating the environment of study. Due to this parameter, Hoadley (2004, p.205) maintains that it is crucial for researchers to describe and monitor ways in which results may be influenced by their own schedule, as well as "document any relevant interventional strategies used by the participants and researchers". This relates to issues of bias. More specifically, it has been recognized that researchers come to research with their own biases (Carr and Kemmis, 1986; Usher, 1997; Yates, 2004). This concern is significant, as it relates to how sound the explanations offered for the reader are; this is sometimes known as the problem of anecdotalism.

I was attentive to the above challenge by presenting the design and intervention, including the practices of both the participants and myself, as well as the context where events took place. This was achieved by presenting the iterative activities of the three stages of the study in an ongoing manner, while also documenting the practice of participants in detail through means of feedback and interviews received. Through this procedure, I was able to distinguish the personal perspective and the potential effect on outcomes in a reflexive way. Sometimes, the extended immersion in the 'field', leads to certain preciousness about the validity of the researcher's own interpretation of 'their' tribe or organization (Silverman, 2006, p.44). This was minimized in this research when coding and analysing data by allowing for similarities and differences between data to emerge, and describing this in reporting the findings.

Another technique which is utilised for ensuring rigour in DBR is the use of multiple methods and multiple sources of data (Cobb et al., 2003). Mixed methods can be used, therefore, for data collection, evaluation and refinement of the design to increase the "objectivity, validity, credibility and applicability" of the findings (Wang and Hannafin, 2005, p.10). Van Der Akker et al. (2006, p.85) argue that the use of this sort of triangulation of data sources is meaningful to "connect intended and unintended outcomes to process of enactment". Triangulating multiple sources and data is thought to be effective, based on the premise that "the weakness in each single data source, method, evaluator and theory could be compensated by counterbalancing the strength of another" (Miles and Huberman, 1994; Patton, 1990). The convergence model of triangulation was utilised in this research (Creswell and PlanoClark, 2007), which refers to collecting and analysing mixed data from different sources separately for each question, and merging them during the interpretation of the findings to develop a holistic analysis from both datasets.

Importantly, the research employed a quasi-experimental design during the field implementation of the LMP programme and evaluation (Table 2.2), to gain better insights on the impact of the intervention on student learning outcomes. This type of approach to research was informed by the criteria of external validity and causal validity, although generalizability was not a major concern in this study, as the aim was to gain understanding of the intervention as it unfolded in its specific context, and develop theories applicable to the particular setting. This would enhance ecological validity. Ecological validity means that theories, methods, and materials which will be applied to a specific setting, such as a museum or school, need to be generated from studies that are undertaken within a setting that approximates the real life situation under investigation (Van Den Akker et al., 2006, p.49) in order to be confident about the applicability of any resulting theory (Entwistle, 1987). Ecological validity was met through locating the study within a museum and school setting. Table 2.1 demonstrates potential threats to internal validity which I developed deriving from the quasi-experimental design and ways in which to eliminate/reduce them.

Table 2.1 Experimental threats to internal validity (Savva, 2016a)

Threats	**Authors' explanations**	**Elimination/reduction of the threats in the present study**
History	Possible events which occur between the first and second measurement that could lead to the observed outcomes (Shadish, Cook and Campbell, 2002).	Teacher participants in the experimental and control stage had the same headmasters, however, they taught different classes. Students were taught by the same teachers in their respective classes.
Mortality	Losing respondents due to treatment or to measurement can produce artificial effects (Shadish, Cook and Campbell, 2002).	There was no drop out in the study from teachers or students.
Instrumentation	Possible changes in the instruments used may produce changes in outcomes (Robson, 2002)	The participants and the data instruments during pre-testing and post-testing were the same.
Maturation	Any naturally occurring changes over time which could be confused with a treatment effect (Shadish, Cook and Campbell, 2002).	Students in the control group shared similar experiences to experimental students.
Selection	Attention to preliminary differences between the control and experimental groups before involvement in the study (Robson, 2002)	Students were matched based on their respective performance level. There were other cases over which the research had no control.

Reliability relates to the consistency of a given research method (Diamond, 1999, p.77). Methods can be called reliable if they produce very similar results when used in different settings, by different researchers, or at different times with the same people (Denscombe, 2003). Some researchers argue that qualitative interviewing is not really

concerned with issues of reliability, since knowledge is situational and conditional (Arksey and Knight, 1999). However, the issue of reliability cannot be disregarded. While the forte of field research will always lie in its capability to sort out the validity of propositions, its results will (reasonably) go ignored, minus attention to reliability. For reliability to be considered, it is incumbent on the scientific investigator to document his or her procedure (Silverman 2006; 1986, p.72). Silverman (1993) addresses a number of ways that reliability can be achieved in qualitative research: pre-testing interview protocols and questions; and systematically collecting, transcribing and reporting field notes and transcripts for others to review as necessary.

I pursued the previous by using the same set of guiding questions for all interviews and other data sources facilitated by piloting described in Chapter Five. Additionally, reliability was covered through systematically digitally recording and transcribing the interviews. To further increase the validity and reliability of the research, I asked for the help of a fellow researcher who was present at classroom observations and completed the classroom observation checklist. This was a means to improve the internal reliability of findings from classroom observations. Additionally, the prototyping phase involved a pilot of the data collection instruments in order to ensure the validity of the instruments utilised during the field implementation and evaluation stage (Chapter Six, Section 6.5, p.224).

2.10 Data analysis procedures

In this DBR research, the qualitative and quantitative data utilised were analysed separately to answer the three main research questions. These were later merged to facilitate a deeper and more holistic interpretation in order to gain an in-depth understanding (Creswell and PlanoClark, 2007). Thorne (2000, p.68) stresses that analysis is:

> An explicit step in conceptually interpreting the data set as a whole, using specific analytic strategies to transform the raw data into a new and coherent depiction of the thing being studied.

I developed a data base from the early stages of this DBR study so as to deal with the wealth of incoming data before data collection commenced, and maintained this throughout the process (Yin, 1994, pp. 94-98).The data were documented and organized as they were collected in 2012.

Table 2.2 The research sample and data collection instruments

The main phases of research and duration	Research activities	Participants				Data collection instruments
		Teachers	Museum educators	Students	Experts	
Preliminary analysis	Context analysis and literature review	2	2	17	2	Documents Semi-structured classroom observations Focus group interviews Field notes
Prototyping	Experts' review	-	-	-	2	Guiding questions
	Users' review	1	1	7	-	Open ended questionnaires
	Pilot with teachers and students	2	1	12	1	Observation checklists Semi-structured interviews Evaluation forms Focus group interviews Researcher journal
Final Implementation and evaluation	LMP programme implementation and evaluation (school sessions, workshop and museum visit)	2	-	17	1	Classroom observation checklists Semi-structured interviews Evaluation forms Focus group interviews Researcher journal Evaluation rubrics

2.10.1 Quantitative data analysis procedures

The quantitative data employed during the three stages of the research involved 5-point Likert scale questionnaires (e.g. Appendices 2C, 2D, 2Ea, 2Eb, 2Fa, 2Fb, 2G, and 2Ic) where 5 = strongly agree and 1= strongly disagree) for schoolteachers, museum educators and students. The analysis involved the use of a computer-based statistical programme, SPSS version 18, to report descriptive statistics using mode, frequency, percentages, and displayed data. For each level on the scale a numeric value was assigned; individual responses deriving from this were treated as ordinal data (Jamieson, 2004; Muijs, 2011). Importantly, it is not definite that participants have the same perception of the difference between adjacent levels equally (i.e. the difference between 'agree' and 'strongly agree', the same as they might be between 'agree and neutral'). A non-parametric statistic test, in this case the Wilcoxon Signed Ranked Test (z value) was used for the inferential statistics for data from the 5-point Likert scale questionnaire. This tool is employed when there are repeated measures on different occasions, in order to determine whether participants change significantly across occasions (Green and Salkind, 2008).

Further to the previous, quantitative content analysis was utilised for the quantitative data from classroom observation checklists. The statements from the checklists were transformed to numeric values (for example, the observed behaviour = 2, behaviour not well represented = 1, and behaviour not represented = 0). The latter allowed for a statistical measurement of percentages for each stage of a lesson. This sort of numeric values become meaningful as they provide the opportunity to compare the weight of the relative importance of different statements and the stages of a session.

2.10.2 Qualitative data analysis procedures

With an overarching commitment to theory, the process of preliminary analysis and interpretation of the research data (including the two iterative stages and the final implementation of the programme) involved firstly to read the transcripts of the lessons,

interviews and my field-notes. This enabled me to familiarize myself with the intervention data. Both the transcriptions from interviews and completed observation sheets were imported, coded, and organized with the help of the qualitative research software program Atlas Ti version 7. Due to the volume of the data, it was easier and quicker to code text on screen than to manually cut and paste different pieces of text. The data were analysed following a hybrid approach of qualitative methods of thematic analysis, incorporating both the data-driven inductive approach of Boyatzis (1998) and the deductive a priori template of codes approach as outlined by Crabtree and Miller (1999). This approach complemented the research questions, by allowing the tenets of interpretive research to be integral to the process of deductive thematic analysis while also allowing for themes to emerge directly from the data using inductive coding. The inductive analysis followed the protocol used for similar studies that comprised the Cultural Practices of Literacy Study (see Purcell-Gates, Perry, and Briseño, 2011).

The focus of the analysis was on depth over breadth of data. As Clifford Geertz ([1973] 1996, p.115) states, it is "not necessary to know everything to understand something". This led to "thick description"[11] in accordance with the conceptual framework at empirical and theoretical levels. This approach was significant also in that it allowed an interpretation of the flow of social interaction which could pertain to larger issues beyond my unit of analysis (Geertz [1973] 1996, p.318).

Throughout the field study, I paired analysis with data collection. The effort to keep these two processes close to each other resulted in the final analysis being shaped by all participants. Selected segments of the interview transcripts that corresponded to each category, code or notes were located, and created clusters of codes according to common subject matter. In addition to this, "memoing" - that is, creating memos on Atlas-Ti - took place by importing the notes taken during the interviews in order to help report interviewees' behaviour, and in particular for up interviews dynamics. Memos could include thoughts

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[11] For a definition of "thick description," see Geertz [1973] 1996, p.312. For the ethnographic concept of keeping the account on empirical and theoretical levels, see Pole and Morrison, 2003, p.5.

about what are considered to be crucial ideas for data analysis, and patterns emerging from the participants' responses that had theoretical significance. Participants' age, gender, the geographical location of school/museum, ethnicity and sociocultural background across the group was recorded in order to determine differences. Pre-existing social relationships between group members and group dynamics were also considered to examine any bearings on the nature of the group interview data.

Finally, all electronic data were stored on a private computer in specific file folders dedicated to this research. Access and ownership of the data (digital recordings and transcripts) is limited to the researcher and dissertation committee. All participants completed the interviews and remained in the study, except for one student who withdrew from the post visit interview.

In summary, the combination of deductive and inductive analysis was essential to cope with the complexity of data and concepts and provided greater depth to the examples of the teachers' literacy perceptions that align with multiliterate practices (Table 2.3).

Table 2.3: The emergent and pre-determined themes for the research questions

Research questions	Qualitative instruments	The main themes
1) *What are the characteristics of an effective museum-school partnership that adequately supports 21st-century multiliteracies learning for CLD students in Cyprus?*	Documents Semi-structured classroom observations Focus group interviews Literature review	**Emergent Themes** - Museum multiliteracies teaching and learning methods; - Students' involvement in the lesson; - Students' performance in environmental education and language arts lesson; - Availability of teaching and learning materials; - Lesson planning and presentation; - Museum educators and schoolteachers' preparation; - Provision of in-service teachers' and museum educators' training; - Constraints in undertaking museum-school partnerships; - Constraints in museum educators' and teachers' preparation and in-service training.

2) *How can a museum-school partnership programme be theoretically and practically designed and implemented to enhance the pedagogical strategies for multiliteracies-based teaching?*	Experts' guiding questions Open-ended questions from questionnaires Semi structured interviews Focus group discussion Researcher field notes	**Predetermined Themes** The curriculum materials and the LMP programme. - Relevance of the materials and LMP programme to the targeted sample - Sequence of the components - Process/presentation - ii) Practicality of the materials and programme. - Resources, e.g. teaching and learning materials, teachers' and students' support materials; - Sufficient time for preparation and implementation; - Teachers' and students' competencies in working with the virtual museum. iii) Improvement of materials and the LMP programme. - The content; - The structure/ components; - Organization; - Presentation modes.
3) *How does a museum-school partnership impact teaching and learning?*	Open questions from questionnaires Teachers' interviews Focus group discussion Researcher field notes	The content of the LMP programme - Relevance of the LMP components - Sequence of activities - Presentation modes ii) Feasibility of the LMP programme - Resources/ materials support; - Peer support;

		- Sufficient time for implementation process; - Teachers' and students' competencies in working with the virtual museum.
4) *How does the museum-school partnership affect students' repertoires of literacy practices?*	Open questions from questionnaires Teachers' interviews Focus group discussion Researcher field notes	The content of the LMP programme - Relevance of the LMP components - Sequence of activities - Presentation modes ii) Feasibility of the LMP programme - Resources/ materials support; - Peer support; - Sufficient time for implementation process; - Teachers' and students' competencies in working with the virtual museum.

2.11 Ethical considerations

Permission to conduct the study was awarded both from the Ethics Board of the University of Leicester and the Cypriot Research, Education and Evaluation Centre, on behalf of the Department of Primary Education in Limassol in December 2011. In terms of ethics the investigation was designed to ensure that the needs and concerns of the people studied were paramount. Most importantly, a basis for trust was established between researchers and study participants. This was achieved in part by promising participants at the outset that the research reports would be shared with them and the research results would be stated as faithfully as possible (Mack et. al., 2005, pp.9-11).

Informed consent forms were signed by all participants (museum educators, parents or legal guardian of pupils, and the pupils) before participation in the research study (Appendix 2Ma, 2Mb, 2Mc). Each participant was fully informed about the topic of the research, the aim and risks, potential benefits, privacy and confidentiality measures (Creswell, 2003) as well as their right to non-participation and withdrawal at any stage of the research. In addition, participants were asked if they wanted to receive a report of the research results. If the answer was yes (2 interviewees requested a report), the interviewee's contact information was noted and a three-page summary report in Greek, along with a thank you letter, was sent to them in July 2013.

Given that research involved interaction with minors (the focus groups and observations were with children of 10-12 years old), this created a unique set of responsibilities for the researcher in addition to the obvious legal responsibilities of any social research. These focused on issues of commitment to minimize the risks associated with the research, including psychological and social risks, and maximizing the benefits that accrue to research participants (Mack et. al., 2005, p.9). The main concern was to ensure the welfare of the children involved in the research, recognizing and accommodate children's emotional and social vulnerabilities (Doyle, 2000). Therefore caution was taken during the interviews to avoid any sort of discomfort due to prying questions or pressure from peers such as individual interviews, best friend pairs, or mini-groups with students

from different classes. Ensuring children's physical safety was also necessary, and care was taken that nothing in this research would harm or risk young people physically or mentally. In designing the research instruments, extra planning took place to accommodate pupils' interests and needs so as to make the experience as beneficial and rewarding as possible. Thus interactive multimodal tools were developed, rather than the traditional question-answer types, for the conduct of focus group interviews.

As far as data collection and analysis is concerned, any information obtained about participants was stored separately from other data. Tapes, data files, and transcripts have been kept in a locked cabinet in a research lab at Cyprus University of Technology. Additionally, computerized data files have been password-protected. Ensuring respondent confidentiality was maintained at all times through using pseudonyms. Therefore, privacy requirements have also been met.

2.12 Summary of the chapter

This chapter outlined the methodology utilised for this research, and proceeded to make explicit the procedures followed for the design of the each of the three phases of the DBR methodology and how the research process evolved, including sampling and choice of specific qualitative and quantitative methods. The iterations and refinement of these helped develop a set of instruments to test the research questions, using a triangulated strategy within the framework of the research. Individuals' views and experiences of teaching and learning before, during and after the intervention were uncovered using the data collection and analysis procedures outlined in this chapter. It also addressed ethical, reliability, validity and generalizability issues. The following chapter will describe and discuss the preliminary phase of the research, which involves the literature review and conceptual framework of the study. The elements of research design used for this study, in terms of the selection of the research paradigm, the strategy of enquiry, research methods and design type, are shown in a combined view in Figure 2.2.
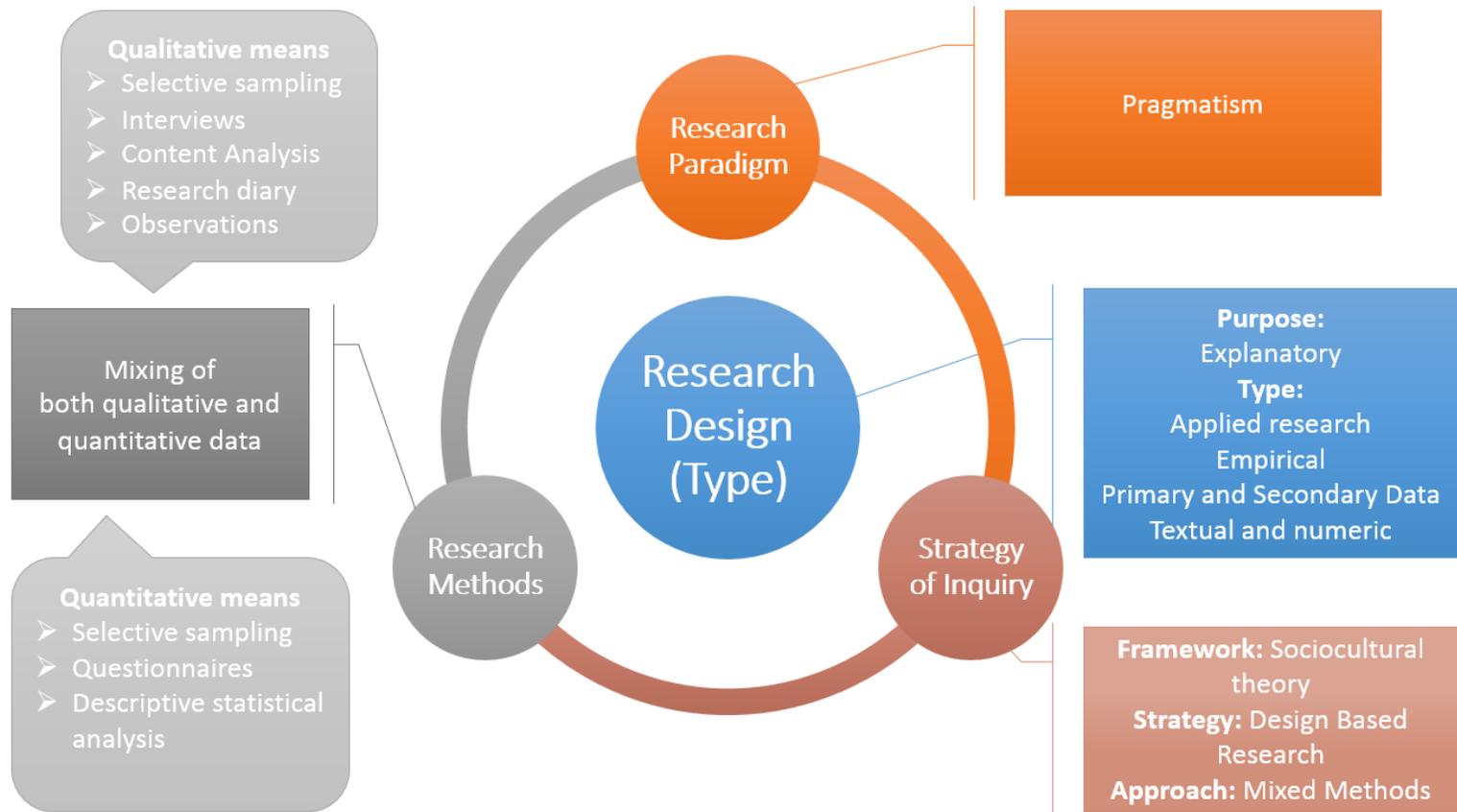
Figure 2.2 Research design elements: summary (Savva, 2016a, Adapted from Creswell, 2009, p.107)

Phase I: The Preliminary stage

Chapter Three - Conceptual Framework of the Research

3.1 Introduction

In this thesis I began by asking: how can a museum-school partnership be designed and implemented to enhance the literacy repertoires, in particular but not exclusively, for culturally and linguistically diverse (CLD) students?

This chapter begins with a discussion of the contributions of sociocultural theory and constructivist perspectives to the study. The literature review builds on understanding, interpreting, and implementing past research among three areas of study: education, museology, and New Literacy Studies (NLS). Relevant contributions in each one of these areas are, therefore, presented in this chapter in order to describe the core pedagogical framework of the museum-school partnership. These conceptualizations informed the design, implementation and evaluation of the partnership and its programme, as described in Chapters Four to Seven of this thesis. The chapter concludes with a summary of the implications of the conceptual framework for the study.

3.2 An Expanded Theoretical Base Informing the MMP framework

I approached the framework drawing from a rich network of theoretical views, chief among them: sociocultural, socio-constructivist theories, and social semiotics. The 'Museum Multiliteracies Practice' (MMP) (Figure 3.1), is not treated as a model as it does not purport to make predictions; there are, however, some assumptions aligned with socio-cultural research tradition (See Vygotsky 1962; 1978; Heath, 1983; Street, 1984; 1995; 1999) and constructivist (See Bruner, 1993; Jonassen, Peck and Wilson, 1999; Papert, 1993; Von Glasersfeld, 1987, 1995a, 1995b) learning principles. I embarked on this research project with a belief in the value of scaffolding[12] for learning (Bruner, 1983); also

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[12] Scaffolding (Bruner, 1975, 1983, 1986) is a metaphorical concept for an instructional approach which posits that teachers (as apprentices) accommodate students' individual needs through "the systematic sequencing of prompted content, materials, tasks, and teacher and peer support to optimize learning". (Dickson, Chard, and Simmons, 1993). A basic feature of scaffolds is the establishment of a positive

the importance of active meaning making based on students' experiences and interests (New London Group, 1996).
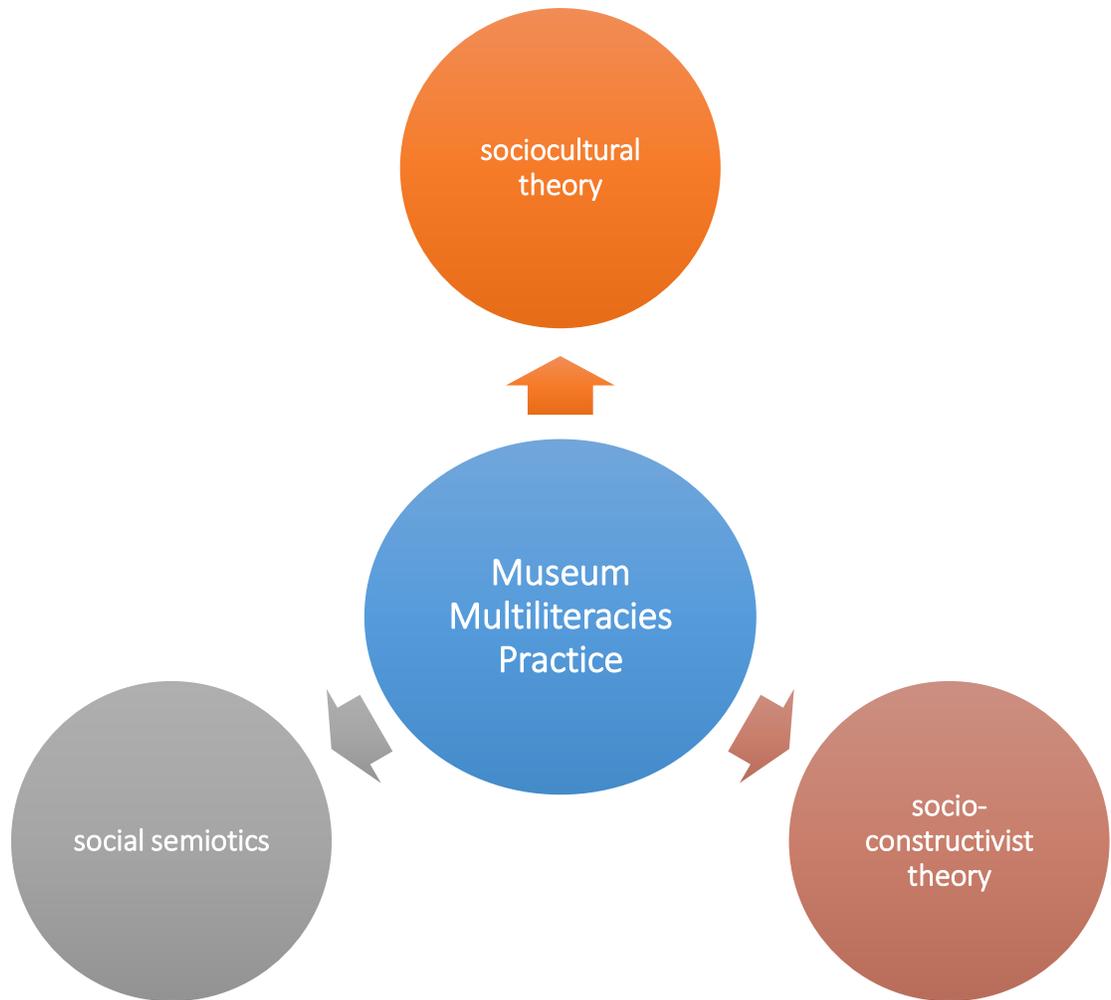
Figure 3.1 The theories informing the Museum Multiliteracies Practice framework (Savva, 2016a)

3.3 Contributions of Sociocultural Theory to the research

In developing the design based research for this study, I aligned with sociocultural theorists (Gee, 1992; Vygotsky, 1986) who support the idea that learning is an active

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atmosphere between the participants whereby teachers support ("scaffold") the students' enactment of a competent behaviour (Freire, 1973).

process involving social participation. I drew also on Dewey (1938), who suggests that individuals develop by interacting meaningfully with their environment, cohorting with the view that "people construct new knowledge with particular effectiveness when they are engaged in constructing products that are personally meaningful" (Resnick, 1997, pp.23-24). For students to deeply engage in tasks that enable higher order skills, it requires to have passionate, positive feelings about these tasks. In other words, engagement is when the cognitive, the affective and the operative are occurring together at a high level (Fair Go Team, 2006, p.10).

Deeply rooted in the MMP framework is an understanding of the significance of students' learning styles and multiple intelligences in pursuing authentic learning (Gardner, 1989; 1999, p.45). Learning styles reflect cognitive, as well as affective and physiological, domains of knowledge (Oxford, Hollaway and Horton-Murillo, 1992), therefore are considered multidimensional (Kinsella, 1996). The belief is that matching learning styles with appropriate teaching approaches will result in increasing student motivation, performance and achievement (Higgins, 2003). Gardner (1989, 1993) posits that schools which utilize the theory of multiple intelligences will succeed at producing authentic learning. The theory of multiple intelligences is of particular importance to this research, as it relates to the acknowledgement that not all people learning in the same way and that not every learner has to be on the same page, depending on their needs and interests (Cope and Kalantzis, 2000b).

3.3.1 Sociocultural perspectives of literacy

Particularly in relation to literacy and cultural and linguistic diversity, a sociocultural perspective such as the one adopted here views language, learning and literacy development as experiences that are socially constructed and formed by the broader cultural context (Erickson, 1986; Gee, 1996). Sociocultural understandings also appreciate the "messiness" of the different internal and external factors which affect how language and literacy are negotiated and possessed (Brisk, Burgos, and Hamerla, 2004; Dyson, 2003). Prominent among researchers pertaining to a sociocultural approach to

language and literacy (e.g. Cazden, 1988; Heath, 1983; Scollon and Scollon, 1981) is also the view that many culturally and linguistically diverse students have negative experiences when their languages and literacies are different than the dominant (mainstream) ones of the country in which they live (Heath, 1983, p.28; Scollon and Scollon, 1981).

Currently, one of the most prominent transformations due to globalization is the advancement of technology and how it influences the way people do things (Borsheim, Merrit, and Reed, 2008; Kalantzis and Cope, 2006; The New London Group, 1996, 2000). There are several supporters of a sociocultural perspective of literacy, who argue that a close relationship exists between the cognitive skills, cultural technologies and societal institutions through which understandings and practices are developed (Dooley, 2008; Ferdman, 1990; Heath, 1983; Luke, 1993).

These sociocultural concepts informed the pedagogic approach in the development of the MMP framework (Section 3.6, p.83). In addition to the socio-cultural ideas, there are strong socio-constructivist perspectives underpinning this research as I shall now explain.

3.4 Contributions of Socio-constructivist Theory to the research

There are two important characteristics of social constructivism. Aligned with its Vygotskyan roots (1978), and central to sociocultural design, the first is that the learner is an active agent in constructing their own knowledge and therefore responsible for their learning (Vygotsky, 1978; Wertsch, 1991). Therefore, students participating in the MMP framework direct their own investigatory activity, "formulate questions, plan their activity, and draw and justify conclusions about what they have learned" (Kuhn et al., 2000, pp.496–497). At its core, the MMP framework is concerned with learning as a process, and draws on constructivist (Bruner, 1993; Jonassen, Peck and Wilson, 1999; Papert, 1993, 1994; Von Glasersfeld, 1987, 1995a, 1995b) learning principles that address collaborative knowledge construction, based on students' experiences and interests. The intention was to opt for an inquiry-driven (Dewey, 1938, 1991; Kuhn, Black, Keselman and Kaplan, 2000), socially mediated form of learning environment by developing the museum-school

partnership through different modes of knowledge representation and interactive, digital media.

Secondly, a social constructivist perspective acknowledges the importance of social interaction in this learning process (Brown and Palincsar, 1989). The latter suggests that learning is context-bound and dependent upon the situation of the learner (CGTV, 1991). Therefore, knowledge derives from the context under which learning takes place, and specifically from interaction with others (Greeno, Collins and Resnick, 1996). Hence, learning is a social activity where knowledge is actively internalized through conversation and interaction between the learner and more knowledgable others (Vygotsky, 1978). An interesting addition to this relationship which is of particular significance to this research comes from Salomon and Perkins (1998, p.5) who extended the "concept of social mediation in terms of cultural scaffolding". This perspective suggests that the individual learner constructs meaning using cultural artefacts (whether in the form of books, videos, articles or other resource materials, including technology tools used for handling information), rather than by interacting with other knowledgeable persons. Closely related to this conceptualization is Pahl and Rowsell's (2011, p.130) introduction of the concept of 'artifactual literacies'. The latter acknowledges that every object tells a story, and can potentially be related to community building and identity performance, hence providing an interesting pathway for approaching and engaging with everyday objects.

Apart from the sociocultural and socio-constructivist notions of learning it is imperative in this research to consider the influence of semiotics which inform postmodern conceptualizations of literacy.

3.5 Social semiotics

Social semiotics is an interdisciplinary field of studies that examines how meaning is made through signs. In semiotics a "sign", is something that represents something (Cope and Kalatzis, 1996, p.62). As humans, we construct meaning through our interpretation of some representational system of signs of all kinds, whether sounds, written text, music,

electronically produced images, dance, or objects (Siegel, 2006). In Michele Anstey and Geoff Bull's (2006, p.107) textbook, *Teaching and Learning Multiliteracies: Changing Times, Changing Literacies,* semiotic systems are defined as "a set of signs that have shared meaning[s] within a group, whether societal or cultural, that allow members to analyze and discuss how they make meaning [on a more global plane]". Within the context of learning settings such as schools and museums, Anstey and Bull propose a more defined perspective of semiotic systems (Anstey and Bull, 2006, p.25) as displayed in Table 3.1.

Table 3.1 Semiotic systems in learning environments

Name	Type
Linguistic	Oral and written language, for example, use of vocabulary and grammar)
Visual	Still and moving images; for example, use of color, vectors, and viewpoint
Auditory	Music and sound effects, for example, use of volume, pitch, and rhythm
Gestural	Facial expression and body language, for example, use of movement, speed, and stillness
Spatial	Layout and organization of objects and space, for example, use of proximity, direction, and position

Note. Adapted from Anstey and Bull, 2006, p.25.

Anstey and Bull's identification of semiotic codes forms part of a new literacies "metalanguage", an alternative approach to literacy education which argues that we often construct meaning from several signs and modes which might be integrated with the written language. Working together, multiple sign systems produce "texts" that communicate ideas (e.g., writing is both a linguistic sign and a visual one, an image can be interpreted both visually and linguistically). Texts, then, are inherently intertextual (Siegel, 2006).

As a concept, intertextuality emerged from semiotic theory (Kristeva, 1980) to describe the process by which individuals come to know a particular text through their prior experiences with other texts. Fairclough (1992) describes intertexuality as the

"potentially complex" (p.82) relationships formed between meaning, text and modes. Importantly, Kress (2003, p.155) added to these relationships the understanding that individuals are "not mere users of a system, who produce no change" but rather that changes take place "incessantly, and that they arise as a result of the interested actions of individuals". In other words, texts are consciously constructed in that the individual actively constructs meaning of the text based on their physical, personal and social understandings; therefore a text may have several possible meanings.

Within the framework of the MMP the goal of identifying the modes (as separate from multimodal) used to derive meaning is to open space for discussion through an explicit metalanguage. In this way, students initiate intertextual chains, create new linkages between popular texts and adult-sanctioned texts, competencies, and ways of viewing the world (Clark, 2007, p.50).

3.6 The pedagogies interacting in the MMP framework

Working within the grounds of the theoretical conceptualizations discussed previously, the MMP framework utilizes three interrelated pedagogies with culturally and linguistically diverse students (Figure 3.2). Cummins (2000) suggests that such transformative pedagogy emphasizes collaboration between teacher and students, as well as critical inquiry, in order to empower students and expand their views on their own potential.
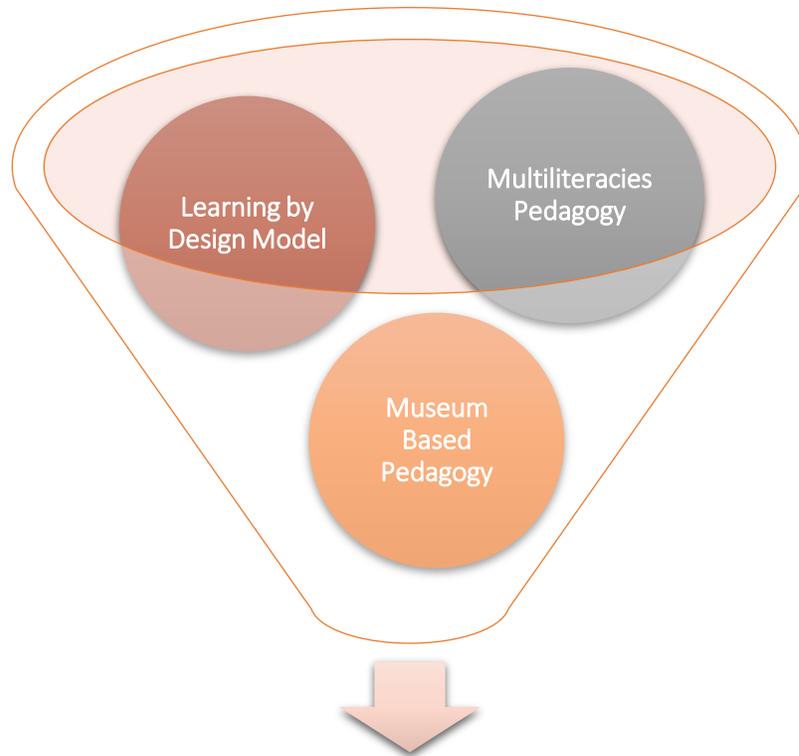
Museum Multiliteracies Practice (MMP)

Figure 3.2 The pedagogies interacting in the Museum Multiliteracies Practice framework (Savva, 2016a)

3.7 Multiliteracies framework of thought

In 1996, the term "multiliteracies" was coined by the New London Group (NLG) in a seminal article published in the *Harvard Educational Review*. This landmark article "served as a catalyst for global change in literacy research, policy, curriculum and pedagogy" (Mills, 2006b, p.62). A developing body of research about multiliteracies, also called "new literacies" (Kress, 2003), has emerged since to help us understand how literacy[13] is multimodal (print, art, drama, and language) and multimedial (combining various means of communication such as the Internet, music, and video) (Vasquez et al.,

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[13] An operational definition for literacy as it is used in this thesis is provided in the Introduction Chapter of this thesis, p.10.

2004). Ajayi (2011), and Rowsell, Kosnik and Beck (2008) highlight how new communication technologies enable the practice of multiple literacies across cultural, social, economic, and national boundaries, and in the process, reconceptualize their self-identities as multiple, hybrid, complex, and dynamic. The cumulative effect of these factors ensures that knowledge afforded by new digital literacies and hybrid textual forms will become increasingly indispensable to literacy teaching/learning (Ajayi, 2009; Leu, Leu and Coiro, 2004).

However, the challenge for education is "not only to educate for new breadth and forms of literacy but also to facilitate learners' critical interpretations of these forms and modes" (Callow, 2006, p.9). Individuals should consider different perspectives, analyze and problem-solve complex issues, and to think critically about social issues. To succeed latter, it requires meaningful and challenging learning experiences that are culturally relevant (Callow, 2006, p.9) and enjoyable while developing students' repertoires of literacies (Ailwood et al., 2000; Unsworth, 2002). Such an approach relates to a consideration of literacy from a social and cultural perspective (See Cope and Kalantzis, 1997, 2003; Durrant and Green, 2000; Freebody and Luke, 2003; Hagood, 2000; Kress, 2003; Kress and van Leeuwen, 2001; Marsh, 2007; Unsworth, 2002; Zammit and Downes, 2002) that acknowledges the situated and contextual nature of reading and writing. Work in new literacy studies (Barton, Hamilton and Ivanič, 2000; Street, 2001), grounded in a sociological frame, acknowledges literacy as a social practice (Vasquez, Egawa, Harste, and Thompson, 2004), as "dynamic, culturally and historically situated practices of using and interpreting diverse written and spoken texts to fulfill particular social purposes" (Kern, 2000, p.6). These understandings emerge from a discourse on the notion of "critical literacy" which aims to "challenge injustice caused by unequal social negotiation of rules" (Jongsma, 1991, p.518).

Critical literacy is a perspective that is crucial to a social justice agenda such as the multiliteracies framework. Freire's work (1970, 1987) in this area is particularly relevant; he proposed a reconceptualization of literacy as reading and writing the world, and looked beyond reading and writing to the knowledge and power relations in literacy discourses.

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Agnello (2001) refers to this approach as postmodern literacy, and argues that through this approach "reading and writing become enhanced methods for exploring the democratic self and its formation through ideological exposure to knowledge and power relations formulated by educational policy texts. Through such exploration, Agnello stresses that literacy becomes a tool for self, student, and social advocacy rather than commodity to determine whether one measures up satisfactorily on test scores" (p.24-25).

Unsworth (2001) affirms Freire's and Agnello's notions of literacy when he argues of a shift from tacit and informal, to transformative knowledge. The former refers to a realization that what appears to be a "natural" view of the world is "actually a view produced by particular combinations of historical, social, political influences, and that alternative combinations of these influence could produce different views" (Unsworth, 2001, p.19). In the context of school education, Callow reinforces Unsworth, noting the learning relationship between teacher and students should be informed by this understanding; to succeed in the latter requires practical ideas and pedagogies which teachers can implement in their current contexts (Callow, 2006, p.8). For example, it is imperative that literacy pedagogy should be grounded in intellectual quality and rigor, equally committed to high cognitive, operative and affective dimensions of engagement (Callow, 2006, p.10). With this in mind, the next section presents multiliteracies pedagogy as both a theory and a practical method integrated into the MMP framework.

3.8 Multiliteracies pedagogy in the MMP framework

> It is not a question of whether students are capable of engaging with meaning making in different semiotic systems, but rather a question of finding the appropriate pedagogy. Students can learn semiotic systems if teachers can find a way to teach them (Anstey and Bull, 2006, p.116)

The multiliteracies pedagogy (NLG, 1996) is a pedagogical model first conceived by the New London Group (1996) and further developed by Cope and Kalantzis (2000b). It was proposed as a teaching approach in light of today's context of social, cultural, and

linguistic diversity and demands and needs of learners. The premise in utilising multiliteracies pedagogy in the MMP framework is that addressing the knowledge, skills and attitudes for multiliteracies will have significant implications for education in museums, and particularly for museum-school relationships, as it recognizes the particular demands of developing learning experiences in the museum setting that enable cultural participation (Mathewson-Mitchell, 2007, p.3).

The proponents of multiliteracies pedagogy suggest learners in the 21st century have to learn to negotiate multiple literacies that go beyond the traditional print-based materials (Leu, Kinzer, Coiro, and Cammack, 2004; Rowsell, Kosnik and Beck, 2008) to achieve work and overall life success (Kress, 2003). Kalantzis, Cope and Harvey (2003) suggest that successful learners in the 21st century should possess a range of skills:

- Broad Knowledgeability
- Diverse Intelligence
- Autonomy
- Collaboration
- Flexibility
- Problem Solving
- Self-directed design of their learning experiences through multimodal ways of meaning making
- Ability to use a set of tools for meaning making

In short, there is a shift in 21st century learners from being literate persons to being multiliterate. Anstey (2002, p.24) defines a 'multiliterate' person as flexible, strategic and able to understand, produce and use literacy and literate practices with a range of texts and technologies, written, spoken or multimodal texts (Kress 1995; Kress and van Leeuwen, 1996). Making meaning is undertaken in socially responsible ways in order to fully participate in life as an active and informed citizen, a goal that presupposes critical literacy. An individual who is multiliterate should be able to critically analyze texts and contexts, recognize the dominant literacy forms and take informed action (Anstey and Bull 2006, p.24).

Sinclair and Britton Wilson (1999) note that "a culturally inclusive classroom is one in which this diversity is welcomed and integrated into the overall learning of all students". The New London Group describes multiliteracies pedagogy as "a teaching and learning relationship that potentially builds learning conditions that lead to full and equitable social participation" (NLG, 1996, p.60). They propose a multiliteracies "pedagogy that opens possibilities for greater access" (NLG, 2000, p.18). This is pursued, for example, through the open-ended and flexible functional grammar designed to assist language learners to describe language differences and its emphasis on multiple channels of meaning. These are positive responses to the changing shape of work, private and civic life (Lo Bianco, 2000). Furthermore, it is claimed that multiliteracies pedagogy allows teachers and facilitators to specifically design learning that is student centered, inquiry based and open ended, to allow for student ownership and transformation of that learning into their contexts and meaning making.

Cummins (2005) revisited the case for a pedagogy of multiliteracies. He argued that multiliteracies pedagogy acknowledges students' cultural and linguistic knowledge built on their prior experiences (Cummins, 2005, pp.149-150). A pedagogy of multiliteracies also means that teachers will be incorporating and allowing the use of multimodal means of meaning making within the class and beyond, while promoting the understanding and use of the multimodal relationships between and within these modes of meaning making (Cummins, 2005, pp.149-150). Multiliteracies pedagogy is thus interpreted as an attempt to improve students' learning behaviour and academic achievement in terms of their cognitive and intellectual growth, critical thinking development and identity formation (Lo Bianco, 2000).

In the next two sections, the two crucial aspects of multiliteracies pedagogy, the content and the form, are expanded upon. In doing so, I am seeking to explain how these can be applied in the MMP framework. The content of literacy pedagogy, also known as the "what" of multiliteracies pedagogy (NLG, 1996, p.65), draws from multiple modes of meaning-making to support a design process for literacy learning. The form of literacy pedagogy, also referred to as the "how," draws from a range of relationships between four components. In the reminder of this chapter the discussion is on how multiliteracies

pedagogy was expanded with the development of the Learning by Design model by Cope and Kalantzis (2005). Following this, John Schwartz's theory of museum based pedagogy is introduced to the framework as an attempt to integrate multiliteracies pedagogy with museum learning practice.

3.8.1 The "What": the content of multiliteracies pedagogy

Learning, specifically literacy learning, is seen as being "part and parcel of collaborative interactions with others of diverse skills, backgrounds and perspectives joined together in a …community of learners" (NLG, 1996, p.30).

In the multiliteracies framework, learning is considered a process of meaning making, during which learners continually reshape themselves. Meaning making and any other semiotic activity are treated as "a matter of Design" (NLG, 1996, p.73). Design is seen as a dynamic process, not governed by static rules (NLG, 2000, p.20). It is a process of subjective self-interest and transformation of existing representational resources—such as linguistic patterns, genres, dialects, registers, and discourses/ideologies, as well as nonlinguistic modalities— to achieve the designer's communicative and cultural purpose (Lam, 2009, p.379). The social semiotic concept of design is helpful, for example, as we consider how immigrant teens draw upon various representational resources to (re)define their identities and relations to multiple localities and communities in the process of migration (Lam, 2009, p.379).

Drawing on the concept of design, multiliteracies pedagogy introduces the idea of multimodality. Kress refers to it as a "domain of inquiry," (2009, p. 54) which discusses learners' movement between written, oral, visual, audio, tactile, gestural and spatial modes, which are combined during communication in order to produce meaning (Kress and van Leeuwen, 1996). This process, in other words, involves "the purposeful integration of semiotic resources" (Vaish and Towndrow, 2010, p.321) where the various modes interplay with each other through how they "are combined and designed to make meaning"

(Baldry and Thibault, 2001, pp.94-98; Kress and van Leeuwen, 2001) such that the "whole (becomes) far greater than the simple sum of its parts" (Lemke, 1998, p. 284).

We can speak of multimodality as either the way in which a text has been designed, or to the process involved in designing (Cloonan, 2007, p.19). In studying the "design of meaning" (New London Group, 1996) - when people "make use of the resources that are available at a given moment in a specific communicational environment to realize their interests as sign makers" (Jewitt, 2008b, p.253; cf. Kress, 2003) - this process demonstrates learners' creative, adaptive capacities in using semiotic resources to construct meaningful knowledge through multimodal representations. Central to multimodal conceptualizations of meaning making is a focus on visually-oriented learning (Jewitt, 2008a; Smith and Woody, 2000). Visuality (Lister et al., 2008) emphasizes vision as "an active, interpretative process" (Wood, 1996, p.68). With an object-oriented focus (Hein, 2006; Sheppard, 2002), of interest is how participants' constructions of visual representations concretize their experiences, beliefs and values in a dynamic way.

The significance of this discussion is found in research evidence suggesting that even unconscious visual learning can be effective, with visual stimuli indicating signs of learning traceable even when subjects were unaware of the stimulus or reward contingencies (Seitz, Kim and Watanabe, 2009). The aim of literacy teaching with respect to multimodality in the MMP framework lies in the acquisition of abilities and skills necessary to produce various text forms linked with information and multimedia technologies (Baldry, 2000, p.21) – multimodalities – to disrupt the students' understandings and encourage learning.

Multimodal literacy (Jewitt and Kress, 2003) emerged from the notion of multimodality. This view of literacy incorporates four types of skills; it encourages a range of language-based skills mediated through multimodal forms and representations; evaluative skills which could be used to critically assess the nature, representational techniques, explicit and subtle effects of exhibits; oral and presentation skills in

communicating proposed plans and perspectives clearly and effectively; and independent research skills used to source and adapt content from multiple sources for specific purposes (D'Acquisto, 2006; Serrell, 1996). Therefore, language learning becomes concrete through addressing the multiple dimensions of multimodal design process (Jewitt, 2006). Language and "languaging" are reconceptualized through the understanding of multimodal communication (Kress, 2003, 2005; Kress and van Leeuwen, 1996, 2001) and how it integrates multiple modes of communication within and across different resources.

Davies (2006) contends that although students are becoming increasingly multimodally literate and although theories of multiliteracies have been established, with increasing research evidence on their feasibility, schools remain focused on traditional print-bound modes and practices. It is often the case that new literacies are not part of policy documents, and if they occur, they are isolated initiatives supporting traditional literacy practices (Leu, Kinzer, Coiro, Cammack, 2004). Dyson (2003, p.330) argued that there is a critical disconnect between the theory of multiliteracies and classroom pedagogy because ''literacy development seldom includes any substantive consideration of such practices''. McGee (2007, p.1) addresses this issue and explains that teachers are usually unprepared or unwilling to engage students in any deconstruction of multimedia and multimodal texts, nor in the production of these texts.

With all the possibilities offered by new forms of technology for multimodal ways of meaning making and artifact design and creation, creating a student generated virtual museum seemed to offer an appropriate means to unlock the semiotic potential of multimodality, and expand the literacy practices of culturally and linguistically diverse students in this research. As far as the Cypriot Primary Education curricula and the goals and practices of educators, there are no immediate links to elements of the process of designing for teaching and learning. Nevertheless, there is acknowledgement of the variety of learning experiences that students bring to school. This is reflected also in museum education policy documents where it is declared that part of the museum educator's role is to use his or her knowledge of the students' cultural and social context to create programs that encourage students to "generate new connections and to expand their existing

understandings" (MOEC, 2012, p.13). The emphasis here is on a cumulative approach to focus students on the "interconnectedness of learning", and also metacognition, thinking about how one thinks and learns (MOEC, 2012, p.14). There are no practical examples, however, as to how this can be facilitated during the museum programme.

This thesis addresses the limitations noted above. Key to facilitating this process is "metalanguage", discussed earlier in this chapter. Metalanguage represents the grammar of multiliteracies pedagogy; furthermore, it is used to explain patterns of meaning created during the design process. Three interrelated concepts are described in relation to meaning making in a multiliteracies pedagogy (NLG, 1996, pp.74-77):

(i)   **The Designed** the available meaning-making resources, and patterns and conventions of meaning in a particular cultural context;

(ii)   (ii) **Designing** the process of shaping emergent meaning which involves re-presentation and recontextualization, and

(iii)   **The Redesigned** the outcome of designing, something through which the meaning-maker has remade themselves and created a new meaning-making resource—it is in this sense that we are truly designers of our social futures (NLG, 1996, p.74; Kalantzis and Cope, 2008, pp.203-204).

In a multiliteracies-influenced museum educational program such as the one intended within the MMP framework, students draw on their experiences, interests and knowledge (available designs) and transform their processes (designing) into remade or new resources (redesigned) (NLG, 1996, pp.73-74). In this way they become "active designers" (NLG, 1996, p.64) with the help of experienced others (educators). The outcome of designing is the creation of a new meaning. The redesigned or transformed notions of meaning produced can then be used by others as available designs to draw upon (NLG, 1996, 2000). Cope and Kalantzis (2000b, p.65) suggest an examination of five "dimensions of meaning" (representational, social, organizational, contextual, and ideological) across six modes of meaning (linguistic, visual, gestural, spatial and audio,

multimodal) to support teachers in their endeavors to describe the interplay and integration of modes of meaning (Table 3.2).

Table 3.2: Questioning of Five Dimensions to Describe Meaning

Dimension	Question to Add Depth to Meaning
Representational	What do meanings refer to?
Social	How do meanings connect the persons they involve?
Organizational	How do the meanings hang together?
Contextual	How do the meanings fit into the larger world of meaning?
Ideological	Whose interests are the meanings skewed to serve?

Note. Adapted from Cope and Kalantzis, 2000a, pp.212-217.

The effect of the designing process in the MMP framework is to "extend students' cultural and representational horizons beyond where they already are" and encourage them to seek "more expansive and deeper forms of knowing and meaning" (Cope and Kalantzis, 2000a, p.207). Ball (2004, p.421) emphasized the need for new teaching approaches focused on the inclusion of multimodal elements "that can help readers interpret meanings made through modes that are beyond linear, print traditions". The most important part in including multimodal approaches to teaching and learning relates to social justice (Siegel, 2006). In this process, teachers are acting as facilitators, moving students from the familiar to the unknown; students' knowledge is the foundation on which they build to further the students' understandings in meaningful contexts. The intention in such an approach is dual: for students to show growth in content areas and at the same time personal growth while they reconstruct and negotiate their identities within the multiple discourses at play.

Therefore, it appears that it is particularly significant to consider what counts as basic with regards to literacy practices, modes and languages. Luke and Freebody (1990,

1999) elaborate these points through their Four Resources Model that presents practices necessary for full literacy development. They identified four competencies: coding, semantic, pragmatic, and critical, which would become known as: code breaker, text participant, text user, and text analyst (Luke, 1995). The characteristics of the model are summarized in Table 3.3.

Table 3.3: Summary of the Four Resources Model of Reading

Competency	Description of Practice	Guiding Question
Code Breaker (coding)	- begin to understand and use the knowledge of the structure of spoken and printed language (such as the alphabet, grapheme/ phoneme relationships, directionality of text, spelling and grammar rules)	How do I crack this text?
Meaning Maker (semantic)	- draw from and develop personal resources of previous knowledge and engage them in constructing meaning - learners need guidance to understand the culture-specific, ideological, and interpretive nature of reading	What does it mean?
Text User (pragmatic)	- becoming more familiar with how, where and to what purpose a text might be used, including the role of power - developing and practicing using sociolinguistic and social resources when reading for use at home, school or work	What do I do with it now?
Text Critic (critical)	- learning that texts are not neutral and to question their validity, force and value - learners need to be engaged in the political nature of text and recognize the dominant ideology	What is the text trying to do to me?

Note. Adapted from Freebody and Luke, 1990; Luke, 1995; and Luke and Freebody, 1999.

The Four Resources Model contributed the most to understanding the meaning making process of including and interpreting multimodal texts as part of the MMP. Anstey and Bull, in *Teaching and Learning Multiliteracies* (2006), approve the combination of Luke's and Freebody's Four Resource Model (FRM) (1999) for outlining that the reader acts as code breaker, meaning maker, text user, and text analyst.

3.8.2 The "How": Dimensions of the form of multiliteracies pedagogy

A pedagogy of multiliteracies features the integration of four components acting as orientations to learning or pedagogical approaches—situated practice, overt instruction, critical framing and transformed practice (New London Group, 1996, 2000). These four pedagogical components can occur simultaneously, randomly or be related in complex ways, each of them repeatedly revisited at different levels (NLG, 2000, p.32) but taken together can support diverse learners by encouraging a sense of belonging and transformation. The four components are not new to pedagogical tradition; however, within the context of the MMP framework, are introduced again to offer a kind of pedagogical palette or "pedagogical knowledge processes schema", to support teachers in the design and enactment of multiliteracies-influenced practices (Cazden, 2000; Cope and Kalantzis, 2000a, 2000b; Kress, 2000; New London Group, 2000) while working within the affirmations of the MMP framework.

Situated practice

The immersion in multiliteracies pedagogy within the MMP framework should start with situated practice. This deals with incorporating the affective and sociocultural needs of all students. Teachers should provide students with ample opportunities to activate their prior knowledge and be immersed in meaningful experience (Cope and Kalantzis, 2000a). The work on previous experiences was first proposed by Dewey (1939). His progressivist approach focused on the need to capitalize on the social nature of humans by centering on problem-based learning, drawing from the learners` previous experiences and reshaping them for learning.

Paulo Freire (1987, p.142) recognized that:

For the notion of literacy to become meaningful it has to be situated within a theory of cultural production and viewed as an integral part of the way in which people produce, transform and reproduce meaning.

This interconnectivity between language and life aims to use the students' lifeworlds as motivation for their learning and is integral to the MMP framework. In this type of sociocultural approach:

the focus of learning and education is not children, nor schools, but human lives viewed as trajectories through multiple social practices in various social institutions. If learning is to be efficacious, then what a child or an adult does now as a learner must be connected in meaningful and motivated ways with 'mature' (insider) versions of related social practices (Gee, Hull and Lankshear, 1996, p.4)

Situated practice presupposes a consideration of lifeworld-based learner diversity such as those multiple intelligences, identified by Gardner (2004) as linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, naturalist, intrapersonal and interpersonal. Additionally, it is important to bring students' prior experiences, knowledge and interests into learning, from the use of technology: whether computers, electronic games, text messaging and the internet (Matsuda, Canagarajah, Harklau, Hyland and Warschauer, 2003) or film and television, as these offer meaningful contexts for students' literacy learning (See Ball, 2004; Chandler-Olcott and Mahar, 2003; Grabill and Hicks, 2005; Mackey, 2003). Digital writing that involves online publications, incorporation of images, layout and typography also helps progress learning (See Grabill and Hicks, 2005; Lewis and Fabos, 2000; Matthewman and Triggs, 2004). In the MMP framework, learning occurs from incorporating all of these resources into museum-related activities. Most importantly, situated practice addresses the need to recognize the students' native languages, home languages or first languages – especially if the languages are not the dominant language of the school.

The Cypriot curriculum documents are reflective of situated practice in their acknowledgement of diverse students' identities. The intention is for teaching and learning "to integrate the social and cultural context in which children live and develop and provide learning experiences that are meaningful, relevant, and respectful" (MOEC, 2011, p.3). However, museum education policy documents (MOEC, 2012) in Cyprus do not make any explicit mention of connecting students' prior knowledge outside of the school curriculum to new knowledge gained at the museum. In the MMP framework, students' prior experiences are imperative to the learning process; they inform and continually grow during the project.

Overt instruction

The second component of multiliteracies pedagogy employed in the MMP framework is overt instruction. As noted above, multiliteracies pedagogy relates to communities of practice theory and how individuals in the community of learners - from novices to experts - engage with each other. It draws on Bruner's (1983) and Vygotsky's (1987) notion of scaffolding, where more experienced participants take on a mentoring role, guiding others through the design process. Vygotsky suggested that students can accomplish more as part of a group than on their own if tutors keep their language crisp and simplified. He argued that students can achieve a higher stage of cognitive development through social learning with more knowledgeable adults in the Zone of Proximal Development (ZPD) (Ornstein and Hunkins, 2004). This connects with Dewey's recommendation that education should be based on personal experiences enhanced through guidance from an experienced mature learner.

It is also significant in overt instruction that teachers explicitly teach concepts and theories which explain underlying processes. Kitson et al. (2007) found little or no evidence of variant use of semiotic systems, cultural or linguistic diversity or critical literacy in debriefing reflections with the teacher. While the study recognized the potential of the inclusion of multiliteracies pedagogy, it also acknowledged that change had been

slow. They advised educators to recognize the challenges created by the explosion of technology, such as social networks, that are an important part of our students' lives.

There is extensive discussion within the Cypriot museum education curricula on the benefits of collaborative learning, guided instruction, and exploratory learning which relate to overt instruction (MOEC, 2012). The curricula do not include consideration of the role of ICTs to support teaching and learning, although multimodal interactions with technology such as computers, overhead projectors or digital cameras are recommended to support interactions with visual images, sound and text and as a tool to motivate students in the national curricula for Primary Education. Suggested uses for technological tools such as the internet, multimedia and word processors focus on "helping students collect, organize, and sort the data they gather and to write, edit and present reports on their findings" (MOEC, 2011, pp.30-40). The potential risks of use, such as issues of internet safety, are also included in the curriculum documents.

Critical framing

In developing multiliteracies pedagogy within the MMP framework, an important component is critical framing, which centers on pedagogy that helps students frame learning within a social context, in terms of "historical, social, cultural, political, ideological, and valued-centred relations of particular systems of knowledge and social practice" (NLG, 1996, p.86). Kalantzis and Cope (2000, p.247) envisioned critical framing as having "students stand back from what they are studying and viewing it critically in relation to its context". The MMP framework requires students to be taught how to critically interpret concepts and ideas in relation to their social and cultural relevance, and to provide a means for students to recognize and discuss the elements of a text so that they may, "contest or rewrite a cultural text" (Luke, 2000, p.109). Students need to be encouraged to ask questions that situate topics within larger contexts; for example, what is the impact of a local or global perspective? Because this requires that students distance themselves from their learning to critique it, a transfer of learning occurs.

Connections with critical framing are evident since 2011 in all subjects of the Cypriot curriculum documents for primary education. For example, through prompts, teachers are encouraged to provide opportunities for students to begin to "develop their capacities for metacognition and use of higher order thinking skills involved in critical thinking" (MOEC, 2012, p.17). The curriculum document for grades 3 to 6 outlines part of the learning process as encouraging students to move beyond literal meanings of text and to "think about fairness; equity, social justice; and citizenship in global society" (p. 23). Nevertheless, this is not reflected in the museum education documents which have been left untouched with regards to critical perspectives towards learning following the new millennium.

Transformed practice

The ultimate objective in the MMP framework derives from the final component of the form of multiliteracies: "transformed" or "reflective practice" (NLG, 1996, p.87). Cope and Kalantzis identify the purpose of transformed practice as dichotomous; first teachers need to help students transfer knowledge from the school context to their real life situations by putting the theories they have learned in class into practice (2000b, pg number). This involves the "transfer of acquired knowledge and experience to an unfamiliar cultural context" (Cope and Kalantzis, 2000b, p.241). Their model is situated in the learner's ability to achieve transformed practice through redesigning, as it is through the transfer of meaning that the learner becomes "a new person by being able to do new things" (Cope and Kalantzis, 2000b, p.248). Students recreate discourses through application to authentic tasks. The demonstration of designs and implementations provides the opportunity for the "situated, contextualized assessment of learners" (NLG, 1996, p.87).

The second representation is based upon the "return to the lifeworld of one's original experience with fresh perspectives and newly relevant knowledge of underlying processes" (Cope and Kalantzis, 2000b, p.241). The intent of this component is to encourage students to imagine the potential of their resources and to contribute to their

learning communities. The goal is for students to be able to select and implement their available designs. Transformed practice provides students with the opportunity to demonstrate extensions of their learning, as they transfer their designs of meaning from one context to another.

As part of the designing process in the MMP framework, learners are guided through redesigning their available resources so that they can remake meaning. This is demonstrated in the learner's ability to transform practice: that is, to transfer learning to other contexts, recreate their designs for meaning-making and implement their newly created designs for learning.

Specific connections can be made with the Cypriot primary education curricula regarding transformed practice. It is considered imperative that students engage in the reflective process of learning from the first until the sixth grade of elementary school. This involves a consideration of learning in its socio-cultural context. The primary curriculum advises that students can be motivated by real-life contexts in their learning because

> children grasp ideas more effectively and maintain their interest in school when they have an educational program that enables them to connect their learning to their own lives and the world around them (MOEC, 2012, p.18).

Despite this, policy-making for Cypriot museum education provision does not incorporate these understandings into the design of educational programs for students.

3.9 Learning by Design Model (LbD)

Kalantzis and Cope (2005, p.72) have extended the multiliteracies pedagogy through the Learning by Design model (LbD) which informs the MMP framework. Learning by Design is building into the curriculum the idea that not every learner will bring the same life experiences and interests to learning (Kalantzis and Cope, 2012), as well as acknowledging that every learner is not on the same page at the same time

(Kalantzis and Cope, 2005). Anstey and Bull (2004; 2006, p.34) identify these different domains or identities collectively as Discourse Worlds, and suggest that students draw on two in particular to make meaning, their Lifeworld and their School-Based World. This concept is represented visually in Figure 3.3, which indicates that these worlds overlap and inform one another. A truly meaningful multimodal integration in schools would require that teachers draw on the key components which comprise school literacies, and use them in combination with outside of school literacies for students to engage attentively with and for others to position themselves in the world.

LbD involves four core knowledge processes – experiencing, conceptualising, analysing and applying. These follow Kolb's (1984), and Bernice McCarthy's (1987) 4MAT model. The original model moved through four distinct phases of the learning cycle using both right and left-brain strategies for knowing. It was constructed along two continua, namely perceiving and processing. Perceiving occurs in an infinite variety of ways that range from experiencing to conceptualising, while processing occurs in ways that extend from analysing to applying.

FIGURE 1
Literacy Identity: A Repertoire of Resources

Lifeworld
Includes all social and cultural experiences and self-directed recreational activity such as reading

Literacy Identity
• Prior experience with texts
• Knowledge about texts
• Cultural knowledge and experiences
• Social knowledge and experiences
• Technological knowledge and experiences

School-Based World
Includes all pedagogical activities, all disciplines, all text-based activities and mediation of text

Source: Anstey, M., & Bull, G. *The Literacy Labyrinth* (2nd ed., p. 89). Pearson Education Australia, © 2004. Used with permission.

Figure 3.3 Discourse worlds in a reader's identity (Anstey and Bull 2006, p.34)

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The four ways of knowing have been expanded by Kalantzis and Cope (2005) to include eight subcategories (Figure 3.4) and are intended to correlate to each of the four curriculum orientations of the multiliteracies pedagogy discussed above (Kalantzis and Cope, 2005, p.72):

       1. Experiencing: a) the known, and b) the new;

       2. Conceptualising: a) naming concepts, and b) theorizing;

       3. Analysing: a) functionally, and b) critically;

       4. Applying: a) appropriately, and b) creatively;

Experiencing involves personal engagement in sensations, emotions, physical memories, involvement of the self, and immersion in the human and natural world. Conceptualising is the translation and synthesis of experiences, conceptual forms, language, and symbols into abstract generalizations. Analysing is the transformation of knowledge by ordering, reflecting on, and interpreting the underlying rationale for particular designs and representations. Applying is the experiential application of internal thought processes to external situations in the world by testing the world and adapting knowledge to multiple, ambiguous situations (Kalantzis and Cope, 2005, p.96). These knowledge processes are intended to enable teachers to analyze the learning that occurs when pedagogy of multiliteracies is implemented.
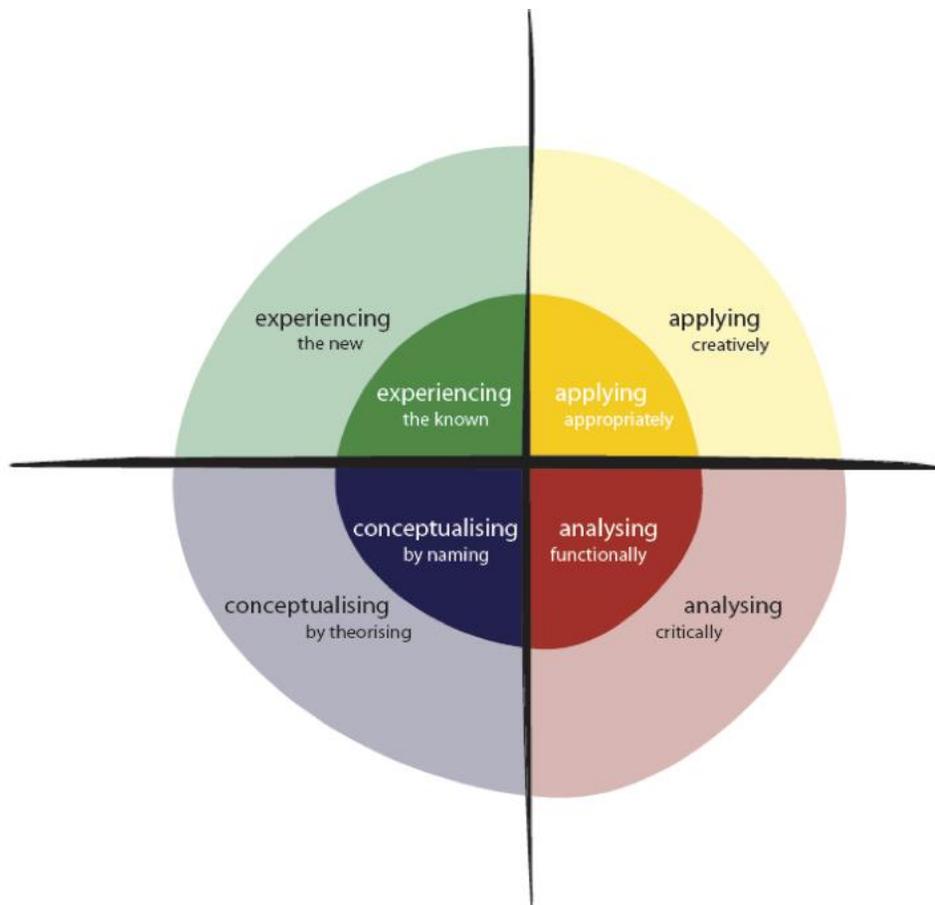
Figure 3.4 The knowledge processes in the Learning by Design Model (Kalantzis and Cope, 2016, p.5)

The mix of Knowledge Processes in the Learning by Design model is of most relevance to the MMP framework as it allows different emphases and activity types as appropriate to students' different 'learning orientations' (Kalantzis and Cope, 2005, p.97). All the Knowledge Processes also change direction of the knowledge flows and the balance of responsibility for learning toward a more active view of learning-as-engagement; in this context, learner identities and subjectivities become more manifest. Learning is conceived as a journey, in a transformational (rather than static) view of diversity in which neither the world nor the learner are quite the same as they were at the beginning by the time their journey finishes.

3.10 Adapting multiliteracies pedagogy for museum learning: utilising museum based pedagogy

The preliminary literature review suggested that the goals and practice of multiliteracies pedagogy could be implemented in the context of museum teaching and learning to enable social inclusion and meaningful participation. Nevertheless, it was critical for the design of the MMP to re-conceptualize what constitutes museum education and museum literacy before addressing a creative synergy between the school and the museum (Savva and Souleles, 2014, p.121).

As authors including Hein (1998), and Falk and Dierking (2000), observe, educational programmes are increasingly a prerequisite in museums around the world, and we have seen a shift in focus from the transmission of object knowledge to personal meaning making (Hooper-Greenhill, 1999). The idea of education in museums is seen as exploratory, broad, experiential, complex and multi-layered; museum educational strategies are now audience driven (Russo, Watkins, Kelly and Chan, 2007, p.20).

Falk and Dierking (2000, 2002, pp.12, 13, 65) have developed a model that considers three aspects of learning which work together in the making of meaning from museum exhibits. They call it the Contextual Model of Learning. These three contexts are the Personal Context, the Socio-cultural Context, and the Physical Context. Falk and Dierking (2000) refined the model by adding the influence of the passage of time on the learning process and renamed it the Contextual Model of Learning. This model is helpful in examining the phenomenon of museum learning investigated through the lens of NLS. It brings together museology and literacy research in a way that increases the body of knowledge in both areas and creates an inter-disciplinary examination of the process of making meaning from museum exhibits.

This view of museum learning redefines the goals and strategies of educators and the museum curricula; it fits the incorporation of museum learning into the multiliteracies concept; this is facilitated by the realization that a display of material culture conveys

messages about the people who created them and the times in which they were used (Pearce, 2003)[14]. Exhibits are not simply displays, but systems of signs that express messages about culture. Museums and their exhibits reflect the ideology of those who create them. Gee (1999, p.93) wrote that "[T]here is no such thing as 'reading' or 'writing,' only reading or writing something . . ."; and the same would hold true for creating exhibits. There is no such thing as displaying an artifact without displaying something about that artefact.

Furthermore, the interpretation of messages is similar to the deciphering of text, using the signs, symbols, objects, etc., of a museum exhibit as part of the process of creating meaning (Roberts, 1997). Griffin (1999, p.8) identifies the unique learning opportunities offered by museums as: opportunities to closely examine objects or specimens; opportunities for comparison that allow trends and patterns to be deciphered; natural learning processes that incorporate the sharing and communication of ideas and the raising of questions; and opportunities to develop perceptual skills that teach how to gather information from objects and experiences. In these conceptualisations of museum learning it is imperative to consider the implications from the introduction of digital cultural heritage in the museum scene within the context of museums operating in a digital age (Parry, 2010). Despite early reticence and suspicion on the use of digital resources and to digital interactives, as well as the problematics of accommodating the 'new media' within museum environments primarily concerned with the presence of genuine, material objects (Parry, 2010), a whole new world opened for visitors at the museums and users of virtual museums concerning their engagement in meaning making. Because museum exhibits make meaning through multiple media, multiple modes, and multiple symbol systems, the literacy practice of museum visiting is a multiliteracy[15].

Schwartz's (2008) work supports my thesis here. He proposed a museum-based pedagogy as opposed to traditional museum education. Schwartz highlights that museum-

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[14] The act of creating an exhibit is parallel to the act of producing knowledge.
[15] An interesting project is the "Museum Literacy Project" in 2008-2010 involving nine different museums, administrations and training institutions based in five European countries, supported by the EU programme Lifelong Learning- Grundtvig Learning Partnerships 2008. The project focus was on museums and audiences with low schooling levels, and how museum literacy can be reached and maximise the museum experience for these audiences.

based pedagogy differs, in that its main goal is "the teaching of verbal, visual, technological, social, and critical literacies; not museum literacy, which is the ability to access the museum's cultural and intellectual resources" (Stapp, 1984; Schwartz, 2008, p.29). Museum-based pedagogy thus appears to be working within the affirmations of multiliteracies pedagogy. Schwartz (2008, p.29) suggests that the goals of teaching and learning at the museum should be to develop competencies analysing the museum's means of persuasion; the ways in which the museum makes arguments through and about the objects that it displays. The aim is to "actively engage" students to think beyond the museum's contents to its immediate and broader contexts. This contributes to acknowledging "the importance of social and material factors in determining students' empowerment and successes" (Schwartz, 2008, p.29).

Schwartz's theory is a unique example of how to engage in museum learning within the affirmations of multiliteracies pedagogy. Nevertheless, this proposal for museum-based pedagogy was only tested in the context of a university course for student teachers. My assumption was that this theory could be used in the MMP framework to address students at primary level. Using the theory of museum-based pedagogy as a guideline, the intention in designing the activities for the MMP framework is for students to engage in practices related to enhancing verbal, visual, social technological and critical literacy (Figure 3.5).
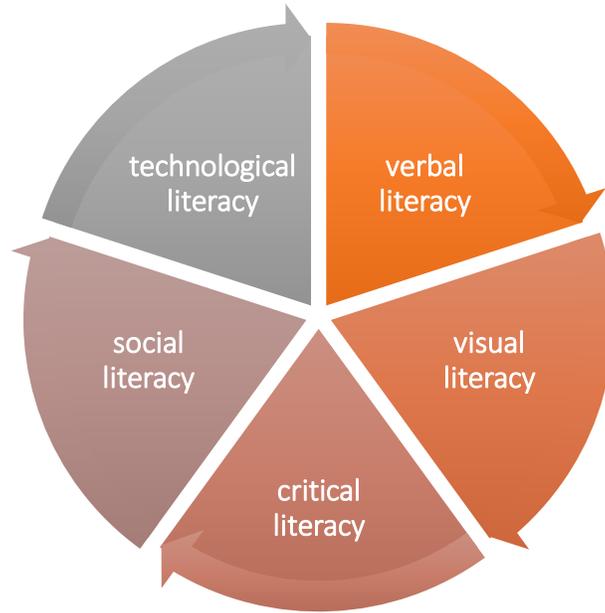
Figure 3.5 The literacies in museum-based pedagogy (Savva, 2016a)

More specifically, for verbal literacy the objectives are to analyze how words interact with objects and their installations to form persuasive arguments. This is pursued through looking at the agency of exhibitors (curators, educators, and administrators) in producing an exhibit's meaning. It also considers the audience's role in shaping that meaning. In visual literacy, the importance of the material context in determining an object's meaning is highlighted: whether through display technology (such as walls, vitrines, dioramas, taxidermy, photography, and video), installation (sequence, height, light), layout and design, overall architecture.

The intention is for students to analyze how objects interact with their physical setting to form persuasive arguments that are primarily visual. In social literacy, the focus is on calling students' attention to the collaborative nature of meaning-making in the museum. Students can look at the exhibitors' agency in producing the exhibit's meaning and ponder their goal in mounting the exhibit. Students can contact the exhibitors in order to discuss the exhibition-making process.

Furthermore, in technological literacy the intention is to reveal the ways that technology increasingly mediates the museum's interpretation of objects to visitors. Students can explore how technology facilitates, alters, challenges, or redefines visitors' encounters with the museum object. Lastly, in critical literacy, the purpose is to help students to recognize and consider ideological stances and power structures implicit in museum displays. This calls for students to acknowledge their analysis of an exhibit as a particular and positioned act of interpretation.

In relation to the Cypriot museum educational context, neither multiliteracies nor technology enhanced learning have been addressed in policy making documents (MOEC, 2016a; 2016b). Nevertheless, this research makes a standpoint that museum multiliteracies should be embraced to enrich students' learning experiences.

3.11 The role of the educator in the MMP framework

Key to the effective incorporation of appropriate and creative blends between the digital and print literacies for young learners is the role of the educator. Any attempt to meet the challenges of the new communication landscape and enable educators and pupils to engage in new forms of literacy should pay attention to the role of teachers as knowledge creators in this endeavor (Farren, Keane, Hennessy and O'Mahony, 2007, p.1). It is claimed that significant change in student learning outcomes is not in evidence until change in pedagogy occurs (Navehebrahim, 2011, p.866), and educators are the ones who carry this role.

I have identified several overlapping roles for educators within the MMP framework. Firstly, although the MMP framework is not set for teaching a specific curriculum or subject, educators in the framework should position themselves as *teachers of literacy*; yet this conception of literacy is broadened in functional terms of providing access to multimodal texts, the burgeoning textual forms such as interactive comics, videos, films, graphics, and visual images that students ''read'' (New London Group, 2000; Rowsell et al., 2008). The premise in utilising the MMP framework is to increase

educators' (museum educators and schoolteachers) multimodal literacy and give them the pedagogical resources to broaden their teaching repertoires in relation to multimodality and the cultural and linguistic diversity of their students.

Secondly, the MMP framework suggests that educators become critical readers of various forms of texts. Freire and Macedo name this role as "teacher as initiator of change" (1987). Ajayi (2011, p.398) and Rowsell et al. (2008) argued that new communication technologies afford learners unlimited potential to practice multiple literacies across cultural, social, economic, and national boundaries, and in the process, re-conceptualize their self-identities as multiple, hybrid, complex, and dynamic.

Another significant role for an educator in the MMP framework is to act not as an authority figure, the only possessor and transmitter of knowledge (Vosniadou, 2006), but rather to become a *co-designer* or *co-inquirer* (Yayli, 2009, p.207) of the social futures for learners drawing from the concept of design found in multiliteracies pedagogy. In this sense, they would act as co-inquirers in meaning making. Cochran-Smith and Lytle (1999, pp.253-274) make a distinction among three approaches to knowledge development in teacher education: knowledge *for* practice (content knowledge), knowledge *in* practice (practice, narrative, reflection) and knowledge *of* practice (systematic inquiry in communities of practice). In the MMP framework the educators should pertain to the third approach: unlike in a student-centered curriculum where the teacher is an expert guide and the student is an explorer, here a practice-oriented curriculum is proposed, where, with an understanding of multiliteracies, the teacher and the student are co-inquirers, which could provide both teachers and students with "social and symbolic interaction" (p.25). Educators take roles as researchers of knowledge.

The above role is also backed up by the notion of *teachers as border-crossers* (Giroux, 1992, p.26), which emphasizes the fact that teachers are learners who continuously develop themselves in their transitions from one sub-culture into another. This notion considers that teachers should become *agents of social inclusion* in teaching students whose cultural backgrounds differ from their own (Helfrich and Bean, 2011,

p.215). Undertaking a culturally responsive approach to teaching within the MMP framework is not an easy task; it has been suggested that many white teachers experience some ambivalence toward minority and immigrant students (Hollins and Torres-Guzman, 2005; Sleeter, 2001) and doubt their efficacy in teaching students whose cultural backgrounds differ from their own (Helfrich and Bean, 2011).

3.12 Research Evidence for the Effectiveness of Multiliteracies Pedagogy

In the few studies that examined multiliteracies pedagogy in the context of the museum, it is evident that teachers who have used museum and gallery resources to support literacy have enhanced literacy teaching by linking it to first-hand experience in museums and galleries. They have re-established purpose as the key motivational force in writing through the use of museums and gallery collections. Educators have developed a more cross curricular approach to the teaching of writing and increased the use of visual images, speaking and listening and performance in their teaching (Eakle, 2007; 2009).

Unlike the museum context, the effectiveness of multiliteracies pedagogy in improving students' diverse methods of literacy learning in the classroom has been well documented[16]. It has been empirically proven that including multimodality enhances learning for all, and particularly for students who have been labeled struggling readers or learning disabled, or whose semiotic resources and sociocultural practices are different than the dominant culture. For this reason, the most common research on multiliteracies pedagogy relates to the teaching of English and language lessons.

3.13 Summary of the Chapter

This chapter does not attempt to introduce a new model of museum learning, but rather to develop a creative synergy of overlapping theories and pedagogies to address the current dissonance between home and school practices, specifically the cultures,

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[16] See for example Emery, 1996; Chow and Cummins, 2003; Chandler-Olcott and Mahar, 2003; Marsh, 2007; Mills, 2006a.

languages, needs and interests of 21st century learners, coming from diverse communities outside of the dominant Cypriot context.

The study of the MMP framework adhering to multiliteracies pedagogy, Learning by Design and museum based research, all seek to inform consideration of the particular affordances museum-based literacies can offer to the student learner. The objective in this environment is to observe how students can reach a greater level of understanding with regards to necessary and appropriate skills for both the museum context and, more importantly, future contexts outside of the museum. The ultimate goal should be to enable the learner to use any or all of the resources available to transform the meaning of texts so that they become personally meaningful and can be applicable to different contexts. Lave (1996, p.161) refers to this as 'changing participation in changing practices'. Table 3.4 provides a summary of the key points and understandings that guide the framework.

I do not intend to make normative claims about the MMP framework in relation to inclusive practices. There is a need to evaluate, rather than simply assume, the potential of the framework in providing access. The next chapter will describe the characteristics of effective museum-school partnerships and the steps taken to plan a coherent learning design for the implementation of the MMP framework to test its feasibility within a real life context. I will seek to explain the intermediary stage between theory and practice in order to connect these strains so the reader will understand the learning framework as a purposeful instructional structure within a naturalistic context.

Table 3.4 Main concepts and principles in the MMP framework

i)	Teachers and facilitators should recognize the enormity of the social change in today's classrooms. Students bring into the classroom and the museum a complex range of representational resources based on diverse cultures in their lived experiences (Cope and Kalantzis, 2000a).
ii)	Literacy learning is situated in social and cultural practices of students and it is distributed across their peers, contexts, and technologies (Gee, 2003).
iii)	Skills are broadly configured and situated in specific contexts that shape understanding. The aim should be co-construction of knowledge and opportunities for authentic engagement and participation drawing on the identities, agency and everyday practices of pupils.
iv)	It is recognized that knowledge construction requires attention to a wide variety of media and diverse modes of representation. These should be integrated into school practice for students to analyze, critically interpret and transform them to apply them in new contexts.
v)	Multiliteracies pedagogy offers potential to deploy pluralism, linguistic diversity, and cross-cultural synergy through introducing multimodal educational resources.
vi)	Multiliteracies pedagogy recognizes difference and meshes students' differing interests, priorities, and needs and the attendant languages, hybrid cross cultural discourses, cross-cultural dialects, intertextuality, and regional dialects as a resource for teaching and learning.
vii)	Museum based pedagogy could facilitate the realization of multiliteracies pedagogy as a site of negotiation, contestation, interpretation, and reconfiguration of relationships of alternative frameworks and mindsets.

Chapter Four - Development of the Living Museum Partnership – Knowledge Journeys

4.1 Introduction

This chapter addresses the knowledge base for developing an effective museum-school partnership to support the implementation of the conceptual framework that was proposed in the previous chapter. The museum-school partnership and its educational programme was entitled the Living Museum Partnership (LMP). The chapter describes the steps taken to plan a coherent learning design for the implementation of the LMP, and also includes the procedures for the evaluation of the programme. Therefore, it represents the intermediary stage between theory and practice. The aim is to connect these strains so the reader will understand the learning framework as a purposeful instructional structure within a naturalistic context.

This chapter is divided into two parts. First, it addresses the literature on the steps suggested by theorists towards a successful museum-school partnership and provides an overview of museum-school partnership models. The second part of the chapter describes the strategies taken to plan a coherent learning design for the museum-school partnership. In addition, it includes the procedures for the evaluation of the impact on students' learning.

4.2 Elements of Effective Museum-School Partnerships

As much of the literature consistently points out, establishing partnerships is one way for museums, schools and communities to create a new educational infrastructure for young children (Falk and Dierking, 2000). These two different institutions provide different sort of experiences and "work together to give students an enriching immersion in ideas, discovery, challenge, and enjoyment. This museum-school collaboration is a

partnership well worth developing and sustaining" (Sheppard, 1993, p.2). Every museum-school partnership differs and one cannot guarantee that there is a recipe of some sort to apply in planning and delivering these collaborations. Nevertheless, there are certain characteristics commonly identified among researchers as the steps to establish a successful museum-school partnership. The most pertinent of these are presented here and informed the organizational aspects of the delivery of the LMP, as will be discussed later in this chapter.

It has been proposed that a successful partnership begins with clear, goal-directed communication, which refers to the schools being clear about their expectations from museums and vice-versa (AAM, 1984; Sheppard, 1993). It is crucial that a culture of dialogue is cultivated. Both museum and school leaders must identify common educational goals, and express how those goals work together for effective and desirable outcomes (Berry, 1998; Huber, 2009; Johnson, 2009; Sheppard, 1993; Talboys, 1996). The partnership must include a commitment to administrative support as well as teacher interest, in order to achieve the ultimate aim of establishing museums as integral components in the total educational experience (Sheppard, 1993; Stone, 1993). There is also the need to undergo a planning process (Berry, 1998; Huber, 2009; Sheppard, 1993), to ensure that the collaboration is successful. Well-planned partnerships with schools "strengthen a museum's community involvement, enrich its educational capacity, build an enlightened audience, and signal a commitment to educational reform and improvement" (IMLS, 1996, p.49). However, these outcomes do not occur automatically. Many conditions need to be met in order to have an effective partnership that benefits museums and schools. The challenge for museums is to change traditional concepts of museum-school relationships, so that they can engage fully in supporting education in practical ways in their communities.

Landau (1986) suggests, as a general rule for successful partnerships, to actively engage parents apart from teachers and museum staff in museum learning while also encouraging them to join museum boards and committees. In addition, he considers that it is important to allocate museum personnel as advisers in schools, allow for flexibility in

museum and school schedules and reference groups to cater for the early years audience requirements.

Other key features of successful museum and public school collaborations are interdisciplinary learning activities and quality in-service training for educators. Hirzy (1996), for the IMLS, outlined conditions for successful museum and public school partnerships in the publication *True Needs, True Partners: Museums and Schools Transforming Education*. The conditions listed for success were as presented in Table 4.1.

Table 4.1 Conditions for success of Museum-School partnerships (Source: IMLS, 1996, p.50)

True Needs, True Partners: Museums and Schools Transforming Education (IMLS)
1. Obtain early commitment from appropriate school and museum administrators.
2. Establish early, direct involvement between museum staff and school staff.
3. Understand the school's needs in relation to curriculum and state and local education reform standards.
4. Create a shared vision for the partnership, and set clear expectations for what both partners hope to achieve.
5. Recognize and accommodate the different organizational cultures and structures of museums and schools.
6. Set realistic, concrete goals through a careful planning process. Integrate evaluation and ongoing planning into the partnership.
7. Allocate enough human and financial resources.
8. Define roles and responsibilities clearly
9. Promote dialogue and open communication.
10. Provide real benefits that teachers can use.
11. Encourage flexibility, creativity, and experimentation.
12. Seek parent and community involvement (p. 50).

There have been other steps that are considered necessary to achieve successful programme development for museum-school partnerships. Lehman and Igoe (1993, p.15) in *Museum-School Partnerships: Plans and programs sourcebook,* further argue that there are certain critical steps of collaboration when creating a programme for museum and school partnerships (Lehman and Igoe, 1993, p.15). The first step requires the identification of needs and options; the two institutions should define the issues they want to address, analyze elements of the programme, develop the course of action and investigate resources. Tushnet (1993, p.3, p.122) concurs that the partnership should be established based on a common concern about a real problem that can be addressed by the two institutions working together. At this point a formal needs assessment will help focus the collaborative activities. The second step, according to Lehman and Igoe (1993), involves the development of the programme. A rationale should be designed collaboratively by the participating institutions that addresses both museum and school objectives. This process entails the identification of the topic of the study and the location of major ideas that students will develop, as well as the inclusion of activities and teaching strategies. Step three of the preparation involves the implementation, where all participants collaborate to define the roles of museum and school staff, as well as identify available resources and seek ways to retrieve any resources that are missing. At this point some revision should follow, based on a system of observation, analysis, and evaluation.

Huber (2009), in *The Museum Educator's Manual: Educators Share Successful Techniques*, adds a final step to the process. This is planning for the future. Her belief is that participants should build support to sustain involvement, promote success to the public, and use the project as a model for future endeavors. It is important that the results of the efforts to sustain a partnership are documented and can work as a means to communicate successful strategies to interested parties.

To maintain a partnership, and have it work in the most efficient and productive way, involves a shift in thinking: "school officials, including teachers, must be willing to accept museums as partners in the educational process; and museum officials, including curators, must recognise that serving the schools and children is an integral part of the

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museum's function" (Danilov, 1976, p.306). These sort of partnerships are fundamentally important to create sustainable museum programmes for schools and communities (Piscitelli, 2001, p.229). On the other hand, among the key reasons why museum and school partnerships have not been sustainable are, according to AAM (1995), the lack of funding, a wrong fit between the museum and school, and insufficient time for teachers and students to familiarize themselves with the programme. The aforementioned reasons have resulted in the dissolution of the museum-school partnership shortly after funding ran out (Barragree, 2007).

4.3 An overview of museum-school partnership models

In the context of museum learning practice Sheppard (2010) and Chesebrough (1998, p.51), developed a stance for museum-school partnerships that addressed different levels of shared risk and reward in the partnership defined as followed: cooperative, coordinated, collaborative and integrated. Wan-Chen Liu (2007, pp.129-135) proposed a different approach in "Working Together: Collaboration between Art Museums and Schools". She delineates six different models of museum-school collaborative relationships based on the level of involvement and interaction between the museum and school, namely:

i) The Provider-Receiver Model: the museum is the provider and the school or teacher is the receiver of some type of service or deliverable. This model is the prevailing model within the Cyprus museum educational context. It includes the standard museum tour designed by the museum educators for all schools visiting the space and a limited level of communication between schools and museums.

ii) The Museum Directed Model: it involves a greater level of cooperation between the two parties; a level of shared responsibility for valuing and utilising museums as curriculum resources: however, the museum is the institution that shares the burden of initiating activities, such as workshops for teachers/

iii) The School Directed Model: a level of shared responsibility between the museum and the school or individual teacher. From this perspective the teachers are actively

involved by initiating curriculum ideas and developing materials via communication with museum educators. Practically, this means that the teachers utilize the museum's collections and resources to design activities related to the museum its exhibit(s), and/or its artifacts. The intention is to use the museum as a resource to cater for the students' specific needs.

iv) The Museum as School Model: museum education is not an extension but rather functions as the core of the school curriculum. Teachers play a primary role in this type of partnership as they make use of the resources within the school community to teach a curriculum that is based on the museum's features.

v) The School in Museum Model: the school is physically located within a museum or on a shared property. The developed partnership is mutually beneficial to all parties, including the museum, school, teachers and students. This model involves a high degree of interdependence between the museum and the school and it is particularly popular in the USA.

The selection of a specific model for creating a museum-school partnership should depend on the needs and resources of the respective institutions. In this research, the School Directed Model was preferred based on the needs of the teachers and students, which is described in more detail in the next section.

4.4 Developing a model for the LMP

The Living Museum Partnership (LMP) was developed based on the characteristics of The School-Directed model (Liu, 2007) by combining different aspects of training and coaching models. This research follows the detailed guidelines by Barragree (2007; 2006) regarding the sustainable design of museum-school partnerships with appropriate curriculum based materials. The guide comprises six stages which are: Creating a Partnership, Preparing a Plan, Planning Curriculum Components, Developing the Curriculum, Evaluating the Process, and Implementing the Products as illustrated in Figure 4.1.
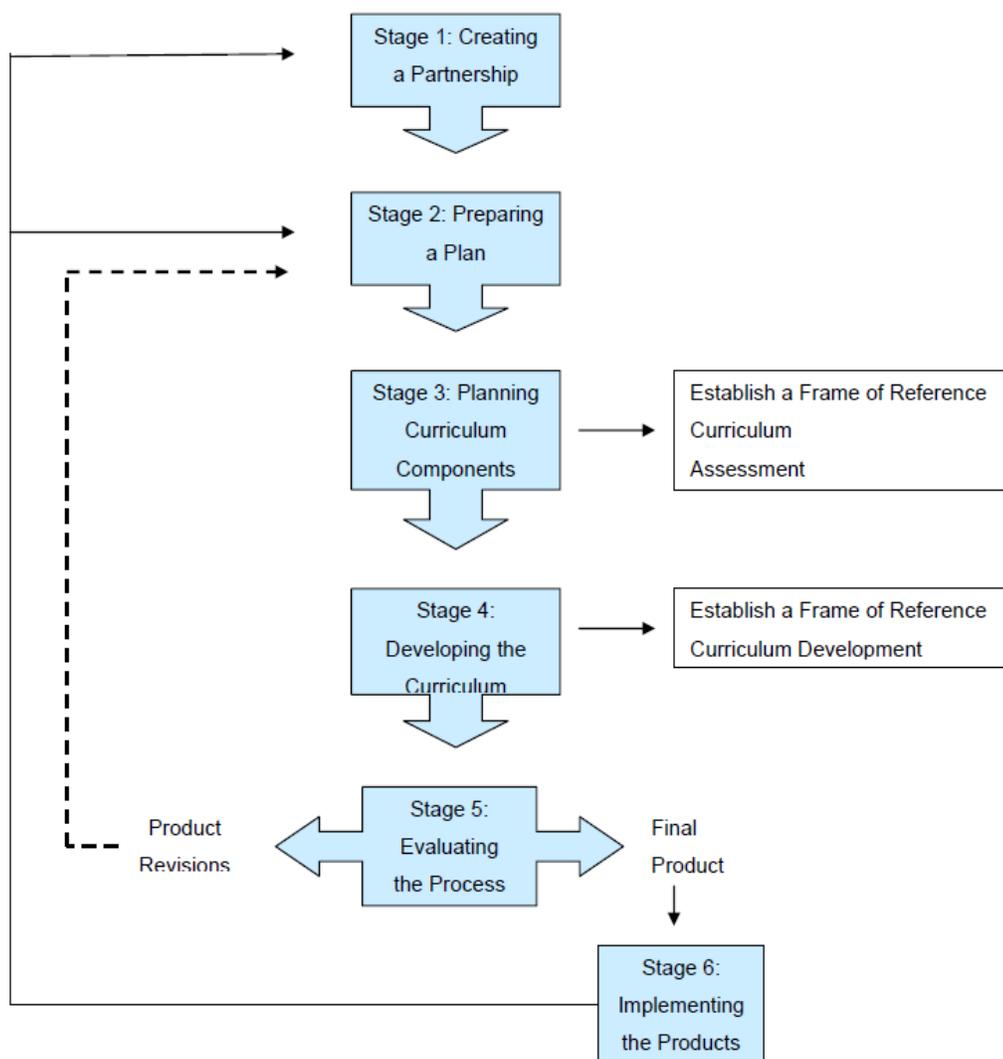
Figure 4.1: The Six Stage Process for Museum and Public School Partnerships (Barragree, 2006).

4.4.1 The purposes of the LMP

The overall intention in the development and implementation of the LMP was to propose an instructional design with practical implementation and evaluation guidelines that would integrate the MMP framework to promote literacy learning for CLD students in the context of an environmental education curriculum. In this context, the decision was made that educational virtual museums could be an appropriate approach to transfer the

developed learning framework into practice. Based fundamentally on the principles of multimodal design, in which "information (is) presented in multiple modes such as visual and auditory" (Chen and Fu, 2003, p.350), as well as written modes, virtual museums fit naturally in the MMP framework as they offer a concrete instantiation of New Literacies, allowing instructional elements to be presented in more than one sensory mode (visual, aural, written). At the same time, virtual museums apart from effective exhibition of objects serve issues of accessibility (Cilasun, 2012, p.2); they facilitate dialogue among people sharing the same virtual space (same context) (Wazlawick et al., 2001, p.15). With the proliferation of technologies, online virtual museums are becoming more immersive and interactive, promoting richer visitor experiences – with scenarios, characters, and objects - with their collections using the latest in multimedia innovations (Payne et al., 2009, p.292). Therefore, "a virtual museum dematerializes the museum itself by making possible a "remote visit" (Djindjian, 2007, p.9). At the same time, maintaining a virtual museum is one manifestation of digital cultural heritage as part of using technological innovations to aid the long-term preservation of cultural heritage and to promote new models of public engagement (Museums Computer Group, 2011). It is considered that developing community-based digital archives (Tait et al., 2013) therefore is a win-win situation (Stevens et al., 2010).

Virtual museums have therefore been used widely in learning settings in recent years. Within the last three decades, interest in Computer Supported Cooperative Work (CSCW) applications using virtual reality (VR) has been growing, resulting in the development of Collaborative Virtual Environments (CVEs) (Wazlawick et al., 2001, p.3). Further to this, the technology has also been used to support learning, as for example in the "*museuVirtual*" project (Wazlawick et al., 2001) and Ho, Nelson and Müeller-Wittig's study (2011). Regarding the educational uses of VR technology, Youngblut (1998) classifies existing tools to support learning features into three categories summarized in terms of their objectives, and the age and characteristics of the users (the students). The first category refers to the students' use of pre-developed virtual worlds without any collaboration. The second category concerns the development of virtual worlds by the students. Students have the opportunity to participate in a more effective way by creating, or

extending simple virtual worlds that they consider interesting (Youngblut, 1998). The third category of tools concerns multi-user, distributed world where students physically placed around the world and connected by the Internet to learn about a subject that is of group interest (Youngblut, 1998).

In this research the decision was to opt for a student-generated virtual museum which is situated in the second category; the basic planning for the museum would be initiated by me as the museum educator-researcher, though the students themselves would decide the topic of the museum and construct the space through minimal guidance. This perspective encompasses a recent trend concerning museum visitors' expectations: the interactivity feature while also responds and tests the MMP framework and pedagogical scenarios pursued in this research.

The impression was that this sort of computer-based learning environment could be motivational for all students involved in the research, as it promotes meaningful opportunities to integrate technology through interactive and engaging learning (Higgins, 2003, p.8). In this sense, the virtual museum could be utilised to enable ways to infuse 21st-century skills into traditional learning to align with students' contemporary needs and interests. There is a scarcity of research on educational contexts that reports to predominantly student-generated design and content for virtual museums; and these studies involve relatively older participants and served different research purposes (Ho, Nelson and Müeller-Wittig, 2011). In addition, theory-based engagement in virtual museum making practice as proposed in this research is even more limited. In relation to the multimodal and interactive nature of virtual museums, it is considered that these materials may lead learners to perceive that it is easier to learn and improve attention, thus leading to improved learning performance and facilitate understanding (Moreno, 2002) in particular for lower-achieving students (Chen and Fu, 2003; Moreno and Mayer, 2007; Zywno, 2003) such as culturally and linguistically diverse students.

Fadel (2008, p.13) found that, students engaged in learning that incorporates multimodal designs, on average, outperform students who learn using traditional approaches with single modes". In addition, this sort of work could be undertaken in the

form of informal, inquiry-driven learning (Dewey, 1938, 1991; Kuhn, Black, Keselman and Kaplan, 2000; Vavoula et al., 2009) through active participant engagement. Finally, it was hypothesized that creating a multimodal learning environment would enable collaborative learning (Dillenbourg, 1999). The latter can take place within environments such as a virtual one which allow communication, exchange of ideas, and decision making (Wazlawick et al., 2001, p.14). This sort of interactivity motivates a wide range of students to learn and carry out tasks due to its social potential (Wazlawick et al., 2001, p.14). This characteristic was a definite element towards utilising virtual museums to respond to the research questions addressed in this research.

4.4.2 Objectives of the LMP

The intention was for both teachers and students to benefit from the LMP. In terms of the instructors' perspective:

i)   Developing teachers' awareness towards using the multiliteracies-based approach supported by the Learning by Design instructional sequence;

ii)   Developing an understanding of the new knowledge and skills in literacy teaching and learning and connecting it to their prior experiences;

iii)   Supporting teachers in practicing and implementing the approach within the context of a museum-school partnership utilising the available resources and affordances of museum learning;

iv)   Supporting teachers to develop the ability to reflect on, and, recognize when misconceptions and misunderstandings occur in the instructional context;

v)   Building teachers' knowledge, skills, and attitudes towards using the new approaches;

vi)   Supporting teachers' in receiving feedback from others and engaging in peer collaboration.

As far as the benefits for CLD students in the research overall, it was anticipated that through the learning process of the intervention there could be evidence of a change in

the social relationships of students both within the school and with the museum and community, promoting and utilising the diversity of the students' cultural and linguistic backgrounds, legalizing the experiences of students, and supporting students in developing the range of literacies that are highly valued in globalized and technologically linked societies. Students could learn how to use and select from all the available semiotic resources for representation. Second, they could combine and recombine these resources to create possibilities for transformation and reconstruction by redesigning various texts.

More specifically, a stated objective was for students to expand their repertoires of literacy practices through multimodal engagement in the construction of the virtual museum and researching for sources, including a wide range of genres and semiotic systems (fine art, advertisements, photography, TV programmes, films, etc). As Pena-Shaffa and Nicholls (2004) contend, engaging students in the construction of a virtual museum could trigger the development of a metalanguage for dealing with multimodal texts, thus sharpening the processes of inquiry and learning. Furthermore, according to Hwang, Wu, Tseng and Huang (2011, p.993) the process for the construction of the virtual museum might enhance participant collaboration and exchange (El-Bishouty, Ogata and Yano, 2008) which are critical to constructing a learning design for the MMP framework which builds on the idea of inquiry driven learning. Students could develop their imaginative, creative skills and overall adaptive capacities for designing meaning on their own and extend their competencies in critical literacy and higher order thinking to understand the impact of multimodal texts on their literacy identities.

In addition to these, the expectation through the use of the platform (the virtual museum) was that it would allow the teaching or reinforcement of cross-curricular content by having students linking ideas, taking inspiration from different subjects. The multimodal character of virtual museums could also offer a form of visual and kinesthetic learning that is favourable for visual learners (Keeler, 2009), encourages writing and allows for differentiated instruction/learning for culturally and linguistically diverse students; which is of particular importance in this research.

The optimum was for the MMP framework to be cultivated in such a way that it would provide other students and adults "outside" the group (including teachers and school administrators) with better insights into their language and literacy capabilities, including those of culturally and linguistically diverse students. The premise was that this multimodal learning environment would allow the students to acknowledge their common experiences, therefore solidifying group identities and memberships while enhancing group dynamics.

4.4.3 Rationale for the design of the programme

Being situated in a real context, DBR focuses on examining a particular intervention by proceeding to continuous iteration of design, enactment, analysis, and redesign (Brown, 1992; Cobb et al., 2003; Collins, 1992). The intervention can be an instructional approach, or a type of assessment, or a learning activity, or a technological intervention, namely testing the effectiveness of the particular learning environment or tool (Anderson and Shattuck, 2012; Zheng, 2015).

The Living Museum Partnership was an intervention integrating the MMP framework (Table 3.1). The MMP framework used in the study informed the design, implementation and evaluation of the LMP through iterative cycles of the prototyping phase of a virtual museum workshop, 13 weeks of multiliteracies lessons, a visit to a local museum (museum educational programme), and finally a Museum Day. To test the effectiveness of this particular instructional approach, I approached the study using the "learning by designing" (Di Sessa and Cobb, 2004) focus through an inventive discovery process appropriate for the kind of literacy work, particularly as the concept of design is also at the core of multiliteracies pedagogy (New London Group, 1996). This sort of engagement is thought to provide opportunities for students to become active designers of meaning, composers and evaluators whilst meaningfully engaging with multimodal resources that enhance their participation and motivation, and facilitate meaning making and collaborative learning in ways that are relevant to their daily lives. Drawing on the

literature it was anticipated that the enactment of the LMP would expand students' repertoires of literacy.

In this research in the area of DBR, prior to the design of the intervention several examples of research on multimodal learning environments were reviewed (see Appendix 4A). Eventually, the design of the partnership was influenced in particular by Ho, Nelson and Müeller-Wittig's (2011) case study on *MUSE*, a Museum-based Multimodal Learning Initiative. Their research approach drew from principles of "design research" (Collins, Joseph and Bielaczyc, 2004) because it involves "close collaboration between designers and practitioners" (Bereiter, 2005/2006, p.17). In particular, Ho, Nelson and Müeller-Wittig's (2011) case study involved the design, implementation and evaluation of a technologically enhanced, museum-based, research intervention within the context of an English Language (EL) curriculum for secondary education, to enhance students' multimodal awareness. Nevertheless, there were some differences between Ho et al.'s study (2011) and the enactment of the LMP. Table 4.2 demonstrates changes made to Ho's, Nelson's and Müeller-Wittig's (2011) research.

Technology enhanced learning can take the form of web-based platforms and resources (Barak, Herscoviz, Kaberman, and Dori, 2009; Eakle, 2009, p.4), mobile devices (Papadimitriou et al., 2006; Reynolds, Walker and Speight, 2010; Vavoula, et al., 2009) or virtual and augmented (Müeller-Wittig, Zhu and Voss, 2007). Ho, Nelson and Müeller-Wittig's (2011) plan of action was designed for use with Singaporean high school students with a basic background in two and three-dimensional multimedia and included the use of augmented reality[17] production, design principles and elements. In this research, the resources used and activities planned were adapted to make them suitable for Cypriot students aged 10-12 who are not exposed to computer lessons nor virtual or augmented reality environments. Therefore, it was regarded best not to introduce the children to any elements of augmented reality design as this was not a learning objective for my research,

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[17]'Augmented' reality (Milgram and Kishino, 1994) 'enriches' learning experiences with information graphically added to the real environment perceived. This study adopted in-house 3D graphics system (Ho et al., 2011).

and teaching about basic design terminology would be time consuming. Instead, students would generate a "non-linear PowerPoint virtual museum[18]". This idea was first introduced at the International Society for Technology in Education (ISTE) National Educational Computer Conference (NECC) in 2005 by a group of educators from Keith Valley. Fasy, Heitzenrater, Rotchford, and Telthorster (2006) developed samples, instructions and templates for student-made virtual museums using PowerPoint slides. These educators' proposal for creating a virtual museum was more appropriate to the level of knowledge and skills of the primary age children in the sample.

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[18] Unlike the traditional use of PowerPoint slides in a linear way, when one slide follows the other in a straight line, this project employed non-linear navigation in PowerPoint which is the ability to move back and forth from the home slide by inserting hyperlinks and action buttons.

Table 4.2: Changes to Ho et al.'s study (2011) Strategy

	MUSE (Ho, Nelson and Müeller-Wittig, 2011)	**Living Museum Partnership (LMP) (Savva, 2016a)**
Grades	Grades 7-8: Students aged 12-13	Grades 5-6: Students aged 10-12
Objective	To examine how the affordances of museum-based, digitally-mediated learning environments can be harnessed effectively to impact teaching and learning.	To examine the potential of the MMP learning framework on changing the social relationships of students both within the school and with the museum and community, promoting and utilising the diversity of the students' cultural and linguistic backgrounds, promoting their experiences, and support them to develop the range of literacies that are now highly valued
Learning Aims	Students should: Develop multimodal awareness Develop their imaginative, creative skills and overall adaptive capacity for designing meaning, receptively and productively, in multimodal contexts	Students should: Develop multimodal awareness Develop their imaginative, creative skills and overall adaptive capacity for designing meaning. Develop critical literacy and higher order thinking to understand the impact of multimodal texts in their literacy identities. Appreciate their cultural and linguistic background and those of others
Content	Augmented learning environment integrated into the regular EL (English Language) curriculum	Virtual learning environment integrated into different subjects in the school curriculum
Resources	Written text, multimodal resources (images, videos, 3D models, audio, animation)	Written text, multimodal resources (images, videos, audio, animation, web based platforms)
Session Activities	Five stages – rationale is not provided	Four stages based on Multiliteracies Pedagogy
Assessment	Informal: through classroom participation and reviewing students' work Formal: final presentation	Informal: through classroom participation and reviewing students' work, self evaluation Formal: final presentation

Ho et al.'s (2011) case study unfolded in five stages; however, no theoretical rationale was provided for their decisions. Before I designed the different stages of the intervention, several curriculum examples of teaching were surveyed based on

multiliteracies pedagogy, which is the core pedagogy in the MMP framework (Appendix 4B). Similar to these examples, I utilised the four components of multiliteracies pedagogy (situated learning, overt instruction, critical framing, and transformated practice) to develop the content for each stage of the LMP. The stages were namely induction, immersion, and creative and transformation (Figure 4.2).
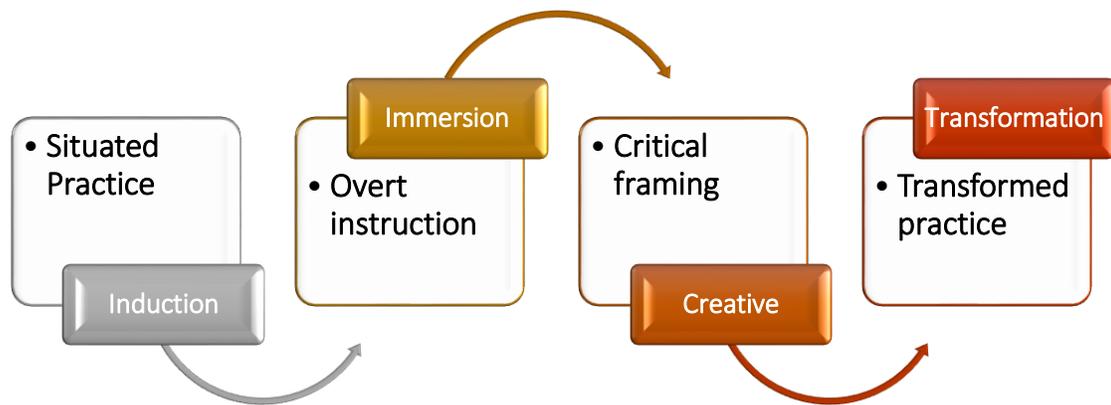
Figure 4.2 Stages in the implementation of the intervention (Savva, 2016a)

The overall thinking behind the design of the museum-school partnership was consistent with Anstey's and Bull's guidelines for teaching in and through multiliteracies pedagogy (2006, p.64). As Figure 4.3 indicates, the process of designing involved locating the theme and scope based on learning needs and objectives pursued through identifying learning outcomes that would be meaningful to students, relevant to their interests and literacy identities, using authentic texts and real life contexts and engaging students in the learning process based on the four components of multiliteracies pedagogy. In accordance with Cope and Kalantzis' Learning by Design Approach, the selection of multiliteracy texts and resources was undertaken through a balance of paper, electronic and live texts, semiotic systems, genre, and delivery platforms, while ensuring engagement with all four practices. With regards to the consumption and production of texts, the intention was to analyze texts and themes in terms of the strategies, skills and knowledge students need to

engage with them, practice engagement in the activities planned and ensure that all four practices are addressed, while also considering students' prior knowledge. Finally, the teaching strategies throughout the project were planned to ensure balance between real-life and simulated activities, and include new knowledge and revision of previous teaching.

Locating theme-scope based on learning needs and objectives	•identify learning outcomes that would be meaningful to students, relevant to their interests and literacy identities •use authentic texts and real life contexts •engage students in the four reading practices (FRM)
Selection of multiliteracy texts and resources	•pursue a balance of paper, electronic and live texts, semiotic systems used , genre and delivery platform •ensure engagement with all four practices (FRM)
Consumption and Production of Texts	•analyse texts and themes in terms of the strategies, skills and knowledge students need to engage with them. •practice engagement in the activities planned and ensure that all four practices are addressed •consider students prior knowledge
Planning teaching strategies	•ensure balance between real-life and simulated activities •organise strategies to include presentation of new knowledge and revision of previous taught. •use all four practices and address the four areas of productive pedagogies for a multiliterate pedagogy

Figure 4.3 Rationale for the design of the unit

4.4.4 Design of materials

In designing the content for the various stages of the intervention, there were five layers of work following the methodological guidelines of Design-Based Research for designing curriculum materials suggested by Van Den Akker and Plomp (1993) and refined in the studies of Ottevanger (2001) and Stronkhorst (2001): selecting the themes or topic, standardization of the structure and designing the relevant activities for the lessons and the construction of the virtual museum (Appendix 4C), anticipation of potential implementation problems and incorporating these into a coherent instructional resource for students to work with, provision of the procedural specifications and systematic formative evaluation.

The curriculum materials for this study integrated the four components of multiliteracies pedagogy (Table 4.3) with a focus on supporting lesson planning (procedural specification) and implementation. Drawing on the components of multiliteracies pedagogy, it was decided to capitalize on *situated practice*[19] by focusing on the need to deepen awareness about a local environment problem near the school area as part of the year of environmental awareness at the school. Thus, the curriculum itself was based on the world of students' designed and designing experiences, because they were engaged in meaningful and relevant literacy practices related to their sociocultural context. Questions about their prior knowledge of the topic of interest were posed and opportunities to express feelings, thoughts and ideas about the situation were an important part of the design.

Another significant objective was for students to understand the major factors that caused this environmental problem by engaging with readings of multiple texts, print and multimodal elements. Students would then gain an understanding of what is presently being done and what else could be done by suggesting solutions on their own. This would be done through *overt instruction*[20], which would explicitly address the development of,

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[19] Draws on students' experience of meaning-making in lifeworlds
[20] Students are taught an explicit metalanguage of Design

and teaching to students – a metalanguage – to describe and evaluate meanings on the topic.

Through *critical framing*,[21] another component in multiliteracies pedagogy, students would be encouraged to think about how people from diverse backgrounds might deal with such environmental issues and how different cultures deal with it. Imperative to this process would be to engage students from different cultures and languages in the classroom discussion and activities by sharing their experiences from their countries. Students could then formulate and identify possible solutions to the problems that exist and record them in various ways.

Students would engage in *transformed practice*,[22] the ultimate component of multiliteracies pedagogy by using what they had learned in the multiliteracies curriculum to reconstruct texts and knowledge practices in new ways and in different contexts through engaging with the construction of a multimodal learning environment, their own virtual museum. Their multi-modal design and redesign of school texts was an orientation to literacy that encompassed the idea of productive power (Janks, 2000, p.177); that is, the ability to harness the multiplicity of semiotic systems across diverse cultural locations to challenge and change existing discourses.

This layer of work in the design of the sessions related to preparing the materials and activities for students to engage in the construction of the virtual museum. Keeler's (2009) and Fasy et al.'s (2006) worksheets were employed at this point to assist with the architectural aspect of the project: students were developing the museum floor plan and engaging in modeling/construction work with guidance from myself and the Computer Science teacher when available (Artifacts, e.g. 3D models, animation, etc.) (Appendix 4D).

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[21] Students interpret the social context and purpose of Designs of meaning across various print and digital texts
[22] Students emerged as designers or meaning makers drawing on their proficiency orchestrating multiple semiotic modes.

In addition to these, more specific worksheets were added, such as for building the rooms of the museum in perspective, and hanging paintings (Appendix 4E and 4F).

Table 4.3 Learning goals, categories and questions based on the four components of multiliteracies pedagogy for the lesson plans

Four components of multiliteracies pedagogy	Learning goals	Topics to develop
Situated practice	Students will develop empathy, concern, and awareness of and about the specific environmental problem in their region, taking inspiration from a local newspaper article.	Find out what students know about this problem in their area and how this problem affects themselves and the community at large. Each student will examine an aspect of the problem by researching, writing, and verbally describing the problems.
Overt instruction	Development of, and teaching to students – a metalanguage – to describe and evaluate meanings on the chosen topic. Students will understand the major factors that cause this problem.	Students will become aware of reasons that led to this problematic situation. They will be able to recognize the traits that create the potential for such environmental problems to grow.
Critical framing	Students think about how people from diverse backgrounds might interpret their relationship with nature and such environmental problems. Students will gain an understanding of what is presently being done to prevent this situation. Students will explore their own cultures and suggest solutions of what needs to be done, as well as what individuals and groups in their community can do, to help.	Students can become critical about ways humans are altering habitats, which is a factor for such environmental problems to occur, and propose possible solutions for prevention. They can then explore how different cultures see nature and deal with the environment taking inspiration from the various cultures represented in the class. Students will formulate and identify possible solutions to the problems that exist.
Transformative practice	Based on the knowledge learnt from various text forms and activities, students plan their course of action for the multimodal design and redesign of the virtual museum.	Students prepare a plan of action for the content of the virtual museum choosing among the material gathered during the previous phase of the project.

4.4.5 The topics and rationale

A basic premise of developing a successful partnership as discussed early on in this chapter, is for museums and schools to have common educational goals, and work towards desirable outcomes (Berry, 1998; Huber, 2009; Johnson, 2009; Sheppard, 1993; Talboys, 1996). In this sense, the development of the topic and supporting materials for the educational programme of the museum was a collaborative process of discussion with the parties involved, including museum educators, schoolteachers of the classrooms, the students and the researcher. The intention was to draw on a unit from the environmental education curriculum that would be appealing and appropriate to unfold through the programme for the LMP.

The first step towards this end was to decide on the theme of the virtual museum, for which students would gather and compile relevant resources and upload this collection into a shared online storage space according to their modes (3D, images, videos, text or audio). Unlike Ho et al.'s (2011) study, the MMP was employed to look to teach or reinforce cross-curricular content by having students link ideas and take inspiration from different subjects. Using as a guideline the results from the preliminary group interviews and discussions with the school principal and teachers, the theme was broadly defined as an environmental problem in the local area which would be relevant to students' lives and interests. The school was engaged in various environmental projects and so students already had some basic ideas about environmental issues and the anticipation was that they could engage more easily in critical reflections on issues of power, ethical issues and allow overlaps between different subjects. Therefore students would be left deliberately to decide on the exact topic during the first session of the project, to establish a level of motivation to participate. An indicative overview of the 13 weeks of lessons developed from the four topics that appear in the current version of Cypriot Environmental Education Syllabus (MOEC, 2005) is provided in Appendix 4G.

4.4.6 A WebQuest for the LMP

Considerable thought was put during the design of the instructional sequence to incorporate students' research on the environmental problem and the construction of the virtual museum. The conclusion was that the best approach would be to utilize the "WebQuest method" introduced in 1995 by Bernie Dodge, also suggested in the Cypriot national curriculum for environmental education. A WebQuest is an active process of directed discovery during which students take up an active role to solve a problem or participate in a realistic situation (Dodge, 1999); in this sense it supports their analytical and higher order thinking skills. The basic source of information in a WebQuest is the internet, whilst the attention is overall at defining the parameters of students' online activity to analyze this information in meaningful ways (Hammond and Allison, 1989; Jonassen, 1991).

I hypothesized that the use of WebQuests to implement the MMP framework could be more understandable for future educators looking to integrate museum-based multiliteracies in their teaching and learning practices at school. WebQuests provide a direction for the educator in planning lessons by defining the fundamental elements and the structure which these lessons should adopt (Figure 4.4). This can save time for the educator while allowing the necessary flexibility to adapt the project to the students' needs and interests.
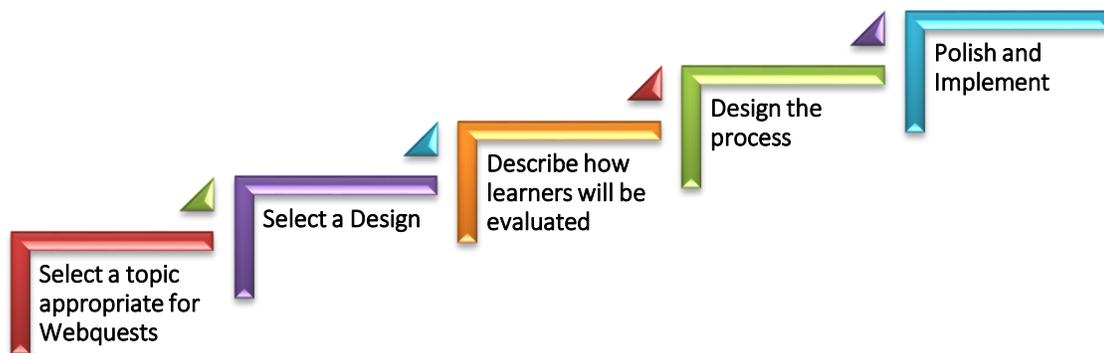
Figure 4.4 A linear description of the design process of a WebQuest. (Adapted from Dodge, 2004)

The process illustrated in Figure 4.4 started once the students decided on the content of the intervention during the induction stage of the research intervention, and was completed before students embarked on the creative stage of the intervention, which was the third of the four stages of work. To prepare the WebQuest, first the educator becomes familiar with resources available online about the chosen topic. Starting from a basic Google search the next step is to seek specific, dedicated sites dedicated for teachers – in this case, in regard to endangered species (Appendix 4H).

Next, the process entailed the identification of topics that fit in with the schools' objectives and the students' interests and for which there are materials online. Specific sources were located which teachers would encourage students to use during the implementation of the project. Following this, depending on the student's skills and the goals of a given activity, they could extend the search to other sources online. What was noteworthy was that it made sense to choose a project that couldn't be done as well without web access. Because to develop a WebQuest actually required the creation of a web site, starting with a template saved a lot of time.

Bernie Dodge's QuestGarden website was utilised to create the WebQuest. The QuestGarden is basically a site which allows users to create a domain and manipulate webpages, to write text and upload worksheets for a single WebQuest. The five elements used were: the *introduction,* which is usually a short paragraph that introduces the activity to the students. The *task* informs the learners of what their end-result or culminating project will be. The *process* identifies the steps the students should go through to accomplish the task and the online resources they will need. The *evaluation* describes to the students how their performance will be evaluated, and is often in the form of a scoring rubric. The *conclusion* summarizes what the learners will have accomplished by completing the WebQuest, and often provides additional opportunities to extend their thinking. The process of designing the materials for the WebQuest lasted a month (mid-September until mid-October 2012). Appendix 4I presents a printed representation of the WebQuest created[23]. The previous was a procedure undertaken using worksheets and text

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[23] The online version of the WebQuest is available in this link: http://tiny.cc/LivingMuseumPartnership

created for the different activities of the intervention (Appendix 4J); links to online sources for each element of the WebQuest were also created.

4.5 The museum educational programme – the visit

Although the basic line up of work for the museum-school partnership was completed on school grounds, an incremental point of the project was the visit to a physical museum. It was anticipated that this sort of physical contact with a real museum setting and the interactions and experiences there would be meaningful for students in their completion of the virtual museum, through engagement with the multimodal resources found at the museum and critical reflection on the museum's holdings.

The visit was planned to be naturally integrated in the course of action with different museum multiliteracies related activities (Appendix 4K). Arrangements were made for students to be exposed to a local theatre museum through a specially designed educational programme which I developed and refined over the course of the formative evaluation of the second phase of the research. The decision was to design the programme for the visit myself, as this would be integrated into the goals of the intervention with the intention to facilitate the process of creating the virtual museum.

Drawing from the MMP framework, activities introduced during the visit would respond to Schwartz's museum based pedagogy (Appendix 4L). Schwartz developed his theory and tested it with secondary and university level students who had a substantive exposure to critical thinking tasks and processes. Therefore, Schwartz's guidelines had to be adapted and simplified to make them suitable for Cypriot students aged 10-12.

The intention was to draw students' attention to the rhetorical nature of museum exhibits: the ways in which the museum makes arguments through and about the objects it displays. More specifically for verbal literacy, the plan was to engage students in a discussion of how labels work at the museum. Students would be asked to talk about specific vocabulary to understand the language of the written texts, how the design and

formatting is appropriate and what could be done to facilitate understanding for people who did not understand the language used in the labels. The objectives were to analyze how words interact with objects and their installation to form persuasive arguments. This was pursued through looking at the agency of exhibitors (curators, educators, and administrators) in producing the exhibit's meaning. It also considered the audience's role in shaping the exhibit's meaning.

With regards to visual literacy, students would explore the importance of the material context in determining an object's meaning: display technology (such as walls, vitrines, dioramas, taxidermy, photography, and video), installation (sequence, height, light, and combinations), layout and design, overall architecture. The intention was for pupils to analyze how objects interact with their physical setting to form persuasive arguments that are primarily visual. This was done through the activity of "Collections" which encouraged debate and creative practice on issues like why is this room organized in this way? Are you pleased with how things are arranged in space? How is the context important to understand more about an object? What other ways can you think to arrange the collections/objects?

In social literacy, the focus is on calling students' attention to the collaborative nature of meaning-making in the museum. This pedagogy looks at the exhibitors' agency in producing the exhibit's meaning. It ponders their goal in mounting the exhibit. It encourages students to contact the exhibitors in order to discuss the exhibition-making process. Students would work in groups during the "Curator's room" activity to try and recreate three different rooms from the exhibits using the resources in the bag provided. They then would present their collage scene to a member of the museum staff and justify their decisions.

Furthermore, in technological literacy the intention is to reveal the ways that technology increasingly mediates the museum's interpretation of objects to visitors. It asks how technology facilitates, alters, challenges, or redefines visitors' encounters with the museum object. To pursue this understanding, students would be given 10 minutes to

familiarize themselves with the museum. During the 'Senses Cards' activity, they would be given five cards illustrating the five senses as guidelines for what to look for at the museum. Upon return to the educator, students would be asked to demonstrate their findings by mentioning which senses they perceived as being more evident across the museum space and how they were communicated to the audience.

Lastly, in critical literacy the purpose is to help students to recognize and consider ideological stances and power structures implicit in museum displays. It calls for students to acknowledge their analysis of an exhibit as a particular and positioned act of interpretation. It encourages students to share the results of their investigation with museum officials. Students would engage in this process by creating postcard letters on the concepts behind the mounting of the exhibit (Postcard activity). At this point the museum director would arrive and collect the postcards to read them (arranged from before) and provide feedback when students return to school.

4.6 Multiliteracies Resources, Materials and Equipment

The MMP framework relies on the meaningful use of various modes, resources and materials, including print and multimodal texts such as videos, images etc. Table 4.4 indicates the range of semiotic systems used for the intervention. The virtual museum was created using desktop computers. Typically, Cypriot primary schools have limited audiovisual equipment and computers are located in special rooms or offices. The head teacher arranged that all sessions took place at the Computer Lab. However, the first session had to be moved to the Art Classroom as the Computer Lab was in use by another teacher which resulted in using own resources (including a laptop) to undertake the project and use the classroom overhead projector. The VGA cameras installed in the computers were also employed alongside iPads and cameras during the museum visit.

Table 4.4: Range of semiotic systems used for the intervention

Type of semiotic systems	Genre/ Text
Linguistic (oral and written language)	Written text, worksheet, oral debate
Visual (still and moving pictures)	Images, pictures, YouTube clips, 3D animated clip, online presentation software (Prezi)
Auditory (music and sound effects)	YouTube clip
Gestural (facial expression and body language)	Role play
Spatial (layout and organisation of objects and space)	Costumes, real objects, seating plan

For the interviews prior and after the completion of the project, online software was employed to develop an audiovisual comic. For the induction session of the project, free online presentation software (Prezi) was used to create an interactive presentation which allowed presenters to zoom in and out of pictures and written text. A well-known online virtual museum, The Smithsonian Museum of Natural History, was used to introduce students to the 'virtual museum' concept (Images 4.1 and 4.2). Microsoft Office PowerPoint 2007 was used to create the virtual museum using basic templates and instructions by Keeler (2009) and Fasy et al. (2006). Students used a range of objects and forms to construct the museum. They recovered images, video clips and pictures of themselves.

Image 4.1 Home page, Smithsonian Virtual Museum

Image 4.2 Inside the Smithsonian Virtual Museum

4.7 The classroom culture and management

In the planning of educational activities, Gravemeijer and Cobb (2013, p.78) stress it is instrumental to consider how these activities are going to be enacted in the classroom. Therefore, it is necessary to think of the nature of classroom norms and classroom discourse (Gravemeijer and Cobb, 2013, p.78). As Matsagouras (1998) points out, the classroom environment can either support or detract from student learning and classroom teachers should develop seating plans that match their teaching. Due to the nature of the project, the Computer Lab was used for carrying the activities for the intervention and therefore there were restrictions as to the organization of the classroom based on how the equipment was arranged (desks in rows and a teacher table in front of the room). However, the idea was to introduce the entire class to the virtual museum concept, and then have students rotate through the process by working in small heterogeneous groups and offer the opportunity to work on virtual museums in stations. Heterogeneous over homogenous groups were preferred so that they included novice and experienced technology users and novice and experienced writers working within the affirmations of multiliteracies pedagogy. This sort of group dynamic could benefit students with different cultural and linguistic backgrounds than the dominant group. Therefore, students from the same group sat next to each other.

According to Matsagouras (1998), even small changes in classroom organization affects children's behaviour. However in this case this was not a problem, as students did not have arranged seats in the Computer Lab. During the intervention, care was taken to ensure that all students could see and hear instructions and they had access to all learning materials and the teacher-researcher could monitor discussion and provide feedback.

4.8 The proactive role of the teacher

Already by preparing a learning design with a scenario of the project, planning activities, choosing the sources and working during the lessons, I remained attached to the traditional role of a teacher. Nevertheless, I was careful to design the learning strategy in a

way that it was faithful to the principles of the MMP framework. Therefore, rather than acting as the sole authority figure (Vosniadou, 2006), I was a co-designer of the social futures for students, drawing from the concept of design found in multiliteracies pedagogy. In this sense I would act as *co-inquirer* in meaning making (Yayli, 2009, p.207) which is common in a practice-oriented curriculum, according to Beach and Myers (2001) with an understanding of multiliteracies, allowing both teachers and students with "social and symbolic interaction" (p. 25).

This role definition is also backed up by the notion of *teachers as border-crossers*, which emphasizes the fact that teachers are learners who continuously develop themselves in their transitions from one culture to another (Giroux, 1992). In taking up the role of teacher-researcher in this study and designing and delivering the programme, although I was acting like a facilitator, I was in a position of power both in terms of the relationship with the teachers, as well as in regards to the students. The term "power hierarchy" implies the relative power difference between group members (Frauendorfer et al., 2014). Power is thought of as the extent to which a person can influence or control other group members (Halevy, Chou, and Galinsky, 2011, p.34; Schmid Mast, 2001). Sharing a high role in hierarchy is important and could act as beneficial for a group since it firstly "establishes order and facilitating coordination", and secondly "motivates individuals" (Magee and Galinsky, 2008, p. 353). Halevy et al. (2011, p.34) further posit that an hierarchy is "beneficial in terms of coordination and cooperation among team members, thus reducing intra-group conflict and as result leading to a positive impact on group performance".

Lastly, I positioned myself in the project as *a teacher of literacy*, yet adhering to a broadened conception of literacy in functional terms of providing access to multimodal texts (New London Group, 2000; Rowsell et al., 2008). I approached the project as a critical reader of various forms of texts. Freire and Macedo (1987) name this role "teacher as initiator of change". Ajayi (2008, 2009) and Rowsell et al. (2008) argued that emerging technologies can facilitate practice of multiliteracies across different contexts while student's self-identities are empowered.

4.9 Evaluation of student learning

In the MMP framework, learning assessment is holistic and ongoing. It is also informal, instead of the typical formal assessment methods like portfolio, standardized tests, reviewing written work, etc. such as is the case in the formal educational system in Cyprus. It derives from students' participation in classroom discussion and activities and by reviewing their practical work. Therefore it is important to acknowledge that assessment is "for learning" (formative assessment) and not just "of learning" (summative assessment) (Cope and Kalantzis, 2015).

4.9.1 Levels of assessment in regards to research design

Despite the rather flexible format of assessment in the MMP framework, it was essential to have a clear path established to evaluate student learning that would establish whether the learning objectives had been achieved. It is widely acknowledged that it is challenging to assess learning in emerging areas of educational research with an emphasis on innovation in instructional practices (Kelly, 2013, p.141; Kelly, Baek, Lesh, and Bannan-Ritland, 2008, p.7).

Towards this end, there were two layers of assessment which informed the evaluation of the LMP programme, The first focused on the implementation of the design based research as the methodology of the research and how it was implemented in practice during the different phases of the research process by addressing Collins et al.'s work (2004). They posit that evaluation should be undertaken at the following levels: cognitive, interpersonal, group, resource, and institutional, and also by addressing different variables.

At the cognitive level, the evaluation intends to assess students' previous knowledge and how their thought process evolve by analysing students' visual representations and verbal explanations. The interpersonal level addresses student-student and student-teacher interactions through means of observations. Regarding the group level, the intention is to evaluate group dynamics as a whole using observations and field notes.

Another important level, according to Collins et al. (2004), is the resource one. This refers to the resources available during the lessons and how well they fit into the learning process, which in this study were noted through semi-structured interviews and surveys. A further crucial element to consider refers to the institutional level of how the institution's organization and outside community influence the design's implementation process. This is assessed in this study through semi-structured interviews and surveys.

Collins et al. (2004) suggest the importance of assessing the three types of dependent variables in relation to the design of the implementation: climate, learning and systemic variables. Climate variables refer to students' engagement, collaboration and effort which is assessed through means of participatory observation or video analysis. Learning variables refer to students' learning of content, reasoning and dispositions. To evaluate the latter variable requires both qualitative and quantitative assessment designs like observation, and pretest-posttest. Systemic variables refer to adoption and sustainability of the design, and how it is diffused to others in the institution. To assess these variables, semi-structured interviews and surveys were utilised in the study.

On the other hand, it is important, according to Collins et al. to also consider the independent variables of the study which relate to the context in which the research is undertaken including:

- The setting: school and museum
- Nature of the learners: age, socioeconomic status
- Required resources and support (technical and administrative)
- Professional development: teachers' training, practices and workshops
- Financial requirements: equipment and service costs
- Implementation path: initiation, duration, evaluation

4.9.2 Assessment tool for measuring students' literacy performance

Cope and Kalantzis (2005) note in their Learning by Design Model that assessment should not consider the 'right' answer or one correct way to do things, but rather address comparable performance in relation to standards. In other words, the multiliteracies framework of thought argues that there are different ways for different learners to do things and thus different ways to evaluate their performance (New London Group, 1996). This research addressed particularly the evaluation of the knowledge processes by focusing on a schema proposed by Cope and Kalantzis which can be incorporated into planned learning experiences. The teaching rating sheet (TRS) is a scheme which allows teachers to track students' performance in each of the knowledge processes (Appendix 2La):

- Experiencing
- Conceptualising
- Analysing
- Applying

In addition, the scheme enables a follow up of how well a learner transitions from "[t]he competence to think and act with assistance", to "[t]he competence to think and act independently", and "[t]he competence to perform collaboratively". As it appears from the schema, the most difficult and higher order form of competence relates to collaborative thinking, as it involves communication, negotiation and sensitivity apart from solid subject matter knowledge. These, together with Luke and Freebody's (1990) Four Resources Model (Appendix 2Lb) created the Multiliteracies Performance Assessment Zones (MPAZ) (Appendix 2L) which were utilised to evaluate the final version of the LMP (see Chapter Two, Section 2.8.1 p.54 and Chapter Seven, p.257).

Pollard (2002) argues strongly that teachers should involve students in evaluation and assessment by giving them opportunities to review their own learning and determine what they have learned. This is of the most prominent modern

assessment practices in the 21st century. Based on the above conceptualizations of assessment, I proceeded to an ongoing evaluation of the programme. Apart from appraising children's participation in discussion and practical activities, I explained how I would collect their drawings and written work in a portfolio and evaluate it at the end of each session. It was significant to make this clear to students, as they were used to a specific form of assessment (memorization tasks and measured scores) which affected the way they approached the learning process. I evaluated the final product, the virtual museum, based on students' work at each stage of the project. Appendix 4M provides the evaluation rubric used which was available on the WebQuest. Table 4.4 describes the criteria that I used to evaluate students' work on the virtual museum which were informed by the Museum Multiliteracies Practice framework. Finally, following the guidelines by Anstey and Bull (2006) on evaluating institutions that implement multiliteracies pedagogy, I used an auditing tool to assess the implementation of the LMP (Appendix 4N) as well as Bloom's Digital Taxonomy Analysis Tool by Churches (2009) as it was explained in Chapter Two, Section 2.8.1 (p.54) to measure their performance on the topic of 'ecosystems and endangered species'.

Table 4.5: Evaluation criteria for students' work

Is the museum visually appealing?
Do the placards include proper spelling and grammar?
Is the content accurate and thorough?
Did students work well collaboratively?
Did students employ strong organizational skills?
Did students use a variety of print and multimodal sources?
Do they appear to have engaged in high-order thinking?
Have they developed critical thinking skills?
Is there evidence of benefits for cultural and linguistically diverse students?

4.10 Chapter conclusion

The intention in this chapter was to discuss the current advances on museum-school partnerships to gain insights on what could be an effective museum-school partnership, as well as addressing the knowledge base and learning design for the implementation process of the LMP. The review indicates that to establish effective museum-school partnerships requires a demanding process for teachers in specified contexts. For these partnerships to be meaningful, teachers have to adopt new roles, and need to be invested with new understandings about learning, subject knowledge, and pedagogical content. Such a change is a complex process and its implementation demands guiding teachers through an effective museum-school partnership process that is well informed and adapted to the unique features of students' context.

Thus, the LMP for this research was carefully designed, taking into consideration the elements of the MMP and the literature to design the workshop, supporting materials for prior, during and after the visit, a museum educational programme, and evaluation based on student learning outcomes and the effectiveness of the design based research. These components were systematically integrated in the LMP programme to enable students to improve self-awareness, and enhance their knowledge base and literacy practices, while also helping teachers deeply understand and implement the new knowledge and practice in their teaching. The following chapter reports on the prototyping stage of implementation of the new approaches.

Phase II: The Prototyping Stage

Chapter Five - Prototyping and formative evaluation of LMP

> Change in education is easy to propose, hard to implement, and extraordinarily difficult to sustain.
>
> Hargreaves and Fink (2006, p.6)

5.1 Introduction

This chapter presents the prototyping phase of the research, involving the formative evaluation of the iterative cycles undertaken for the museum-school partnership and refinements to improve the programme. The activities discussed are, in this sense, driven by the second research question: *How can a museum-school partnership programme be theoretically and practically designed and implemented to enhance the pedagogical strategies for multiliteracies-based teaching?*

5.2 Prototyping and the formative evaluation of supporting materials

When a prototype of an intervention does not result in the desired outcomes, it can be inferred that the asserted design principles or intervention theory is not yet good enough or has not yet emerged (Plomp, 2013, p.33). To deal with the latter, there is a need to redesign or refine the intervention, which goes hand in hand with the refinement of the intervention theory or design theory: in this case, the museum multiliteracies-based approach and the LbD Model.

5.2.1 Prototyping of supporting materials

Nieveen (1999) describes a prototype as a preliminary version of an intervention before the final product is fully developed and implemented. With regards to the formative evaluation of the museum-school partnership, an "evolutionary" prototyping approach, as

defined by Nieveen and Folmer (2013, p.157), was followed. The authors posit that the development of an innovative learning and teaching situation, such as the case in this research, requires the use of this approach (Nieveen and Folmer, 2013, p.157). During this process, the prototype is continuously refined until it reaches the final deliverable. That said, the research design has to change from one cycle to the other, yet not forever. McKenney et al. (2006, p.84) refer to this through addressing the notion of evolutionary planning, i.e. "a planning framework that is responsive to field data and experiences at acceptable moments during the course of the study".

In this sense, the formative evaluation was critical in each iteration, as it provided a conceptual understanding of the potential of the intervention and its characteristics. The observed outcomes informed the improvements and refinements of the prototype in a way that it maximized its feasibility and clarified the underlying tentative design principles. As far as the supporting materials, three prototypes were developed and tested with a higher degree of iteration (Figure 5.1).
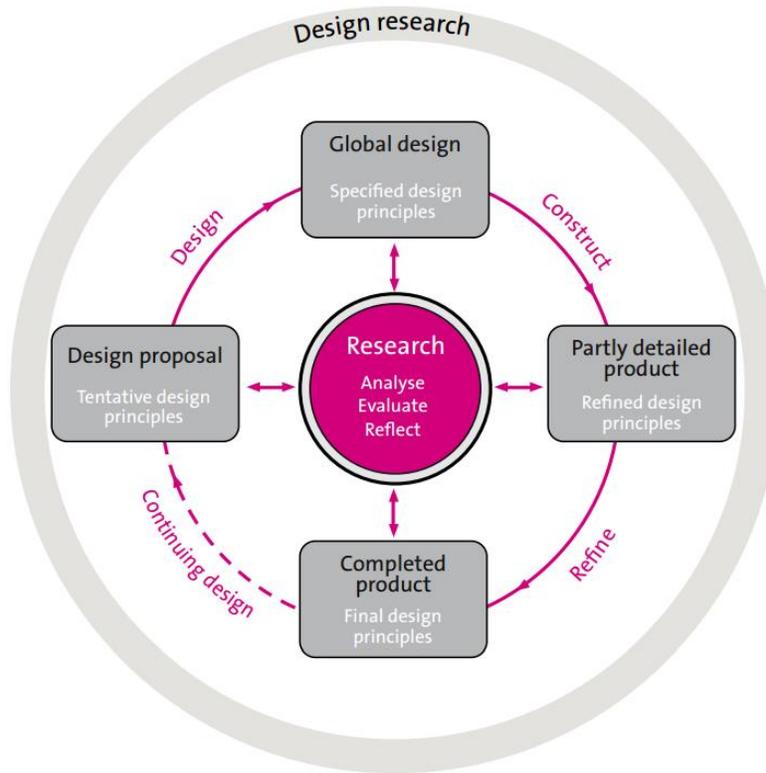
Figure 5.1 Development of prototyping phase in the educational design research study, (Nieveen and Folmer, 2013, p.159)

5.2.2 Rationale of evaluation

The Joint Committee on Standards for Educational Evaluation (1994) and Trochim (2006) define "evaluation as the systematic assessment of the worth or merit of some object." The essence of evaluations are to collect data and analyse them to contribute to knowledge (Russ-Eft and Prekill, 2009); evaluation, together with research and policy analysis, can then lead to disciplined inquiry (Guba and Lincoln, 2001). Regarding museum evaluations, Bitgood (1994, p.8) suggested that museum evaluation "should meet at least three criteria: (1) it should order our knowledge, (2) it should promote clear thought, and (3) it should be parsimonious". These criteria were taken into consideration during the entire life of the LMP programme.

A formative evaluation is prominent in the context of educational design research (Van der Akker, 2013, p.65). Nieveen and Folmer (2013, p.158) define formative evaluation as a systematically performed activity (including research design, data collection, data analysis, reporting) aiming at the quality improvement of a prototypical intervention and its accompanying design principles. (Nieveen and Folmer, 2013, p.158). This approach to evaluation was preferred as opposed to summative evaluation which is conducted after the development and implementation (Guba and Lincoln, 2001) and inclines towards "proof". Formative evaluation, on the other hand inclines towards "improvement" by addressing the shortcomings of an object during its developmental process. For instance, in this research the intention was to examine if the programme had been implemented as designed and proceed to refine it accordingly while it is implemented (Nieveen and Folmer, 2013). Some of the overarching questions addressed during this stage of the process evaluation are found in Table 5.1.

Table 5.1: Formative Evaluation guidelines (Savva, 2016a)

Example of Formative Evaluation Questions
Is the programme being implemented as it was designed?
Do the students and teachers understand the programme's concepts?
What are the misconceptions about the programme?
Is the programme being implemented on schedule?
Is there sufficient time to implement all aspects of the programme?
What aspects of the programme seem to be working less than expected?
Is there a need for extra training to implement the programme?
Are any negative outcomes surfacing from the programme?

Tessmer (1993, p.11) suggests that formative evaluation is a "judgment of the strengths and weaknesses of instruction in its developing stages, for purposes of revising the instruction to improve its effectiveness and appeal". He proposed that to undertake the latter approach involves various layers in a design research project, starting from something more informal in the early stages of a project and moving on to small group evaluation, to a full field test where possible (Figure 5.2). These layers informed the

evaluation design for each cycle of the research, with expert review, focus groups, self-evaluation and small group or micro-evaluation (Plomp, 2013, p.36). These aimed to improve the quality of the materials.
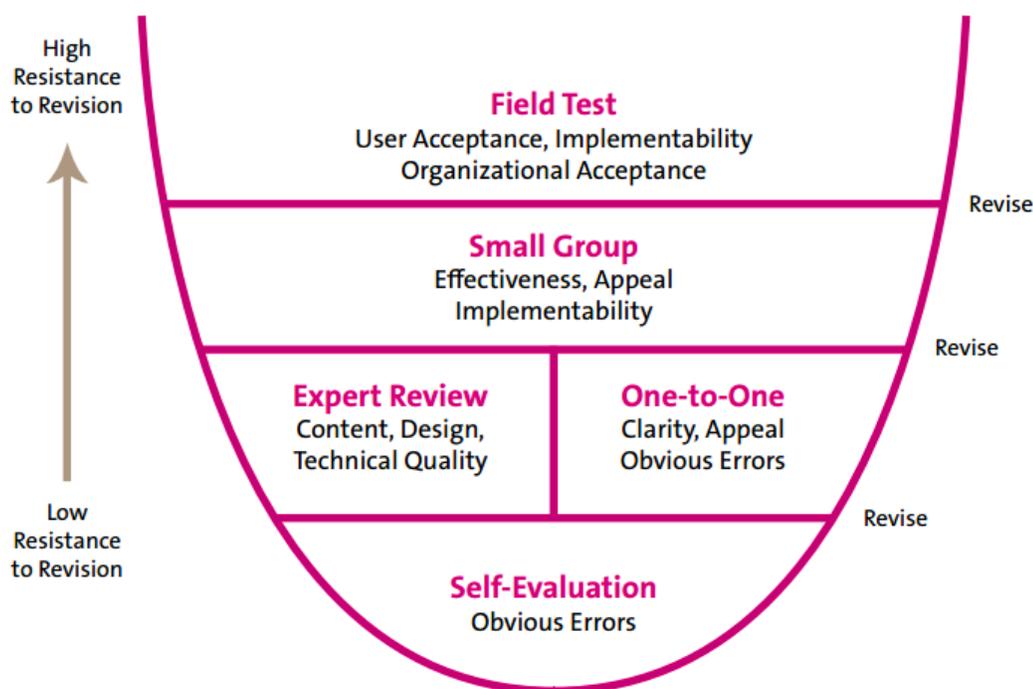
Figure 5.2 Layers of formative evaluation (Adapted from Tessmer, 1993, p.11)

The emphasis of the formative evaluation was to identify what kind of supporting materials could adequately support a museum multiliteracies-based approach during the partnership. The different stages involved are displayed in Figure 5.3. The final summative evaluation was performed when the intervention was developed to such an extent that it was considered to have sufficient potential effectiveness (Nieveen and Folmer, 2013).
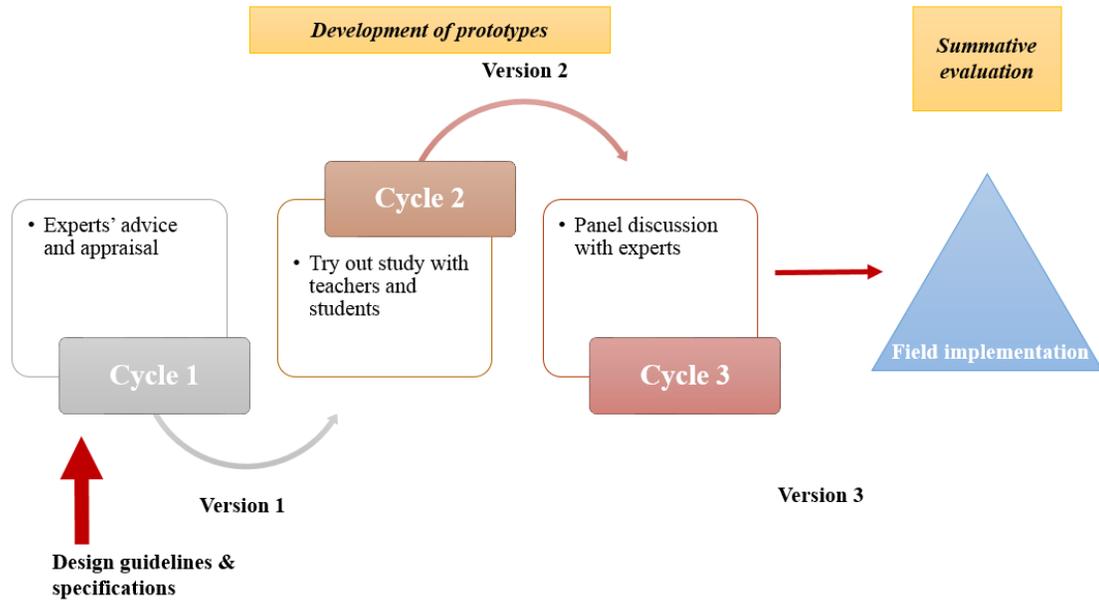
Figure 5.3 Iterative cycles of the LMP during the prototyping phase (Savva, 2016a; Adapted from Mafumiko, 2006)

Each prototype or cycle entailed particular developmental multiliteracies-based activities, together with the anticipated outcomes which are illustrated in Table 5.2. The intention was to develop and improve both end results of design research efforts: the educational intervention under development; and its accompanying design principles (Nieveen and Folmer, 2013, p.156).

Table 5.2 Description of stages in the prototyping phase

Prototype levels	Activities	Participants	Outcomes
Version 1	Identification of problem and determining design requirements based on context analysis and literature studied	The researcher/designer 2 Supervisors	Improved validity of the supporting materials
Version 2	Review of the first draft and conduct of formative evaluation.	- 7 students from Y. Primary School, Limassol district - 2 experts in Cyprus (museum educator and school teacher)	Improved validity and the initial practicality of supporting materials for use in Cypriot primary school classrooms
Version 3	Review of the second draft and conduct of formative evaluation.	2 schoolteachers 12 students in two classes from E.A primary school, Limassol district	Improved practicality of the curriculum materials
Final	-Review of the third draft and conduct of formative evaluation -Use of supporting material to the pilot workshop	2 teachers and the researcher - 17 students from two classes, A.P Primary School, Limassol district	Improved validity, practicality, and determining the initial effectiveness of the supporting materials

A useful typology used for assessing the end results of the research during this prototyping phase related to clarifying the notion of quality of curriculum materials (Nieveen, 1999). A specific framework of the quality aspects of materials was employed to determine the quality of the materials under development. This is addressed in the following section and represented in Table 5.3.

5.2.3 Quality criteria for the intervention

Educational design based research is a means to design a high quality solution for a complex problem in educational practice (Plomp, 2013, p.29). With regards to this research, while the intention was not *per se* to test a new curriculum, developing

supporting materials for the museum-school partnership entailed exploration of the potential of curricular development and was helpful to my project (Van der Akker, 2013). This approach combines three related goals (Van der Akker, 2013, p.54):

- Optimization of interventions/products such as curriculum frameworks and educative materials
- Design principles contributing to knowledge
- Professional development of all involved

In this sense, the design of each prototype demonstrated in Figure 5.3 aimed to improve the quality of all elements of the partnership as they were developed through addressing the criteria proposed by Nieveen (1999; 2013): relevancy, validity, practicality and effectiveness, which are applicable to a wide array of educational interventions (Table 5.3). At the end of a design research study, the intervention should suffice for all of these criteria. They are linked to one another in a hierarchical way. Van der Akker (1999) and Nieveen (1999) contend that the primary characteristic of high quality materials is validity, which refers to the intended vision and intentions underlying the curriculum materials that are worth noting. To achieve validity, there should be internal consistency between the curriculum materials and state of the art knowledge, namely content validity, and the different components, namely construct validity.

When it comes to practicality, which is the second characteristic of curriculum material, there is a need for consistency between the intended and the perceived curriculum, and the intended and the operational curriculum. Practicality is reached when the users (in this case the teachers and students), consider the materials of certain appeal and feasible to work with in their daily routines, while in compliance with the developers' intentions. When the materials exhibit consistency between the intended and experiential curricula, and the intended and learned curricula, the third characteristic of curriculum material - effectiveness - has been achieved. The latter is evident when the experiences with materials result in the desired improvements, such as students appreciating the programme and benefit in terms of their learning. Using a prototyping approach to achieve

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the aforementioned quality aspects can be ongoing until the anticipated product is obtained. During the course of the development of the curriculum materials and the LMP programme, all of the above characteristics were evaluated before being implemented in the fieldwork.

In addition, Nieveen and Folmer (2013, p.160) argue how it is important to distinguish between expected and actual practicality and effectiveness. Plomp (2013, p.28) explains how practicality relates to the extent to which the prototype is measured when the target audiences use the intervention. Plomp further explains that actual effectiveness is understood when the target users apply the intervention in the target setting. Any other data from expert appraisals or group discussions, according to Plomp (2013, p.29), are deemed as relevant to expected practicality and/or expected effectiveness.

Table 5.3 Quality criteria of high quality interventions (Source: Plomp, 2013, p.29)

Criterion	
Relevance (also referred to as content validity)	There is a need for the intervention and its design is based on state-of-the-art (scientific) knowledge.
Consistency (also referred to as construct validity)	The intervention is 'logically' designed.
Practicality	**Expected** The intervention is expected to be usable in the settings for which it has been designed and developed. **Actual** The intervention is usable in the settings for which it has been designed and developed.
Effectiveness	**Expected** Using the intervention is expected to result in desired outcomes. **Actual** Using the intervention results in desired outcomes.

Within this research, following the guidelines by Van der Akker (1999), Nieveen (1999), and Nieveen and Folmer (2013), there was a shift in emphasis on the quality criteria in each of the three phases of the design based research: an overview of which is provided in Table 5.4. The prototyping phase which is addressed in this chapter was

characterized by an emphasis on consistency and practicality, gradually giving way to practicality and effectiveness.

Table 5.4 Evaluation criteria related to phases in the design research (Source: Plomp, 2013, p.30)

Phase	Criteria	Short description of activities
Preliminary research	Emphasis mainly on *content validity*, not much on *consistency* and *practicality*	Review of the literature and of (past and/or present) projects addressing questions similar to the ones in this study. This results in (guidelines for) a framework and first blueprint for the intervention.
Development or Prototyping phase	Initially: *consistency (construct validity)* and practicality. Later on, mainly practicality and gradually attention for effectiveness.	Development of a sequence of prototypes that will be tried out and revised on the basis of formative evaluations. Early prototypes can be just paper-based for which the formative evaluation takes place via expert judgments resulting in expected practicality (see for an example, Table 4).
Assessment phase	*practicality* and *effectiveness*	Evaluate whether target users can work with intervention (actual practicality) and are willing to apply it in their teaching (relevance & sustainability). Also whether the intervention is effective.

A number of data collection methods, including interviews, semi-structured questionnaires, a supporting materials observation checklist, and field notes, were employed to inform the formative evaluation for this research based on the criteria discussed. The wealth of data drawn were summarized in accordance to the quality aspects of curriculum materials, including validity, practicality and effectiveness by constant improvements. The findings, therefore, were used to refine both the theoretical framework and instructional practices used, identify initial problems and challenges of implementation of the museum multiliteracies-based approach and Learning by Design model, as well as to brainstorm ideas that would guide improvements and adjustments required that informed successive prototypes.

5.3 Addressing the validity of the supporting materials

To sustain insights of the validity of the supporting materials for the LMP which was key in the prototyping phase of the research, experts' and users' appraisal activities were carried out. For the purposes of this study, as discussed in the previous section, the term "validity" denotes how the supporting curriculum materials contain state of the art knowledge that is relevant to student learning and includes components that ensure internal consistency - for instance, subject content, pedagogy, and assessment - in a way that is integrated and logically incorporated into the lessons.

5.3.1 Experts' appraisal

Following my own preliminary evaluation of the prototype, I sought external evaluators' advice on the prototype in order to ensure scientific rigor (Nieveen and Folmer, 2013, p.164). Therefore, the first version of the supporting curriculum materials developed was appraised by two experts (a school teacher and a museum educator) following some guiding questions (Appendix 5A). The knowledge sustained from the experts' input was meaningful to define a clear path for the design of the materials content-wise, as well as to adjust the structure and presentation. More specifically, findings of experts' appraisal indicated the need to:

i) Dedicate more time to existing knowledge during the situated practice stage, as well as *experiencing the new* as it is suggested by the Learning by Design Model (Chapter Three, Section 3.9, p.100). This was an appropriate pursuit that suited the Cypriot context, where the context analysis indicated students were lacking in multiliteracies experiences: these composed important part of the multimodal activities designed. In particular, students' answers to the "Diary Notes" tool, demonstrated that students do not engage in multiliteracies experiences despite curriculum imperatives to implement such teaching. In this sense, these CLD students' repertoire of literacy practices was limited from school while at times this was also the case for their lifeworld experiences.

ii) Re-organize the supporting materials in order to be in compliance with teachers' professional knowledge. Despite in-service training on multiliteracies pedagogy and particular emphasis on critical literacy, experts were doubtful of the suggested plan of action first presented to them, since they considered it extremely difficult to be incorporated in their routine and felt uncomfortable adapting to this sort of lesson plan. They seemed to be lacking in knowledge on how to utilize such an approach in their teaching. It was therefore evident that the supporting materials should consist of content knowledge, including examples of activities to support teachers' museum multiliteracies-based practice in the context of their classrooms.

iii) Consider evaluation and reflective practice as an incremental part of the teaching and learning process from the very beginning of implementation and not merely something to be employed at the end of a lesson.

The above refinements were undertaken during the course of two weeks before the second appraisal given by users.

5.3.2 Users' appraisal

The second stage of prototyping involved users' appraisal, with 7 primary students and 2 teachers (a schoolteacher and a museum educator) in Cyprus taking part. The findings derived from the evaluation questionnaire (Appendix 5B) indicated that:

i) More digitally mediated activities were needed in order to attract students' attention and motivate them during the overt instruction component where conceptualising by naming and with theory was pursued;

ii) It was essential to establish a form of reflective practice, such as by using rubrics in the WebQuest, for students to learn from each other and also allow them to keep track of their progress both individually as well as in terms of group work;

iii) It was necessary to restructure the format of activities of the WebQuest to better reflect the components of the LbD Model and allow for flexibility to use the WebQuest without much assistance needed from a teacher;

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iv) Additional materials to support the facilitators (teachers and museum educators), particularly in relation to the technical challenges for developing the virtual museum: for instance, the workshop lesson plans;

v) Remove part of the activities for the transformed stage, to simplify it in terms of content so that more in-depth work would be undertaken without concern for time limitations.

Nevertheless, findings from conversations with these educators suggested that both teachers would implement the museum multiliteracies-based approach and the Learning by Design model in their teaching:

i) The teachers seemed motivated to introduce the museum multiliteracies-based approach and felt that it was motivational and meaningful for their students;

ii) The teachers were confident that this approach would allow them to gain more insights on their students' prior experiences, which would be particularly beneficial for the CLD students in the classroom;

iii) The approach allowed students opportunities to self-direct their learning and reflect on their practice, empowering their overall commitment and critical thinking.

In addition, the two teachers mentioned they could use the new approaches. However, they did not feel able to do so at all times, and preferred to us them for short topics in the form of projects, since they did not feel they shared the competencies needed to plan and execute lesson activities based on the framework. Furthermore, they were reluctant to use the museum multiliteracies-based approach and LbD model as they were doubtful of its practicality in terms of the excessive preparation time and pressure of the curriculum that would not allow such teaching in a systematic way. Moreover, they felt that perhaps this approach works for small groups of students rather than classes with more than 20 students, which is often the case in Cypriot schools.

Overall, the teachers perceived that the biggest challenges for adopting this approach would relate to:

i) Lack of time to sufficiently prepare the lesson on a daily basis;

ii) Inadequate knowledge and skill to plan appropriate materials and implement them in the classroom;

iii) Lack of resources, such as computer equipment, for teaching and learning.

5.3.3 Revision decisions following users' appraisal

The aforementioned experts' and users' appraisals were instrumental in improving the validity of curriculum materials through the suggestions and recommendations made. Most of the suggestions were incorporated into the third prototype and tested during the final implementation. Of biggest concern with regard to the final intervention was the teachers' and students' unfamiliarity with the approach, which was considered to be resolved through the workshop of the first two weeks of fieldwork.

5.4 The practicality of implementation of the supporting materials

The intention in the final intervention was to extract meaningful insights into teachers' and students' experiences, and the initial challenges and issues arising concerning the practicality of implementing the supporting materials. The latter were implemented with the assistance of two schoolteachers who were previously provided with brief training on the museum multiliteracies-based approach. The profile of the two teachers is shown in Table 5.5.

The findings that informed final implementation were separated into three distinct categories:

- Implementation of the pilot lessons.
- The perceptions and experiences of participants with the new approaches.
- Students' experiences from the teaching approach adopted.

Table 5.5: The profile of teachers who participated in the try-out of the lessons

	Teacher A	Teacher B
Gender	F	M
Education	Master in Educational Leadership	Bachelor of Education
Teaching experience	5 years	12 years
Class size	17	21
Teaching sessions per week	29	26

5.4.1 Implementation of the pilot museum multiliteracies-based lessons

One of the key characteristics of the implementation of the programme, according to the experts, was to ensure that peer collaboration would take place throughout the duration of the museum-school partnership. A significant concern was regarded how an effective support system could be established so that teachers and museum educators would not resort to their old teaching practices and would continue working with the new approaches, even when the research fieldwork was completed. Therefore, and since my aim was to ensure a more sustainable pedagogical change, I considered ways to ensure that these educators would not only proceed with the intervention but also extend this practice after I left the respective schools.

During the fieldwork of the pilot study, a curriculum profile classroom observation checklist (Appendix 2B) was used to record teachers' and students' interactions. Ottevanger (2001) argues that a curriculum profile is appropriate, as it reflects the key

parts of a curriculum innovation, and indicates what elements were the ones expected to happen as designed by the researcher. The profile created for this thesis was informed by the literature review. The intention was to focus on the implementation of the four components of multiliteracies pedagogy through addressing the knowledge processes described in the Learning by Design Model (Table 5.6).

Table 5.6: Matching the elements of multiliteracies pedagogy with the Learning by Design Model (Adapted from Kalantzis and Cope, 2005, p.84)

Multiliteracies Model		Learning by Design	
Situated Practice	The immersion in experience and the utilisation of available Designs of meaning.	Experiencing	• *the known* – learners reflect on their own familiar experiences, interests and perspectives. • *the new* – learners observe or take part in something that is unfamiliar; they are immersed in new situations or contents.
Over Instruction	The systematic, analytic and conscious understanding of Designs of meaning and Design processes.	Conceptualising	• *by naming* – learners group things into categories, apply classifying terms, and define these terms. • *with theory* – learners make generalisations using concepts, and connect terms in concept maps or theories.
Critical Framing	Interpreting the social and cultural contexts, where students critically view their study topic in relation to its context.	Analysing	• *functionally* – learners analyse logical connections, cause and effect, structure and function. • *critically* – learners evaluate their own and other people's perspectives, interests and motives.
Transformed Practice	The transfer in meaning-making practice, which puts the transformed meaning to work in other contexts or cultural sites.	Applying	• *appropriately* – learners apply new learning to real world situations and test their validity. • *creatively* – learners make an intervention in the world which is innovative and creative, or transfer their learning to a different context.

The framework of instructional practice in Table 5.6 was used to structure a learning environment that facilitated CLD students' literacy engagement in a critically reflective and inclusive manner. Depending on whether an activity was completed fully, partially, or not executed at all, a 'Yes', 'Partly', and 'N/A' statement was used as a scoring mark respectively, with a top down score of 2 for 'Yes', 1 for 'Partly', and 0 for

'N/A'. Each lesson received individual scores which were then added up and expressed in a percentage form to demonstrate each stage or component of the implementation. Based on the four components of the checklist, each one was analysed and presented separately (for example, Appendix 5C).

Together with Teacher A we conducted three sessions, and Teacher B and I undertook another three sessions. Each session lasted 80 minutes. I kept file notes for each classroom instructional behaviour and the physical environment, features which could not have been registered in the profile classroom observation checklist. The scores for the two teachers, facilitated by my help in each session, are presented in percentages in Table 5.7.

Table 5.7: The pilot stage teachers' classroom profile practice scores (i.e. 100% = all items for each stage were met in full)

Session stages	Teacher A scoring in %	Teacher B scoring in %
Situated practice	83	72
Overt Instruction	85	83
Critical framing	42	47
Transformed practice	53	68
Average scores	66	67

Findings from Table 5.7 suggest that the average profile practice scores for the two teachers involved in the fieldwork were satisfactory. The lowest percentages were notably found in the critical framing stage. It appeared that the teachers had difficulty implementing the proposed activities on their own, although there was sufficient material provided. When discussing the latter during the post implementation interviews (Appendix 2Hb), it was evident from their answers that these teachers had not been systematically exposed to methods and techniques for critical literacy in order to be able to implement similar lesson activities. They specifically mentioned how it was difficult to cultivate their

students' higher order thinking and critical skills. The following paragraphs present the descriptive analysis of each stage of implementation.

The *situated practice* stage involved activities that related to previous lessons as well as the new ones, drawing on the knowledge processes of experiencing the known and the new as proposed by Kalantzis and Cope (2005). Some of the questions posed using a PowerPoint presentation with two child characters managed to provoke students' curiosity and prior knowledge to an extent, for instance in regards to their museum experiences and knowledge (Images 5.1-5.2).
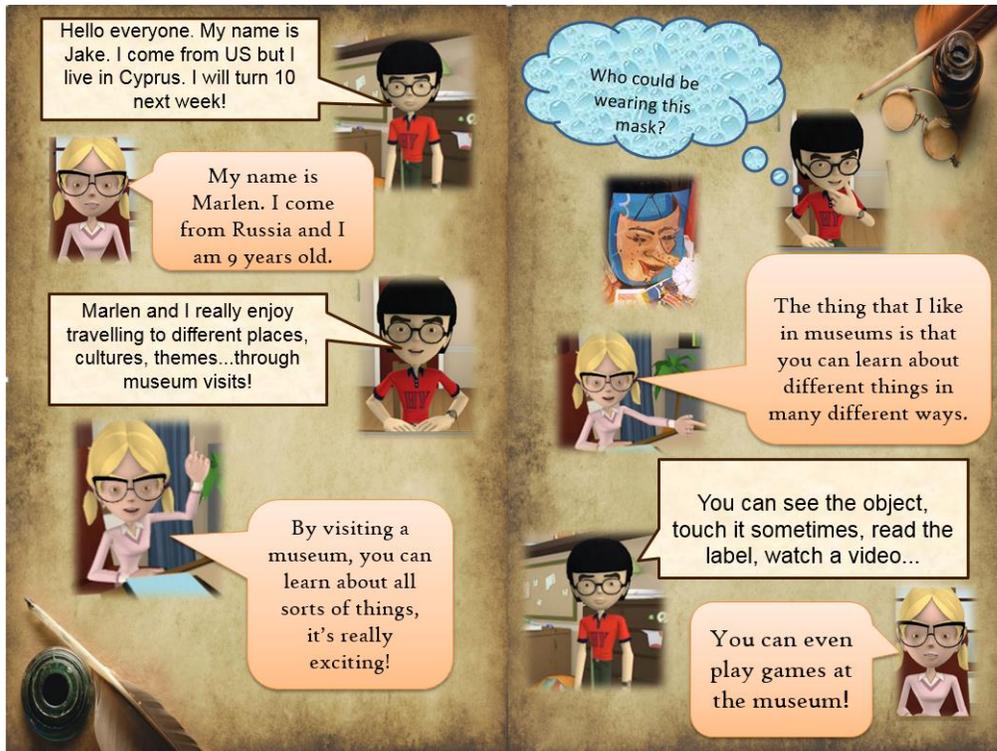
Image 5.1 Powerpoint presentation extract from a museum book created for the students
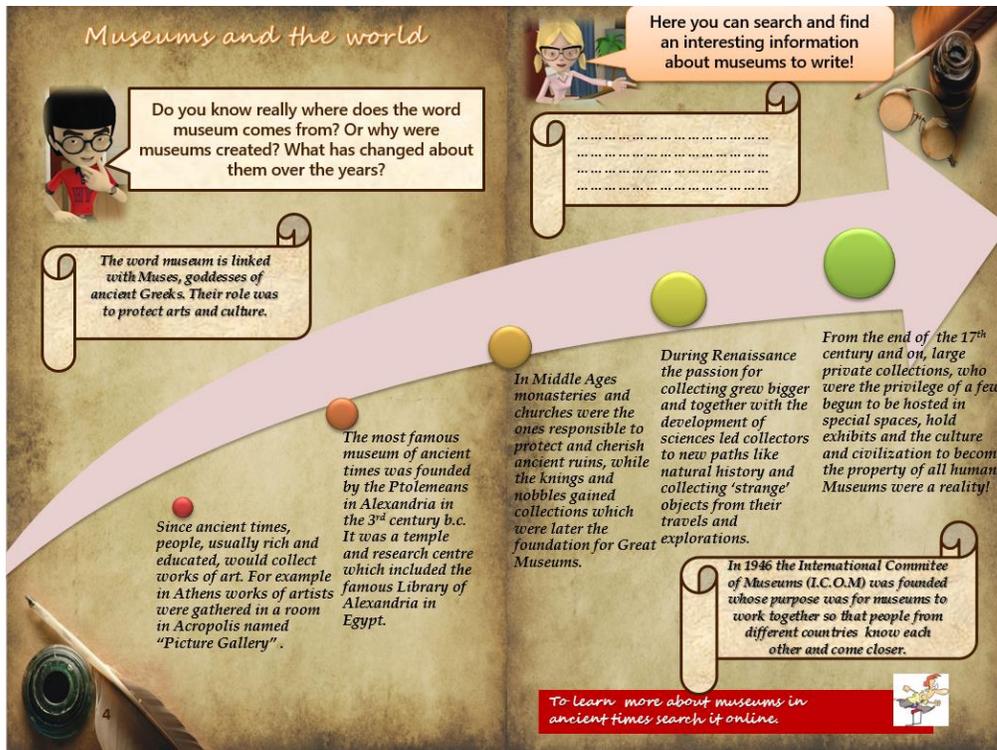
Image 5.2 Powerpoint presentation extract from a museum book created for the students

Students, on the other hand, were not familiar with some of the terms used for museum exhibitions, and the presentation helped them get to know these, to be prepared for the next steps of the pilot LMP (Images 5.3-5.4). Delivering these lessons with the two teachers was significant to assess the best way of implementing the sessions and how each teacher would facilitate practice together with the researcher. Insights from the reflective interviews (Appendix 2Hb), conducted at this stage with the two teachers, provided evidence that they were familiar with the instructional activities during this stage. This justifies how the teachers had high profile scores in the situated practice component (i.e. teacher A=84% and teacher B=71% respectively).

Image 5.3 Collections, collectors and museums

Image 5.4 Museum professions (illustrations are of the researcher's)

Students were exposed to the *overt instruction* component by having them work in groups of 3-4 students of mixed gender and ability. The activities introduced involved primarily grouping animals into categories, classifying items and defining terms through use of flow charts and Venn-diagrams. Other than this sort of conceptualization, students were encouraged to make generalizations for certain categories and concepts using a consequence-effect wheel, a tool that is useful for analysing concepts critically to examine environmental and societal impacts (with teacher A). Another tool used with the younger group was a fishbone (Images 5.5-5.7), a type of concept map that resembles a fish skeleton and can demonstrate how different causes can lead to an effect (with teacher B). Findings in Table 5.7 show that teacher A scored 85% and teacher B scored 83%, both positive indicators of teachers' instructional practices regarding this component. However, in terms of the time spent for the activities during this stage, it was found that students were struggling to keep up and complete all the activities: therefore, the activities required a rescheduling of the amount of time spent to complete each activity. It was obvious that their performance would improve if the number of activities was reduced to allow for more time for students to interact with the materials.
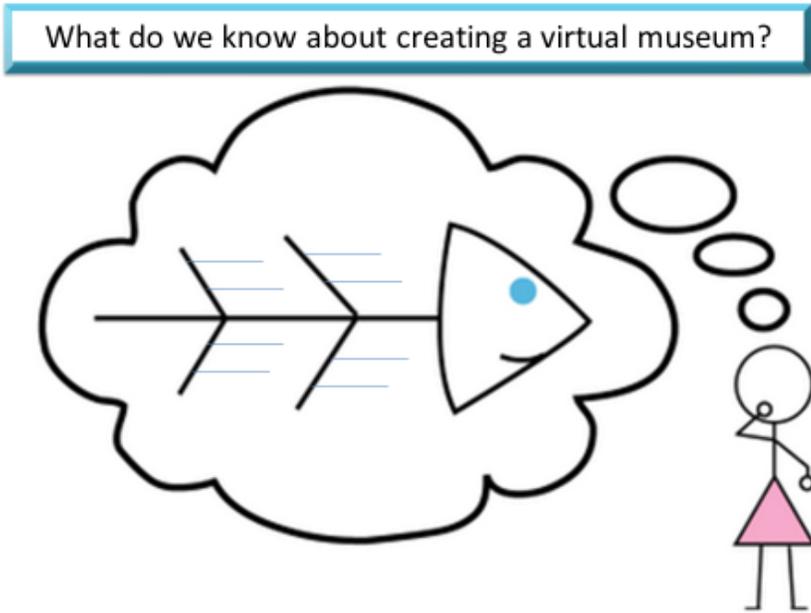
Image 5.5 Fishbone for Knowledge Journey
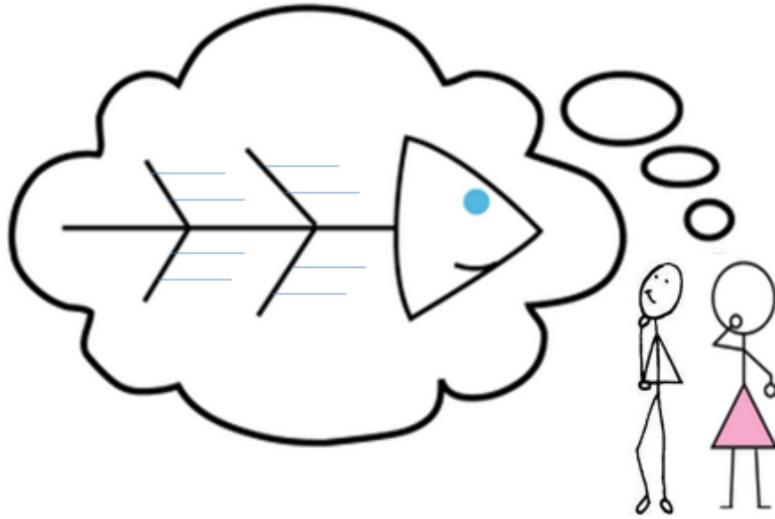
Image 5.6 Fishbone for Knowledge Journey
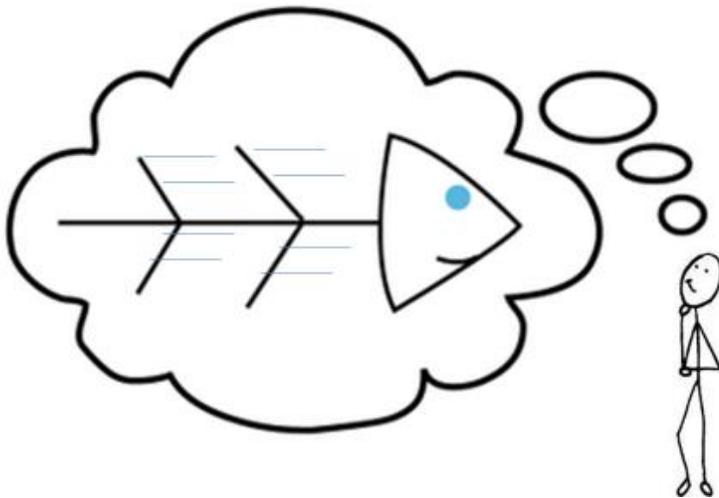
Image 5.7 Fishbone for Knowledge Journey

As Table 5.7 suggests, the biggest difficulty was in implementing the innovative approaches during the *critical framing* and *transformed practice* stages of the first iterative cycle. In particular both teachers scored low in the practice profile during the critical framing stage (i.e. teacher A=42% and teacher B=47% respectively). This stage involved

creating storyboards for the construction of the wings for the virtual museum using an online storyboard creator (Image 5.8). Storyboards were chosen as they are entertaining means of bringing together many aspects of story, character, problems, and solutions, to make complex ideas much clearer. Storyboards are easy to draw even at a basic level, since everyone understands the sequential nature of telling a story through pictures. The digital storyboard tool utilised[24] enhanced students' digital and critical literacy skills. Students working in groups taking inspiration from existing storyboards, were prompted to sketch their own storyboards, focusing on elements which first had been discussed in the classroom using triggers like what led to the formation of the story in the first place and what the final outcome is intended to be. The topic of the storyboard was to design a better museum visit experience for teachers and students.
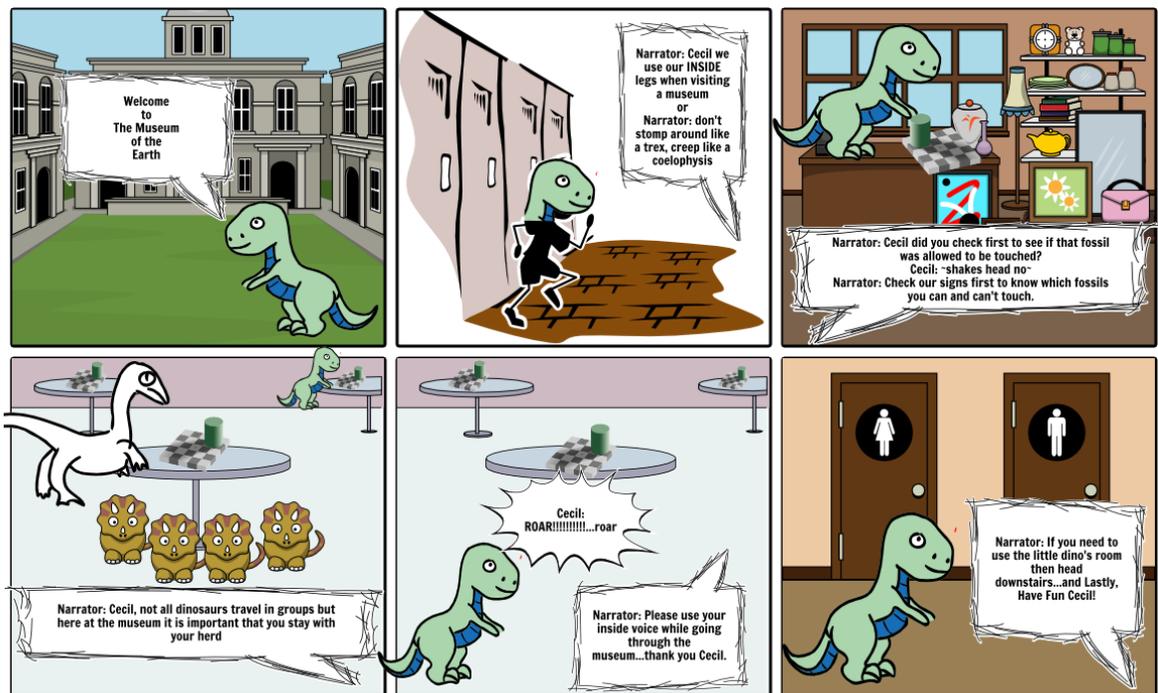
Image 5.8 StoryboardThat (StoryboardThat template, 2016)

The second element of the knowledge process following the LbD Model involved *analysing critically*. Concept maps were employed to scaffold students' reflective practice

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[24] http://www.storyboardthat.com/

and evaluate museum staff's motivations and perspectives behind the use, or not, of certain objects for the exhibits. This work was inspired by other concept maps (Images 5.9-5.10). Both the teachers, despite my help, appeared to lack the skills to sufficiently stimulate students' explanations of the concepts discussed during this process. Therefore, it was not possible to facilitate the museum concepts lesson to the desired level, since the students demonstrated weak conceptual understandings following the activities. Generally, teachers did not seem confident enough to probe the students' ideas, whereas students were not familiar with strategies of analysis to facilitate higher order skills and critical thinking. To alleviate this problem, the teachers and I drew on the other aspects of the intervention, such as the use of scaffolding and prompts with multimodal texts, which resulted in improved performance.
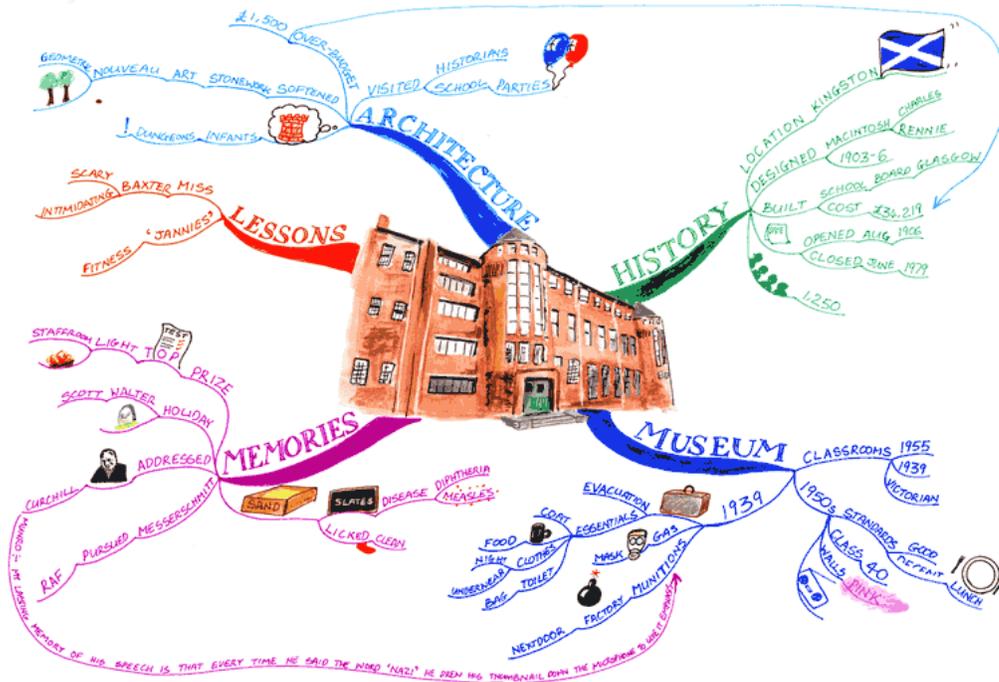
Image 5.9 Examples of concept maps used
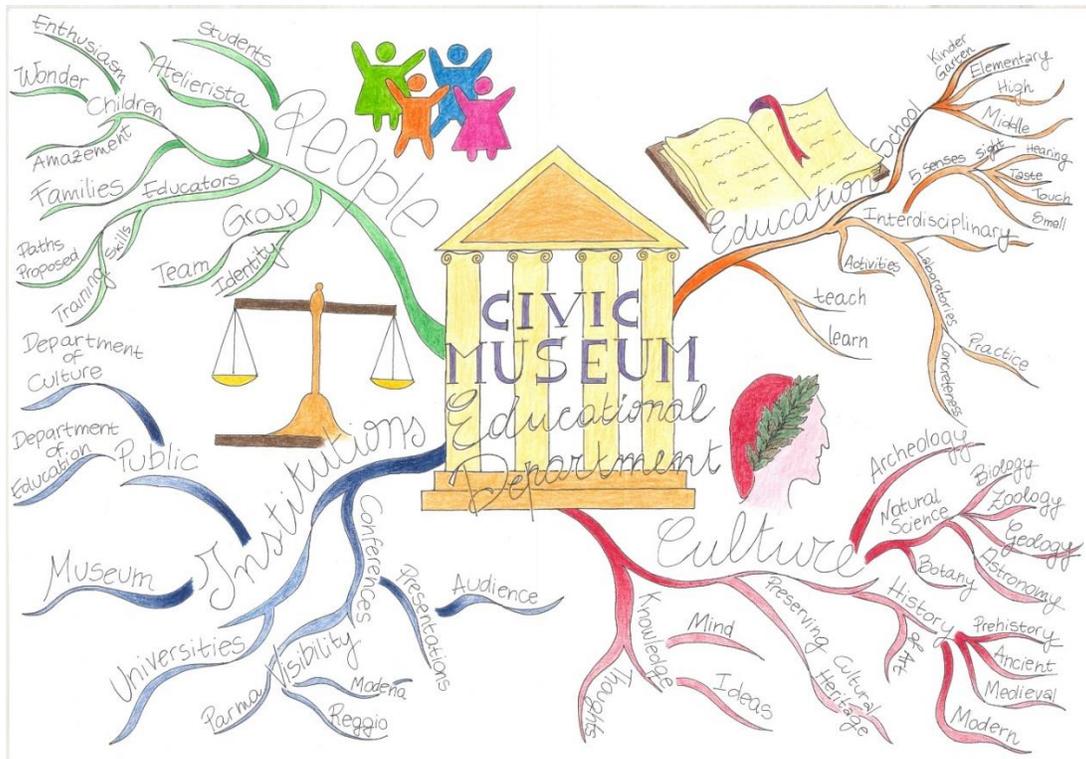
Image 5.10 Examples of concept maps used

The final stage of the LbD Model involved *transformed practice*. According to Table 5.7, as is indicated by teacher A's practice score of 53%, it was not as easy to implement the elements of this final component, whereas, for teacher B, scoring a 68% meant that it was much better implemented. Part of the multiliteracies applications of this stage involved to *apply appropriately* in a conventional or 'correct way' to solve a problem (Kalantzis and Cope, 2005, p.119). For the pilot LMP, this process entailed the productive activity of delivering a presentation. Once the students had drawn their storyboards, teachers asked individuals from the different groups to present their storyboard to the rest of the classroom.

Students were also asked to fill in a rubric and discuss their experience overall, and critique the ideas put forward. They were inclined to use the conventions of this genre (storyboard) and notice the use of colour, and how simple figures and drawings can convey a lot of ideas while making choices about its visual features to enhance the images (Kalantzis and Cope, 2005, p.280). The intention of both teachers was for students to apply

their learning in new contexts. Findings from teacher B's reflective interview suggested that he was able to extend the learning during the transformed practice by *applying creatively* with my assistance. Students created a multimodal text of their story using mixed modes of meaning (linguistic, visual, gestural, audio and spatial), in an original or hybrid way. Teacher A, on the other hand, failed to engage in *applying creatively* and was restrained to *applying appropriately* with her students. In particular, she maintained a rather traditional presentation format and the session was lacking opportunities for students to creatively transfer their learning into other contexts.

Significantly, both teachers were unable to provide students with enough time to critically reflect on their learning and use the rubric on the pilot WebQuest page developed. Therefore the evaluation stage was not completed successfully and this was attributed to the lack of lesson time.

5.5 Teachers' perceptions and experiences with the museum multiliteracies-based approaches

Based on teachers' reflective interviews following the pilot implementation (Appendix 2Hb), they seemed to appreciate the new approaches integrated with the supporting materials and thought they could support their teaching and concurrently enhance students' learning. Characteristically, Elena, Teacher A from the Fifth Grade, stated:

> The museum multiliteracies-based approach allowed me to re-engage with my students and build my lesson instruction on what students know, and better support them with the use of the supporting materials provided. Even those students who I usually lose sight of during the lesson, I was able to reach and help them acquire a meaningful understanding of the lesson during group discussions.

Explaining how the new approaches were supportive in making students actively engage in the sessions compared to the traditional lessons, Dimitris, Teacher B from the Sixth Grade, stated:

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I could see how my students were participating differently in the lessons, my impression is that they noticed the shift in my approach to teaching, and like you mentioned they seemed engaged throughout the sessions and intrigued to be doing practical work at the computer for the museum and discussing in small groups.

Nevertheless, both teachers mentioned they faced challenges in working with the new approaches, in particular during the third and fourth stage of implementation (i.e. critical framing and transformative practice). They also perceived it to be difficult to have to constantly prepare this sort of material for their students, if it was to be adopted on a more frequent basis. Findings from the pre-intervention interviews and observation of the lessons revealed that students were unfamiliar with the new approaches and this was confirmed by the researcher's field notes, with distinct parts demonstrating how the sessions taught for the LMP differed from the typical everyday school practice. In this sense, more time and support was needed for teachers and students to collaboratively engage in the approaches implemented.

5.6 Students' experiences with the museum multiliteracies-based approaches

The analysis of the student evaluation questionnaire (Appendix 2E) revealed that all students (n=12) enjoyed the new approaches implemented by myself as a teacher-researcher and their respective classroom teachers. Some of the insights into their experiences drawn from the focus group interviews are indicative of the latter:

I think today's session was the best, I enjoyed using the resources provided and how our teacher explained everything regarding the diagrams in order to make us understand the lesson. (S4, from Grade Five).

I felt that during the past few lessons on the museum, everything was more interesting and I would like it to continue, like never stop and be part of our regular lessons like gym and math (S3, from Grade Six).

Another student seemed to enjoy working in the group for developing the wings of the virtual museum and said:

I thought working in a group for developing the museum was better as it helped me since I could learn from my classmates and we could find solutions to problems together rather than trying to work on my own on difficult topics (S4, from Grade Six).

Students were also able to distinguish the differences between the trial sessions and their usual school routine by saying that:

We were able to create concept maps and cool online storyboards for the first time. These will be useful to remember key points and organize our thinking for the virtual museum exhibition (S1, from Grade Six).

In regards to how the students perceived how the teachers and I taught the pilot sessions, another student pointed out:

I noticed how the teachers talked less unlike the usual lessons, when he dedicates much time on explaining theory. Instead, she was still helping us yet allowed to do more practical work, experiment on our own and we were able to sketch, observe and work in groups to present our findings (S4, from Grade Five).

The majority of students (84%) suggested that their teachers should adopt the new approaches. A typical statement of one of the students is:

I feel that it would be great if our teacher adopted this way of teaching for all of our lessons. It is more fun and easier to understand the point he wants to make when he uses different stuff like videos, images and definitely more of the computer (S5, from Grade Six).

5.7 Revision decisions following pilot of the museum multiliteracies-based lessons

Following the pilot of supporting materials, the major revisions undertaken included:

i) To add an additional 10 minutes to the conceptualising with naming during session three, i.e. 35 minutes instead of the 25 previously arranged, so that students could accomplish the intended activities; and

ii) To re-organize the session activities for session six, in a way that analysing functionally would allow us to differentiate and create a storyboard for classification systems and explanations provided in a more meaningful order.

5.8 Summary of the practicality of the supporting materials

Overall, it appeared that both teachers and students sustained a positive stance with regards to the new approach and its adoption in class. The pilot study generated data which confirmed the practicality of the supporting materials and the feasibility of the framework for the development of the partnership as a whole. Reflective interviews with the two teachers indicated that both found the new approaches meaningful and useful to implement, since they gained new knowledge that benefited their instructional practices and planning of relevant sessions. Drawing on the findings of the supporting materials using the profile classroom observation checklists, it was evident that both teachers attempted to follow the knowledge processes by addressing in hierarchical order the four

components of multiliteracies pedagogy (situated practice, overt instruction, critical framing and transformative practice).

Based on the student reflective questionnaires and interviews, students appeared to enjoy working in small groups of 3-4 and performed better, 10 of the 12 students perceived that they had benefited from the activities during the pilot study. These findings were in compliance with classroom observations and the researcher's field notes. Following the revision of the supporting materials, the final draft was incorporated in the pilot LMP workshop (Table 6.2 and Figure 6.1). The following section addresses the prototyping approach of the museum educational programme, another important component of the partnership.

5.9 Formative evaluation of the museum educational programme

Part of the museum-school partnership involved the development of a museum educational programme for a museum visit (Chapter 4, Section 4.6 and presented in Figure 4.3, p.129). Similar to the supporting materials designed for the school sessions, a formative evaluation process for the museum educational programme took place, and involved three prototypes drawing on feedback from experts' consultation, a pilot with teachers and an informal meeting with experts, as shown in Figure 5.4.
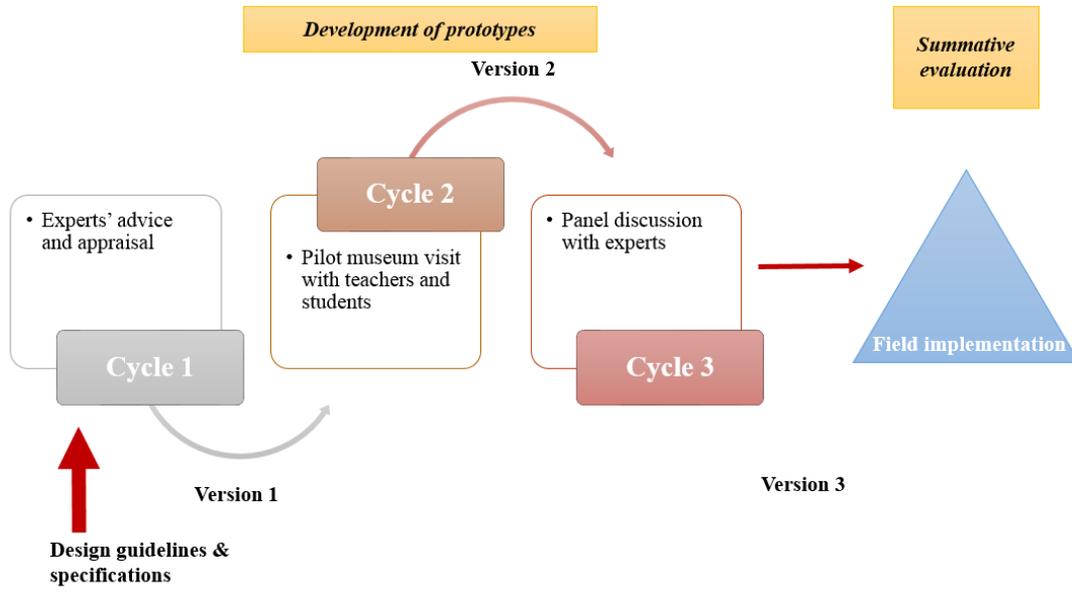
Figure 5.4 Iterative cycles of the museum educational programme during the prototyping phase

Based on the analysis of the evaluation data from the museum educational programme in each of the iterations, it was sought that the "realized outcomes" were close enough to the "intended outcomes" and therefore the design principles appeared to be effective (Plomp, 2013, p.33).

5.9.1 The validity of the museum educational programme

Such as in the case of the supporting materials, experts' advice was sought in order to improve the validity of the museum educational programme as far as structural issues, components and delivery were concerned. Once the preliminary design of the programme was completed, two museum educators reviewed the programme and another two schoolteachers further enhanced the planned activities in order to validate the intervention because of their familiarity with the context of the study. In May 2011, I distributed an outline of the programme guided by questions (Appendix 4L).

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The suggestions made by the two experts were summarized and used in respective aspects of the programme, such as the number of activities to be undertaken during the visit and what could be omitted or modified according to the CLD students' age and needs.

5.9.2 The activities of the museum educational programme

Several activities in the form of missions took place during the students' visit to the Natural History Museum in Nicosia, as part of the pilot of the programme. Included in the situated practice component was an activity where, upon entering the museum, students familiarized themselves with the space and were advised to try and look for how their senses were influenced by the stimuli at the museum (Image 5.11). They were given five cards illustrating the five senses as guidelines for what to look for at the museum (Appendix 5D). After 10 minutes, the students were asked to return to our meeting point and demonstrate their findings, which senses were used the most to navigate around the museum space.

This sensory activity caused a stir in the group. Everyone was intrigued by the newly found objects and most students felt challenged to retrieve information on what they smelled and tasted. Apparently it would not be possible to taste an object in a museum, yet it was interesting to get everyone to imagine what flavours might still be on the object. For example, students looking at nests of fowl and insects mentioned a taste of worms. One girl said this was a disgusting slimy taste while a boy from Grade Five perceived it as a refreshing tasty delicacy. Similarly, it seemed weird to ask students to smell an object, yet this led to creative thought and could inspire creative writing. Some students mentioned they didn't smell anything; on this occasion, I asked them to imagine what it might smell of. Then some students said it could be the smell of pine trees from the forest, while others were still unconnected with the room. These students were still encouraged to try to imagine, because it could lead to creative writing. Indeed, back at the school, students were asked to write a poem called: What the Museum Sees/Hears/Smells/Feels/Tastes (Appendix 5E).

Image 5.11 Senses cards
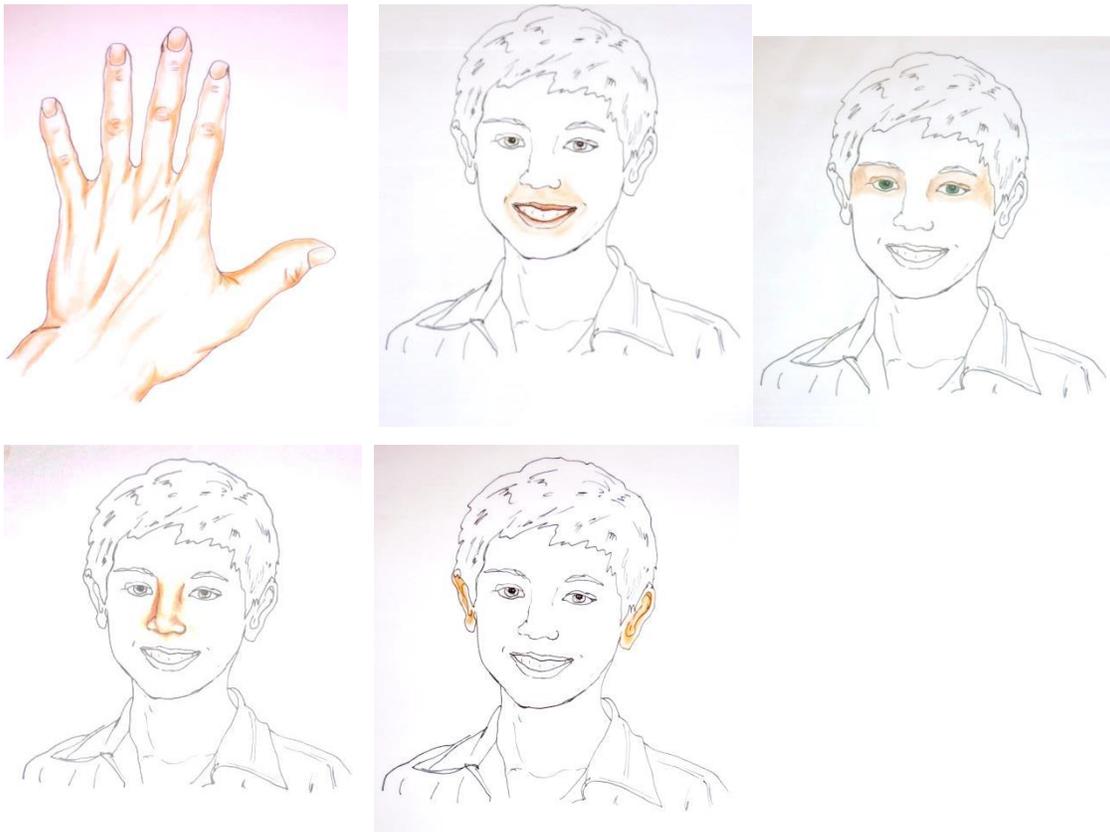
Image 5.12 Senses activity (all illusrations are by the researcher)

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A visitor's notebook was used for carrying out some other activities during the implementation of the *overt instruction* stage, when students were exposed once more to the role of the curator (Image 5.13). Through a puzzle activity they were asked to classify which of the roles adhered to exhibition designers and curators.
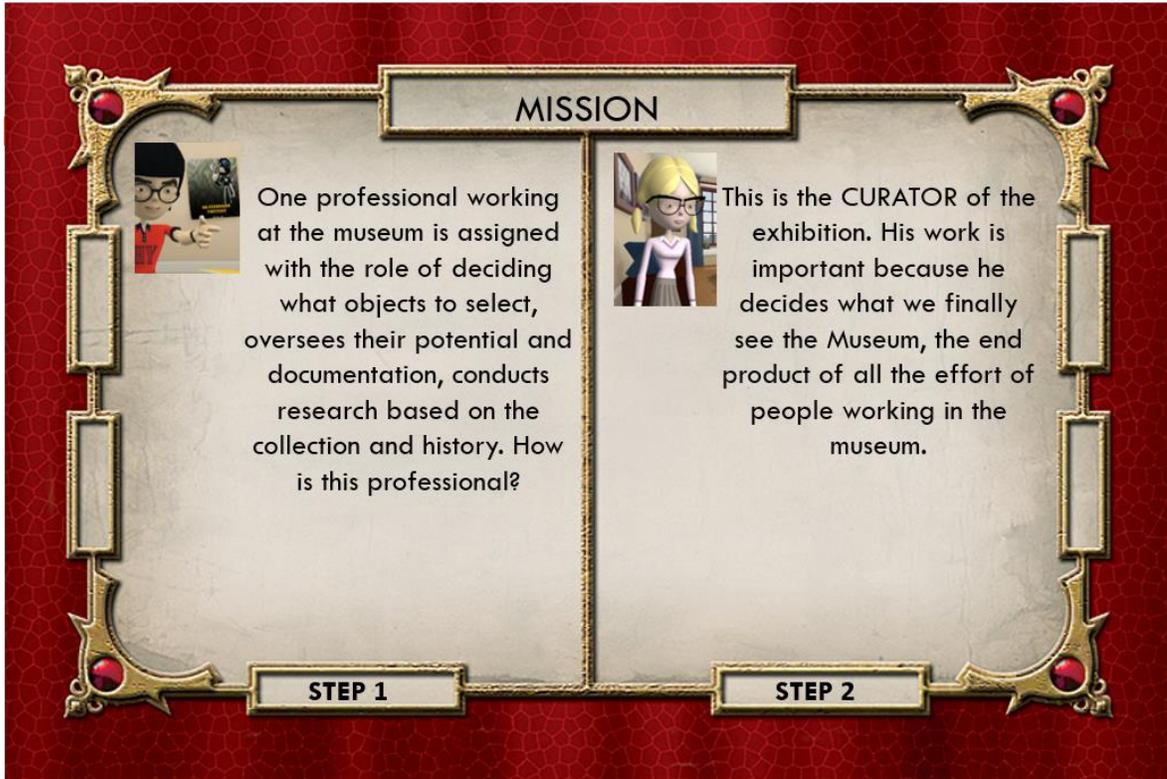
Image 5.13 Curator card

A key activity of the *critical framing* component during the museum visit was for students to become curators for the day. Using prompt questions such as "If the objects had voice, what would they tell you? Are they pleased with how they are arranged in space? What other ways can you think to arrange the collections/objects?" Students were encouraged to think of ways to re-arrange parts or whole rooms of the museum (Images 5.14-5.15). Key probing questions to spark their imagination included questions like "What could we have done differently for the objects to show? Which objects would you pick to display first? Why? Which objects should they see last and how do you justify your choice?"
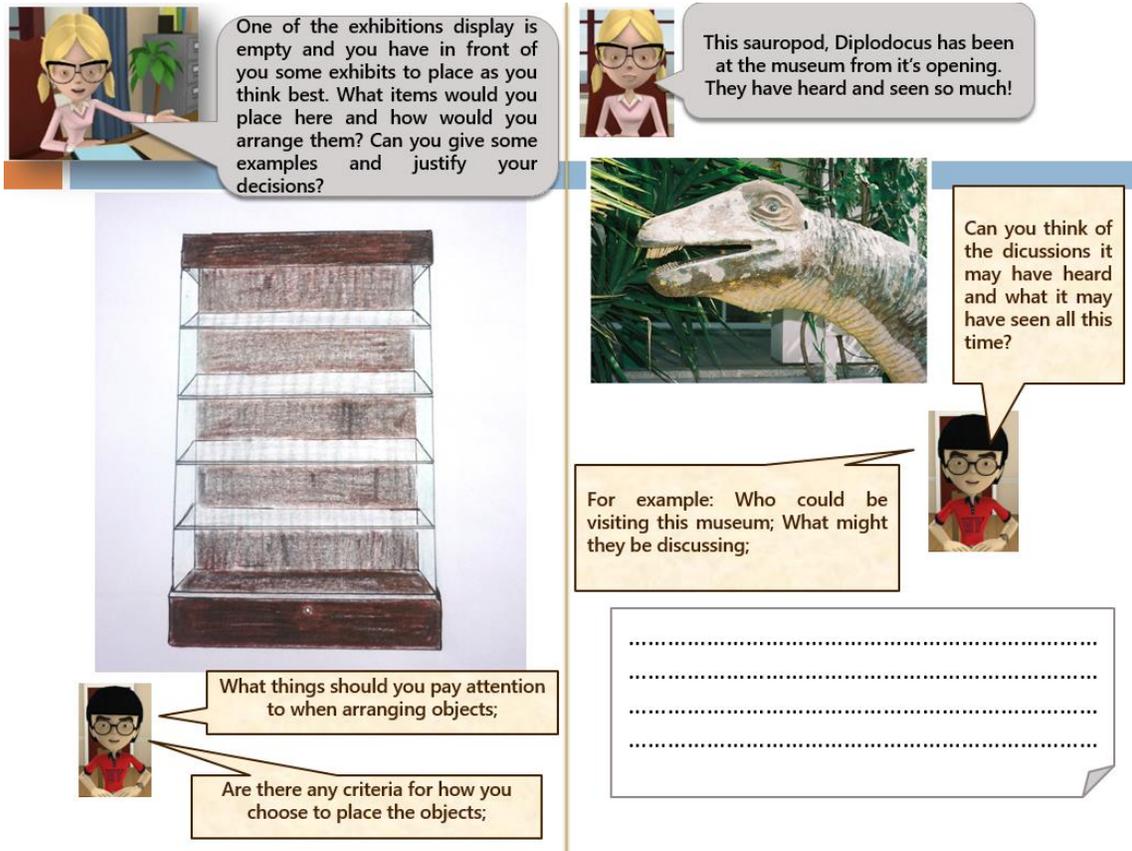
Image 5.14 Extract from the visitor's notebook

They were then asked to ponder upon their thoughts and draw a model of the room, which pertains to ways for *analysing functionally* in the LbD Model (Image 5.15). Students were keen to re-design parts of the exhibit and crafted their art using paper, scissors, glue, pictures of objects from the museum, foam paper etc. provided to them in a bag. The students enthusiastically gathered in their teams and tried to recreate three different rooms from the exhibits using the resources. They then presented their collage scene to the rest and justified their decisions.
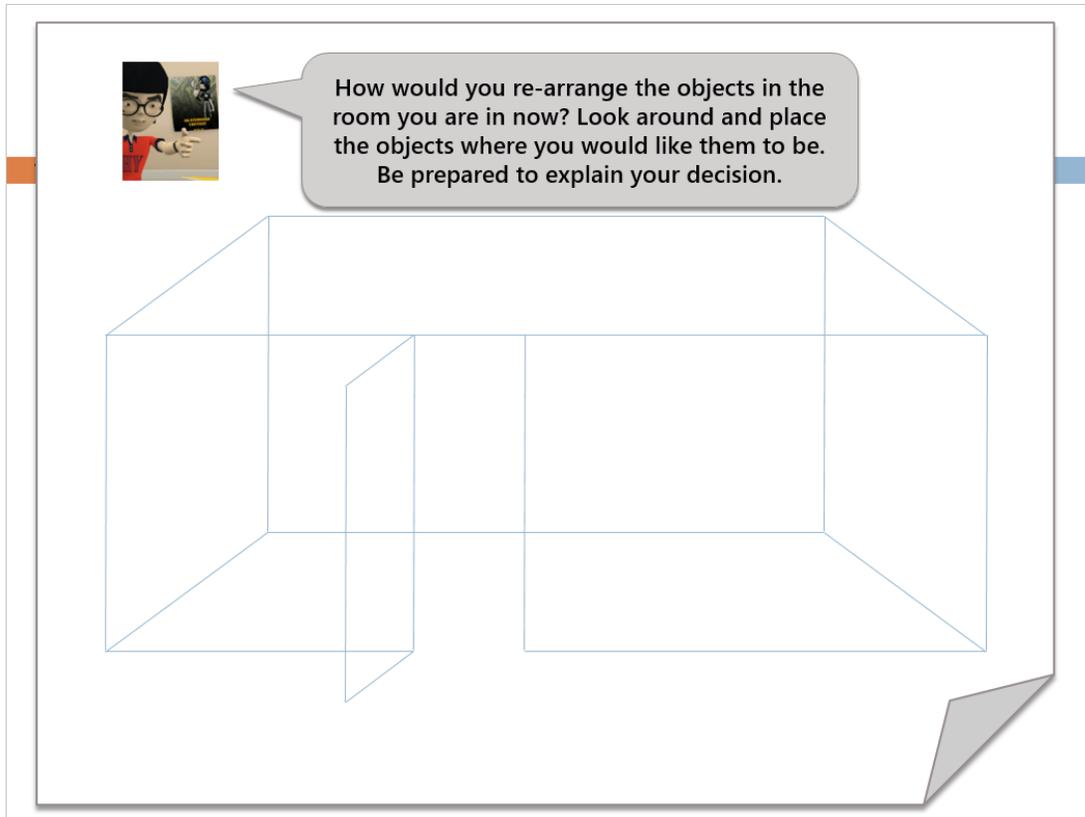
Image 5.15 Extract from the visitor's notebook

A second step of the critical framing component involved *analysing critically* by working in groups to create postcards. The students exposed the problems with the particular room they were in and recorded them on the postcard in the Postcard Problem section (Image 5.16). Their task involved the identification of problems in the way the objects were placed in the room and proposing an alternative solution to the problem. Postcards were then "mailed" to another group who discussed the problem posed and then recorded an answer to the problem with an explanation or justification. The postcards were collected again and delivered to another pair or group for an alternative response. The letters were returned to the original owner (group) and read aloud for discussion. Following this, the assigned messenger from each group took the letter and handed it to the museum director, who arrived and collected the postcards to read them (arranged from before) and provide feedback through me when students return to school.

Image 5.16 Postcard to the museum director

The *transformed practice* stage was completed using the *Story Map* technique, a strategy that helps students to build a framework for understanding and remembering a narrative, thus 'shines a spotlight onto practice that can lead to self-reflection and improvement' (González and Frumkin, 2016, p.31). A carton Story Star with a representation similar to Image 5.17 was utilised for encouraging students to report in written form about their understandings of a text found in the museum. This text considered the "bluntnose sixgill" shark, which is a member of the "Hexanchidae" family whose actual name is "Hexanchus griseus"; it is often simply called the "cow shark" (Image 5.18). Although the group of students had difficulty in completing this activity, they were able to provide a meaningful summary and link key information from the Story Star to demonstrate their knowledge and understanding of the text.
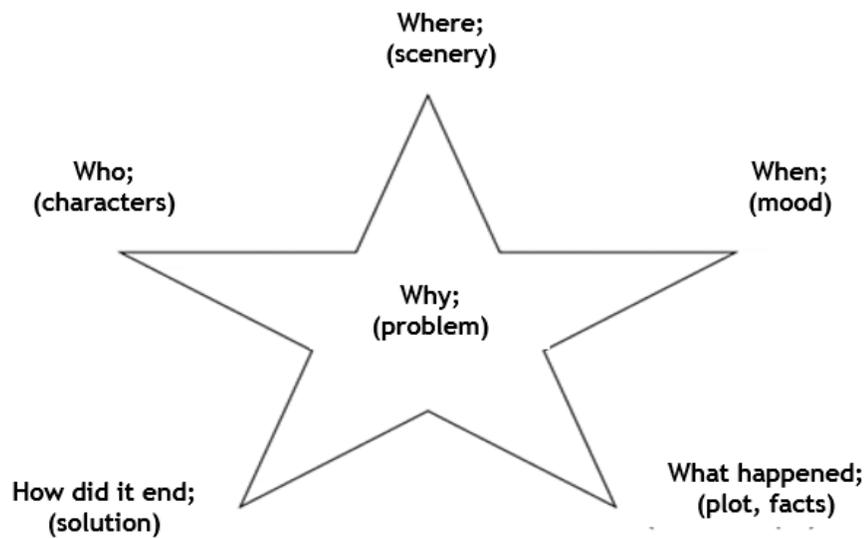
Image 5.17 Guidelines for developing a story map used during the museum visit

Image 5.18 The bluntnose sixgill'' shark

5.9.3 Activities of the pilot LMP workshop

The pilot workshop for the Living Museum Partnership focused on the development of practical skills for students to use to address the construction of their virtual museum (Appendix 5F). The micro-teaching session was implemented by myself

due to time constraints (i.e. that this was a one day workshop) as well as my personal training and experience with the approach. Data from the micro-teaching of the virtual workshop were collected and analysed as in the previous part of this chapter for the supporting materials and educational programme. My profile practice scores are summarized in Table 5.8, whereas the descriptive summary is narrated for each stage of the workshop.

Table 5.8: The pilot stage museum educator-researcher classroom profile practice scores (i.e. 100% = all items for each stage were met in full)

Session stages	Researcher-teacher scoring in %
Situated practice	79
Overt Instruction	82
Critical framing	62
Transformed practice	63
Average scores	66

Findings in Table 5.8 indicated that the micro-lesson taught was well implemented and I tried to involve the students in the workshop activities as suggested in the supporting materials. For undertaking the workshop, I used the Computer Lab of the school and allocated one computer per three or four students. Following a virtual visit to the Smithonian Museum, where students were able to navigate through the different rooms using the tool, two online virtual museum creators were used for students to experiment on their own. The first tool[25] was more of an introduction to familiarize students with the concept of the virtual museum. The tool is a simple way of allowing students to design a virtual, 3D animated museum exhibition on a topic or theme of their choice (Image 5.19). Students were given a few minutes to familiarize themselves with the tool and retrieve a

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[25] *http://www.classtools.net/3D/*

few images using a search engine. This activity lasted approximately 30 minutes and was followed by the second session immediately after.

Image 5.19 Developing a virtual museum exhibition using the Classtools generator

I exposed students to the second tool[26], a web-based environment which allows its members to create virtual art galleries in lifelike 3D spaces. The application is designed to model actual or virtual exhibitions by designing realistic 3-dimensional room complexes. Students were provided with a helpsheet/rubric (Appendix 5F) to accompany the activities and chose their images, whether 2-dimensional artifacts (e.g. paintings, photos and posters), 3-dimensional artifacts (e.g. sculptures or small installations) or carefully streamed videos.

The activities started with the construction of the space of the gallery—choosing the layout and designing various specifications (Images 5.20-5.22). The resulting virtual space was used as a practice tool for students to begin to realize their potential to act as curators, while it provided the possibility to use the virtual environment as a testing ground for trying out and exploring different ideas. Each exhibit created by respective groups of

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[26] http://www.artsteps.com/

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students was given a title, which could be an entire topic, or a narrower focus within it. Students in their groups also came up with a description for maximum educational effect and were able to save their work for future editing. During the final stages of the workshop, students were allowed to take a tour of other groups and users' virtual galleries.
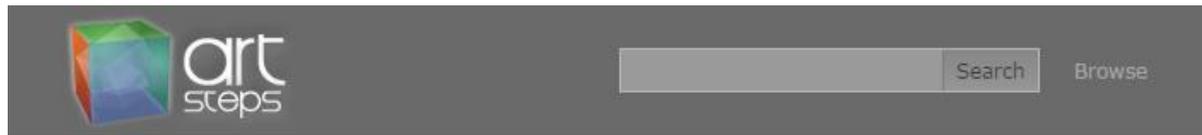
Image 5.20 Designing and creating 3D virtual exhibitions (Source: http://www.artsteps.com/*)*

Design & Create / Upload your artifacts
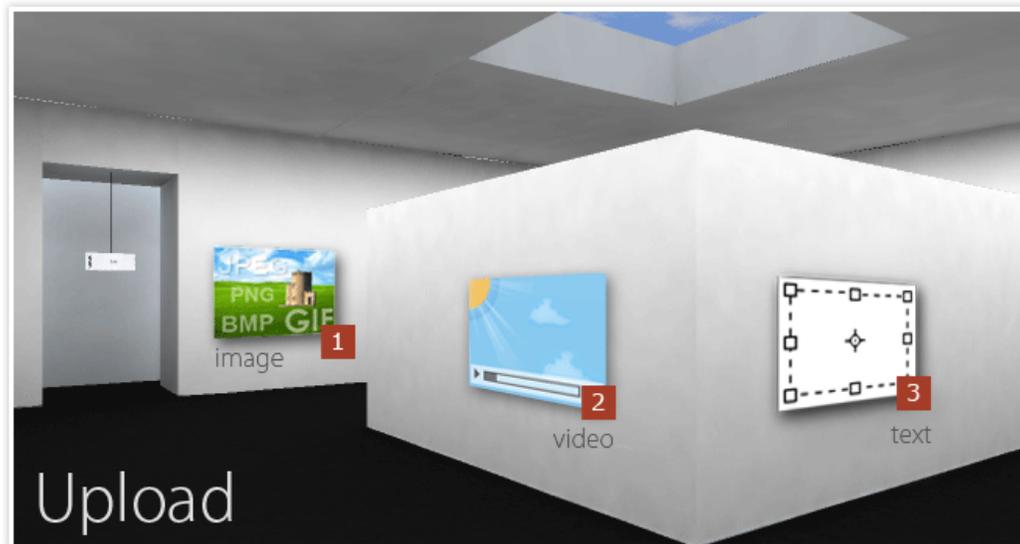
1 Image

Upload image and add title, description, copyrights and tags.
Artsteps currently supports the following image formats: JPG, PNG, GIF, BMP.
Set your image height to the real image size or alter its dimensions while curating your exhibition rooms.

2 Video

Enter Vimeo video ID or URI (e.g. 74629589 or http://vimeo.com/74629589). Update its title, description, copyrights and tags.
Your videos' dimensions cannot be changed.

3 Text

While curating your room space, create text labels that will accompany your artifacts. Use a simple text editor to select the right font-family, font-size and font-color.

Image 5.21 Uploading artifacts (Source: http://www.artsteps.com/*)*
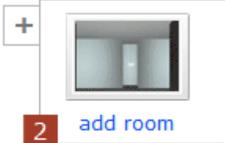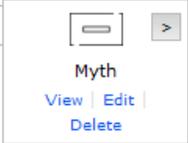
Image 5.22 Creating the virtual exhibitions (Source: http://www.artsteps.com/*)*

5.10 The practicality of implementing the pilot LMP workshop

The intention in delivering the pilot workshop was to investigate the practicality of implementation, including but not limited to design, content, and delivery, before it was implemented in the final fieldwork. Twelve students participated in the workshop as displayed in Table 5.9. The workshop sessions and activities are illustrated in Appendix 5F.

Table 5.9: The pilot workshop participants' background information (N=12)

Participants	Gender	Grade	Perceived Digital Literacy Performance
Student A	M	6	High
Student B	M	5	Low
Student C	F	5	Average
Student D	F	5	Low
Student E	F	6	Average
Student F	M	6	High
Student G	F	6	High
Student H	F	5	Low
Student I	M	5	Low
Student J	F	5	Average
Student K	M	6	Average
Student L	F	5	Low

Data collection and analysis during the pilot workshop focused on evaluating participants' reactions and learning with relevance to the implemented activities and applied knowledge and skills gained. Data collection instruments included a students' expectation questionnaire (Appendix 2C), supporting materials profile classroom observation checklist (Appendix 2B), and students' workshop evaluation questionnaire

(Appendix 2Eb). The intention was to provide information derived from both qualitative and quantitative data methods that would reflect students' expectations, reactions during the pilot workshop and their learning from the workshop and suggestions for improvement.

5.10.1 Students' expectations from the workshop

Prior to the workshop, students were asked to comment on what they expected to gain from the workshop (Appendix 2C). Table 5.10 summarizes students' expectations.

Table 5.10 Students' expectations regarding the pilot workshop (N= 12)

Students' Expectations	Mode	Frequency
To get information on:		
How virtual museums look	5	8
How to plan and organize a virtual museum exhibit	4	7
How to improve their digital literacy skills	5	8
To acquire knowledge and skills in using the virtual museum creator.	4	7
To explore methods which lead to improvement of students' understanding of how to curate a virtual exhibition	5	9

Note: 5 = strongly agree and 1 = strongly disagree.

The findings in Table 5.10 show that six students expected to get information about using the virtual museum creator, and how these could be used to plan and organize a virtual museum exhibit and understanding how to curate an exhibition. Three students expected to acquire knowledge and skills about using digital tools, therefore improving their digital literacy skills, and ten students expected to find out what virtual museums are.

5.10.2 Students' reactions and learning from the pilot workshop

One of the most imperative parts of the evaluation of the pilot workshop involved to assess students' learning as a result of attending, as far as the new knowledge, skills, and dispositions that they may have gained. To sustain insights on the latter, students were asked to indicate to what extent they agreed with the closed statements related to the acquisition of knowledge and skills on the virtual museum concept and its construction. It was evident based on the students' evaluation questionnaire (Appendix 2Eb) that students were positively impressed by the workshop activities and found it relevant to their learning. They also appeared to gain insights into the concept of virtual museum, as well as how to become curators of their own virtual museums.

Much of the material housed in the virtual museum was generated and produced by students following brief research on the topic over the two sessions of the workshop. In this sense, students engaged in an online treasure hunt to retrieve information and electronic artifacts. Three of the students suggested that this was the most fun way they had worked as part of a team, how it all made more sense and they did not feel they were having a lesson, but rather more of a field trip. Five of the students found that some of the activities were overwhelming and would prefer to handle less, while others stated that it was far more interesting to do most of the work needed using a PC. It was an encouraging research finding that 10 of the 12 students expressed extremely positive feelings regarding the workshop activities. Overall, since the students were actually building meaning as the added to the museum collection, this workshop was a great enactment of constructivist learning.

5.10.3 Suggestions for improvement of the pilot workshop

The evidence from the data derived from the workshop evaluation questionnaire (Appendix 2Eb) suggested that the most important alterations concerned allocating additional time for workshop activities, in particular for the overt instruction component. This conclusion complied with the feedback from the two experts - it was considered appropriate to increase the time given for advancing students' theoretical and practical skills on IT from 1½ hours to 2½ hours. This extra time was thought of as valuable for students to engage in a discussion of their prior experiences and gradually be immersed in the concept of a virtual museum while accommodating their different learning styles and familiarity with the concepts of museum and virtual museum, as well as practical aspects of their knowledge such as creating PowerPoint slides, embedding pictures and video, etc.

Importantly, as this fieldwork unfolded and written, no specific time was allocated in the curriculum for computer science or any other relevant IT subject. In this sense, it was meaningful to dedicate extra time for developing these students' digital literacy skills. In addition, despite prior meetings with teachers who were to act as facilitators in the museum-school partnerships having been arranged and taken place, the workshop was considered an additional opportunity to assist these teachers in gaining a more in-depth understanding of the new teaching approaches, as I was solely responsible for the delivery of the workshop using the museum-multiliteracies-based approach. Therefore the workshop acted as a demonstration session for teachers to observe the implementation process during the particular component of the intervention (Appendix 5F).

5.11 Teachers' opinions from the pilot LMP

Teachers' responses regarding their perceptions from the implementation of the pilot LMP (Appendix 2D), including the supporting materials, workshop and museum educational programme, were considered as an important part of the formative evaluation. Their perceptions are summarized in terms of the modes and frequencies as shown in Table 5.11.

Table 5.11 Teachers' opinions about learning from the series of pilot LMP sessions (N = 2)

Teachers' views about the LMP activities (Question 7, Appendix 2D)	Mode	Frequency
i) After participating in the workshop my awareness and understanding of the museum multiliteracies-based teaching and learning approaches was enriched	5	2
iii) The use of a wide range of multimodal means made me consider practicing the museum multiliteracies-based teaching and learning	4	2
iii) Participating in the design of these lessons I believe that I can put it into practice in my class	4	1
iv) The museum multiliteracies-based approach and feedback sessions raised my awareness of my own teaching behaviour and knowledge about alternatives	4	1
v) I am confident to use the museum multiliteracies-based approach with my students	4	1
vi) Following the LMP, I will start teaching my lessons by eliciting students' prior conceptions in order to make my teaching meaningful	5	2
vii) I will plan and organize my language arts lessons differently because of this workshop	4	2

Note: 5 = strongly agree and 1 = strongly disagree.

Results in Table 5.11 suggest that teachers gained substantial information about the museum multiliteracies-based approach and the LbD Model instructional sequence, and how they can use them for classroom instructions. As a result of the two teachers' participation in the micro-teaching session, one of them strongly agreed with the closed statement "Participating in the design of these lessons I believe that I can put it into practice in my class" (Table 5.11, statement No. iii). In addition, both teachers agree with the statement "I will plan and organize my language arts lessons differently because of this

workshop" (Table 5.11, statement No. vii).

Nevertheless, responses to the open ended question of the questionnaire (Appendix 2D) suggested that the teachers were critical and doubtful over the strategies to plan and organize lesson activities in their classrooms with more than 20 students. Their concern was with regards to their ability to manage students' lesson activities for effective learning outcomes, and in particular with regards to their cultural and linguistic differences. In this respect, the preliminary findings suggested that teachers would require additional skills on how to implement the new approach in big classes.

On the other hand, both teachers indicated that they felt more confident in using multiliteracies-based strategies following their participation in the micro-teaching sessions (Appendix 5F) with the 12 students.

5.12 The second and third cycle of formative evaluation following the pilot LMP

The overall impression from the pilot LMP was that the students seemed to respond in a positive manner to the museum multiliteracies-based approach. Based on the student workshop evaluation questionnaire (Appendix 2Eb), it was evident that most of the students had gained new knowledge and appreciation of virtual museums, while their multimodal literacy learning experiences were enhanced from participating in the museum multiliteracies workshop following the particular instructional sequence. Importantly, a concern of the teachers for implementing this approach related to how to plan and organize classroom activities for more than 15 students, which is often the case in Cypriot primary classrooms.

The improvements suggested by the experts and teachers were incorporated into the second revision of the prototype before they were exposed to the second experts' review and later on the implementation in the field. During the second cycle implemented, the experts provided further suggestions and insights after they were provided with an outline

of the structure of the LMP. I undertook a panel discussion with two experts in Limassol where they shared their experiences from the pilot stage, and how the implementation of the LMP could be further improved.

Most importantly, the experts observed that the virtual museum workshop should be extended, and how the critical framing and transformed practice stages should be enhanced with more meaningful and appropriate activities to respond to students' level of knowledge and needs. Once the second experts' review was completed, the revision decisions were included in the third cycle. The final version of the LMP was compiled and the components, and activities of the field stage were delineated as illustrated in Chapter Six, Table 6.4 (p.222).

Overall, the researcher-teacher role undertaken during the first couple of sessions (including the virtual museum workshop) worked adequately - with a few awkward moments where I needed to record parts of the students' experiences. Following these, having the teachers enact the reminder of the pilot LMP sessions was catalytic to delivering the planned sessions during this time, while they further illuminated the researcher's insights into the students' experience with their reflection interviews.

It was evident that without the teachers' help, undertaking this project would not have been possible. They maintained their facilitative role throughout the iterative cycle by moving around the classroom to distribute material, and interacting with the groups by guiding the students with regards to the steps of the WebQuest which needed to be followed, and any other questions that would arise.

Emphasis was given on CLD students' needs by providing additional guidance where needed - for instance, using personalized worksheets in the students' native language etc. The teachers explained, during their reflective interviews, that group discussions were at times uncomfortable, since this sort of interaction with students was not typical in their professional role. Likewise, students seemed a bit surprised, although positive, about these rather new teaching and learning approaches.

5.13 Improvements following the pilot of the supporting materials and LMP workshop

Following the third revision of the supporting materials (Fig 5.3) the amendments pursued were:

i) An improved session drawing on the Learning by Design Model with the Situated Practice component being the first stage which could motivate students' interest in the new teaching approach, as well as derive information on what the concept of the virtual museum is and how it relates to their previous knowledge of physical museums (Section 6.2, p.205).

ii) A re-organization of the session activities in a way that would support students' acquisition of key concepts in critical framing and help ensure that they are more actively engaged and self-reflective in terms of their learning.

iii) Addition of two sessions regarding transformative practice, and in particular the knowledge processes of applying appropriately and creatively.

iv) Addition of 5 minutes per session during the overt instruction component of the implementation stage, so that students can complete their session activities successfully.

The third prototype of the LMP workshop also incorporated several final adjustments:

i) It was decided to increase the workshop time from one day to two days, a change which would allow for sufficient time to complete workshop activities (Chapter Six, Table 6.4, p.222).

ii) Further empowering the museum multiliteracies-based approach of the workshop by adding a video to complement the main presentation, and prepare students for the coming sessions for the entire duration of the project.

iii) Adding an extra activity for the overt instruction session of the workshop which could facilitate the understanding of conceptualising by naming, as it was vital for students to gain this sort of knowledge before proceeding any further to the

construction of the virtual museum. Knowing the basic features of the virtual museum was thus imperative.

Importantly, the findings of the pilot stage informed the refinements of the instruments to capture the essential information during the fieldwork:

i) Workshop evaluation questionnaire (Appendix 2Eb), including a set of open-ended questions for teachers to provide more explanations.

ii) The resource profile classroom observation checklist was adjusted to include information about general classroom observation which could be relevant for the field implementation.

iii) The student focus group interviews were refined and narrowed to focus only on the experiences from the sessions taught with the new approaches rather than the typical everyday lessons taught (Appendix 2Ic).

5.14 Summary of the chapter

The intention in this chapter was to describe the collaborative design and formative evaluation process of the LMP, including the supporting materials for the construction of the virtual museum, the LMP workshop and the programme for the museum visit. These components were refined to facilitate implementation through teachers' pedagogical knowledge and skills, as well as enhancing students' literacy learning experiences. An evolutionary prototyping approach was pursued using a cyclic iterative process, which entailed the development, testing and refinement of components of the partnership based on formative evaluation. Different levels of evaluation were applied based on experts' feedback, users' appraisal and pilot studies with museum educators, school teachers and students.

The feedback and findings of different levels of evaluation gained based on distinct categories that illustrate the quality criteria of the components produced, such as the validity and practicality of the LMP, were used to refine the prototypes both in terms of the

instructional theory (the museum multiliteracies approach supported by the Learning by Design Model) and practice (intervention) during an ongoing process, until the final fieldwork was conducted. Importantly, significant initial problems and challenges associated with the framework and implementation of the partnership were identified and addressed to the maximum level possible. The use of data collection instruments was equally important so as to improve for the project before the final fieldwork.

Another important aspect of the formative evaluation during this iterative phase was the benefits for teachers, since it enhanced their awareness of the new approaches by providing practical insights into effective teaching and learning methods. Thereby, and based on their reflective interviews, it can be claimed that the experiences gained during the formative evaluation process enhanced these teachers' professional growth and in-depth understanding of the intended theory and practice. Teachers gained confidence in using the new approaches within the context of the museum-school partnership. They were also able to be more actively involved in developing instructional activities, such as classroom discourse, lesson plans, and learning strategies for differentiating teaching, to include consideration of culturally and linguistically diverse students' needs and interests.

Phase III: The Assessment Stage

Chapter Six – Findings and evaluation of the LMP

6.1 Introduction

This chapter is the first of the two chapters presenting the final phase of the research involving the evaluation of the LMP (3rd version). These findings answer the third research question: *What is the impact of a museum-school partnership on teaching and learning?*

The final prototype of the LMP in this research comprises a workshop, 13 sessions conducted with supporting materials, and the museum educational programme (Appendix 4G). Formative evaluation during the prototyping phase was discussed in the previous chapter with relevance to the quality criteria proposed by Van der Akker (1999), Nieveen (1999), and Nieveen and Folmer (2013) (Table 5.3, p.151). Following these guidelines, the emphasis was on the practicality and effectiveness of the intervention. This chapter builds on that discussion to examine the relevance and sustainability of the final version of the LMP.

To assess the effective design of the LMP intervention, the evaluation was based on the cognitive, interpersonal, group, resource, and institutional level criteria proposed by Collins et al. (2004) described in Section 4.9.1 of Chapter Four (p.143). The above intertwined criteria informed the data collection, analysis and the interpretation during the assessment phase of the research. Each evaluation level had key indicators which were employed in the judgement of the impact of the LMP as summarised in Table 6.1.

Table 6.1: The key indicators for judgement of the impact of the LMP and
implementation of the new approach during the final intervention

Evaluation criteria	**Characteristics**	**Means of analysis**
Cognitive	Assessment of students' prior knowledge and evolution in thinking	Observations of students' visual representations and verbal explanations. Evaluation sheet Rubric
Interpersonal	Student to student interactions Student to teacher interactions	Observations during the fieldwork and supplementary interviews field notes
Group	Group dynamics Engagement in the intervention: a sense of belonging	Observations and field notes.
Resource	Availability and use of print and multimodal texts	Semi-structured interviews and surveys
Institutional	School culture and parents' support; School leadership support.	Semi-structured interviews and surveys

This chapter comprises two parts. The first part includes two main sections: the preliminary procedures prior to implementation of the LMP, and an overview of the implementation of the new approaches at the target school. The second part explores the impact of the new approaches to teachers and students focusing on the cognitive, interpersonal, group, resources, and institutional levels of evaluation. The last section presents a summary and reflection of the chapter.

Part One: Preliminary procedures and final implementation of the LMP

6.2 The context

The following is a description of the two museums, the school and participants of the final intervention drawing on official documents from the Cypriot Ministry of Education and Culture as well as preliminary context analysis undertaken between April and June 2012.

6.2.1 The museum sites

The two museums used as the physical spaces for students to visit and test out the implementation of the MMP framework for designing museum educational programmes differed in their content - one was a natural history museum, and another a theatre museum. Nevertheless, both were the first museums of their type in Cyprus and were, at the time of the selection, the newest addition to museums in the whole of Cyprus, the openings held on June 2011 and May 2012 respectively. The Cyprus Theatre Museum in particular was given considerable attention by the media as it had been a long wanted demand of the intellectual world in Cyprus. Both museums had been designed with attention to including technologies and interactive exhibits for their visitors. Another crucial element of importance to this research was that none of the two museums had previously run museum educational programmes for students or adults. In fact, at the time of the conduct of the research, I was collaborating with both institutions for the design of proposed programmes as the only museum educator. In this sense, having this affiliation with the two institutions enabled to ask for permission to conduct the research and engage in the design and implementation of the museum educational programmes and discuss the potential of establishing a partnership with a school. Both museum directors therefore embraced the research and facilitated the conduct of the fieldwork during the prototyping phase.

6.2.2 The school site

The school demographics

The AP Elementary School is located in the east suburb of Limassol[27]. The school is situated next to the High School. For the 2012-2013 school year, 142 students, 78 boys and 64 girls were enrolled in grades kindergarten through sixth. The demographic composition of the school population is listed in Figure 6.1. Interestingly, the school population is more diverse than the surrounding community and in comparison to general student population demographics for Elementary Education in Cyprus. According to the school records around 35% of students were Cypriots, another 30% were Russian while the other 35% came from 10 different countries (Figure 4.1). The majority of the students (75%) were categorised by the school as middle class. Twelve generalist teachers, the headteacher, a music teacher and a physical education teacher worked in the morning programme 08.00-13.40. There was another teacher responsible for a reception class (*Taksee Ypodochees*) for immigrant students who experienced difficulties with Greek language.

Student population: ethnic background

Legend: Cypriot, Russian, British, Ukranian, Iranian, American, Czech, Polish, German, French

Cypriot 35%, Russian 30%, British 10%, Ukranian 10%, Iranian 5%, 5%, 1%, 1%, 1%, 1%, 1%, 1%
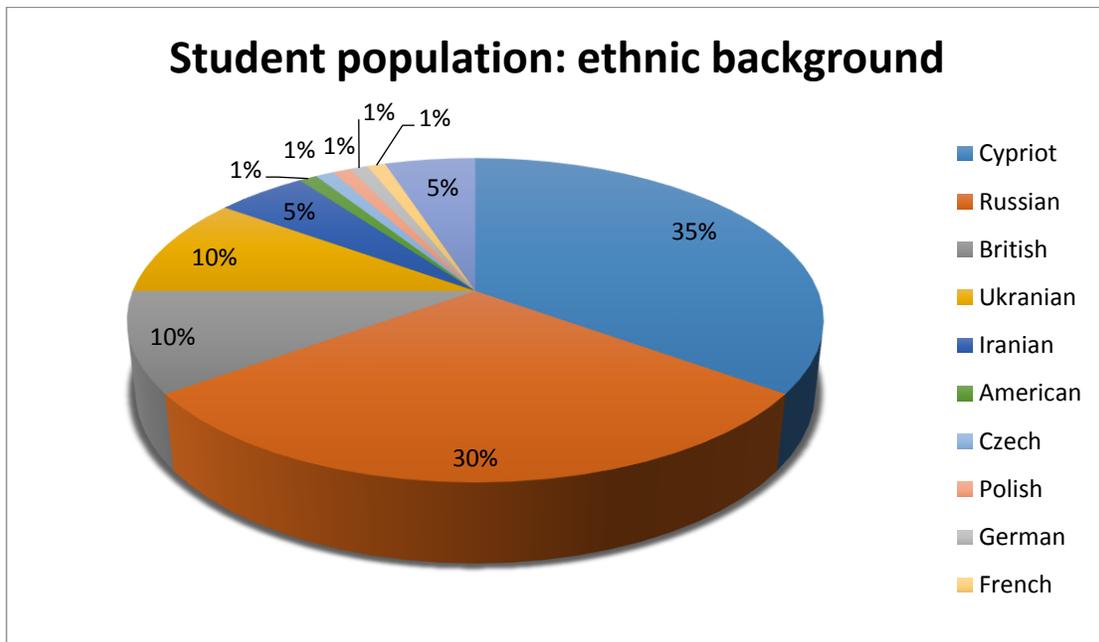
Figure 6.1 Student Enrolments by Ethnic Group at the AA Elementary School 2012-201

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[27] For detailed description on the city see Chapter 2, Section 2.7, p.51.

6.2.3 Key participants in the study

School Principal

John, the school's principal, was the main contact person for setting up and providing with continuous support throughout the museum-school partnership. The year before the partnership was implemented, John had been appointed as school principal following ten years of working as a vice-principal. John exhibited a genuine interest towards the prospect of the partnership as he was focused in promoting an active culturally responsive agenda at the school due to the high number of students coming from linguistically and culturally diverse backgrounds. John found time to accompany the student group at the museum site, took photographs and participated in activities there.

Schoolteachers

Demographic data for the two schoolteachers whose classes' participated in the research are presented in Figure 6.2.

Class	Grade Five	Grade Six
Education	MA in Music Education	MA in Science Education
Years of experience	15	4
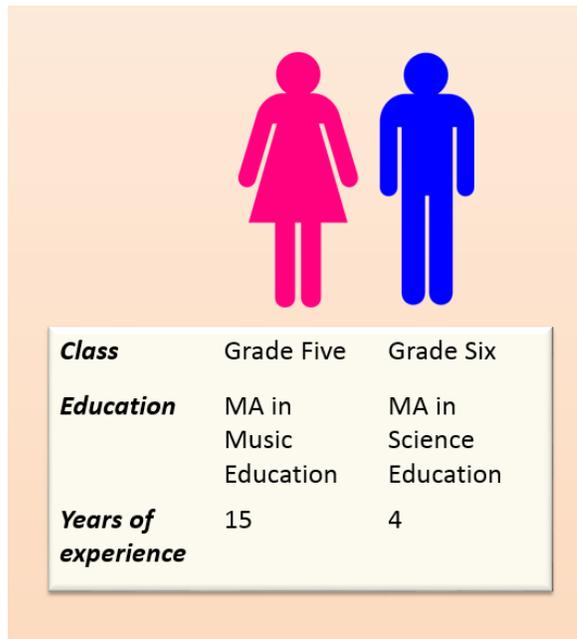
Figure 6.2 Characteristics of schoolteacher participants in the research (Savva, 2016a)
Grade Five Teacher

The Grade Five teacher, Myrto, a native Cypriot in her early 40s had been working in the particular school for 4 years and had 15 years of experience in teaching in public primary schools in all of Cyprus. She holds a Master's degree in Music Education. Myrto was eager to help with anything that arose during the project. The teacher described the students in her class as quiet and cooperative despite language barriers making it challenging to respond to the pressure from the national curriculum. In this respect, Myrto stated that, 'the attainment level was not very good' and that 'the majority of the students had difficulty with comprehension and written tasks and reach national standards'[28]. She mentioned how the major difficulty was trying to make everyone understand the purpose of each activity as there were so many different cultures and languages spoken in the classroom. In this sense, the teacher would try to differentiate the worksheets however she admitted that this was not always possible as:

> It is difficult to differentiate for all subjects and at all times. I try to, but I don't always make it happen. I incorporate a lot of images and use games to complete activities as my experience over the years taught me we should accommodate for students' different learning styles (TI, from Grade Five)

Grade Six Teacher

Andrew, a native Cypriot, was the Grade Six schoolteacher at the AP Elementary School. A male in his late 20s with four years of experience in teaching following a Master's degree in Science Education, Andrew had been working at the school for two years prior to the project. He seemed particularly interested in authentic approaches to teaching and learning such as hands on learning and collaborative work and was about to start his PhD.

Andrew was actively involved in the school-based sessions, however towards the end of the project he missed a few sessions due to other teaching duties. Nevertheless, he

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[28] Interview with Grade Five teacher, AP Elementary school, 27/05/2012

accompanied the students at the museum visit and assisted with the different activities at the museum. Andrew described the Grade Six class as a 'demanding case' overall in accordance with the principle's views who also warned me that Grade Six was the most undisciplined class in the school. Andrew identified that most of the challenges in teaching with this group related to their classroom behaviours derived from the fact that a large proportion were immigrants and did not have Greek as their native language. This created concentration and practical challenges in terms of delivering the curriculum since five of these students were also attending individual classes to learn the basics.

> They get upset easily, talk back at me and give up. I try to create two or three different sets of the same worksheet, for example adding pictures or more explanation for some students but this does not always help particularly for writing tasks and assessment (T2, from Grade Six)

Andrew mentioned lack of motivation and interest to the content of the curricula particularly for core content subjects such as Language and Maths and attributed this to cultural and linguistic barriers which hindered daily activities during the lesson:

> Look…It is a challenge because they are at the last grade and there is the pressure to perform but for many of these students it's a daily struggle to get by because of the language barrier (T2, from Grade Six)

The student group

The target group for this study comprised primary aged students drawn from two classrooms, namely Grade Five and Six. A total of seventeen students, nine boys (Figure 6.3) and eight girls (Figure 6.4) comprised the student group involved in the final implementation of the LMP (Pseydonyms were used for all students mentioned in this thesis).

Six students from Grade Five, two boys and four girls aged 10-11 participated in the research. Three of them were of Russian origin, one was English, one Cypriot and the other one was Greek. The English student, a girl was a newcomer and could not read or write in the Greek language which is the language spoken at school. According to the Grade Five teacher, Myrto, she was reluctant to speak in the class and seemed to avoid attending Greek lessons. She preferred spending more time at the library with a supplementary teacher reading Greek books. The two Russian girls didn't know Greek at all and had limited vocabulary knowledge of English so they would count on their classmate from Russia to translate everything. Regarding their social background, the majority of children's parents were middle class, with one or two coming from upper middle class.

With regards to students recruited from Grade Six, four girls and seven boys were recruited. Similarly, to Grade Five, the majority of the students' parents were middle class. Four of the students were of Cypriot origin. Two were half Cypriot half English, one half Cypriot half Russian, one Persian, one Bulgarian and two Russian. The two Russian students and the Bulgarian had basic knowledge of Greek and attended extra lessons for Greek language acquisition. The Persian student was fluent in English and had a fair knowledge of Greek. The rest of them were affluent or had an average level of knowledge of Greek. Figures 6.3 and 6.4 present the breakdown of male and female participants to the research including their characteristics in terms of their literacy performances as it was derived from informal conversations with their teachers and preliminary observations in the classrooms.

The STUDENT GROUP

Name: Martin / **Grade:** Six / **Background:** Bulgarian / **Speaks:** Greek, Bulgarian
Characteristics: Reads with difficulty, writes with difficulty, communicates arguments well, able to solve complex problems, works with ease in a team.

Name: John / **Grade:** Six / **Background:** Russian / **Speaks:** Greek, Russian
Characteristics: Reads with ease, writes with ease, communicates arguments appropriately, good with complex problems, works well in a team.

Name: Panos / **Grade:** Six / **Background:** Cypriot / **Speaks:** Greek, English
Characteristics: Reads with ease, writes fluently, communicates arguments well, good with complex problems, works excellent in a team.

Name: Sergey / **Grade:** Six / **Background:** Russian / **Speaks:** Russian
Characteristics: Reads with difficulty, writes with difficulty, communicates arguments with difficulty, analyses and solves complex problems, works well in a team.

Name: Demetris / **Grade:** Six / **Background:** Cypriot / **Speaks:** Greek, English
Characteristics: Reads fluently, writes fluently, communicates arguments excellent, difficulty with complex problems, works well in a team.

Name: George / **Grade:** Six / **Background:** Cypriot / **Speaks:** Greek
Characteristics: Reads fluently, writes well, communicates arguments with difficulty, solves complex problems with difficulty/ timid to work in a team.

Name: Peter / **Grade:** Six / **Background:** Cypriot-English / **Speaks:** Greek, English
Characteristics: Reads fluently, writes fluently, has extreme difficulty to communicate arguments, difficulty with complex problems, difficulty working in a team.

Name: Andreas / **Grade:** Five / **Background:** Cypriot / **Speaks:** Greek
Characteristics: Reads fluently, writes with difficulty, communicates arguments appropriately, difficulty with complex problems, leadership in a team.

Name: Marco / **Grade:** Five / **Background:** Russian / **Speaks:** Greek, Russian, English
Characteristics: Reads fluently, writes fluently, communicates arguments with difficulty, has difficulty solving complex problems, has difficulty working in a team.

Figure 6.3 Male participants at the student group for the research

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Figure 6.4 Female participants at the student group for the research

6.3 Preliminary procedures prior to implementation of the LMP

Prior to implementing the final prototype, I undertook a preliminary context analysis in an attempt to understand and chronicle the culture of the school (in relation to multiliteracies and culturally responsive teaching) and get a sense of the figured worlds of participants, in particular the students. Data were collected over two months between April and June 2012 using pre-intervention classroom observations and focus group interviews. The following two sections address the findings of this preliminary stage of work.

6.3.1 Pre-test student museum attitudes survey

A pre-visit museum attitudes survey was conducted among the group of 17 students prior to the LMP, in order to determine their behaviour, interests, and perceptions towards museums. Instead of the traditional questionnaire I was looking for a playful activity that would engage all learners into talking and participate in the session, even the most timid ones. For this purpose and to invite dialogue, I incorporated a scenario where the students read an online announcement in a short WebQuest created for the purposes of the research, saying that a local newly established museum was looking for volunteers to contribute to its work. Two activities were undertaken to elicit data: filling in a 'Resume form' and a 'Museum Box' activity, the findings of which are described below.

First, the students were asked to fill in the resume including questions about themselves and their knowledge of museums to see if they are qualified to become volunteers at the museum (Figure 6.5).

5. Circle all the words you feel relate to what a museum can offer to the visitor:

Work of art	fun
monument	curiosity
game	Heritage site
anxiety	culture
pride	interesting
adventure	discovery
civilization	knowledge
drama	education
fascinating	art
creativity	Critical thinking

3A. What is it that you remember the most from your visit;

....

....

3B. What was something you did not like;

....

....

4. Web of thought! A museum is...

What could a museum be?
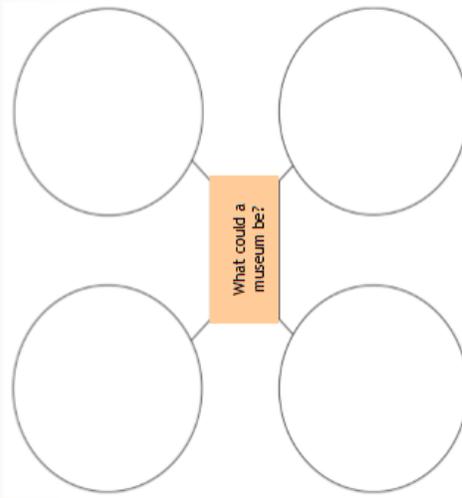
Contact details

Name:... ... ...

Age:... ... ...

School:... ... ...

1. INTERESTS: Name 3 things:

You enjoy doing when you have spare time:

....

....

You do apart from reading homework:

....

....

2. SKILLS: Name 3 things you are good at:

1 ....

2 ....

3 ....

3. EXPERIENCE

Have you ever visited a museum; If so, do you remember which, when and with whom did you go?

Yes ... ...

....

No ... ...

....

If you answered YES to the previous question move on to 2A and 2B. If you answered NO move on to Question 4.

Figure 6.5 Short resume for student participants (Pre-visit)

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Following the 'Resume form', instead of directly questioning students' about their perceptions and attitudes towards the museum, I engaged students in an activity which I named the 'Museum Box'. This activity is inspired by an activity called Mystery Box or 20 Questions in the activities proposed for the knowledge processes by Cope and Kalantzis (2000a). As a continuation of the scenario asking from the students to become volunteers for our museum, I presented a wooden box to students to launch the activity and spark their interest. I asked them to imagine what could be inside the Museum Box. Students were intrigued by that and thought that there could be some objects inside. I opened the box and revealed folded papers with questions (Table 6.2). The questions were carefully designed to encourage students to think about the multiple ways and means of communication in a museum, how it differs from a school and their home, as well as derive core knowledge about these students' museum experiences. Initially students were reluctant to discuss about their experiences, but gradually they engaged in lively conversation, despite the language barriers, and seemed genuinely interested in the discussion. Providing the questions in English, Greek and Russian enabled participation in this activity.

Table 6.2: The questions asked for the Museum Box Activity in English, Greek and Russian

What does a museum look like?
What does a museum sound like?
What does a museum feel like?
Have you ever been to a museum?
Do you know any famous museums?
What was the most impressive thing that you found in a museum? What did you like the most?
What would you like to see in a museum?
What kind of museums are there?
Why do museums exist?
Who runs a museum?
Who determines the content of a museum?
What do museums do?
What are they for?
What is a collection?
Why do people collect?
What is the role of objects?
How do we value objects?
How and why do they collect?
How are their objects catalogued and stored?
When and where are their objects displayed?
How are museum objects experienced?
What is a museum object?

Findings of the students' pre-visit attitude survey are summarised in Table 6.3.

Table 6.3: The modes and percentages of students' pre-visit attitudes towards museums (N = 17)

Attitude statements	Mode	Percentages
i) Museums sound very interesting to me	2	56
ii) Museums are fascinating and fun	3	43
iii) I enjoy visiting museums	2	65
iv) I have good feelings towards museums	2	42
v) I would have liked to visit museums more often	2	44
vi) I feel more relaxed in a museum environment than in a school	3	54
vii) Museums are places worth visiting as they are stimulating for knowledge	3	41
viii) I am very interested in doing practical work about virtual museums	4	68

Note: 5 = strongly agree; 1 = strongly disagree

Findings in Table 6.3 show that 56% of the students were undecided whether they disliked museums or not. With respect to the teaching and learning methods, 68% of the students indicated that they are interested in doing practical work involving virtual museums. On the other hand, the activities revealed that this group of students had limited or none experience of visits to museums in Cyprus or abroad. Only three students out of the thirteen mentioned having visited a museum more than once in their life. However, it was apparent from the discussion that the majority of students were keen to explore virtual

museums and seemed mostly interested in topics related to nature, animals and technology and mentioned films, games and online sources related to these topics. In discussing what sort of museum they would be interested in visiting they mentioned a natural history museum while they did not seem familiar with certain terminology used at the museum such as collections, exhibits, diagrams etc.

6.3.2 Pre-intervention classroom observations

This section presents a situational analysis of the teaching and learning in the classes of the primary school where the final research took place. I conducted two semi-structured classroom observations in targeted classrooms during this preliminary stage of analysis in May 2012, in order to gain insights into the current situation of teaching and learning focused on teaching practices related to multiliteracies pedagogy.

Field notes from structured observations of teaching practices using guidelines by Anstey and Bull (2006) (Appendix 2B) facilitated the evaluation. Overall, what derived from the observations in relation to teachers' literacy practices is a lack of systematic use of the lifeworlds of students apart from their school-based worlds. Further to this, teachers used restricted semiotic systems; they were mainly focused on print texts rather than live and electronic texts. In our conversations it appeared that not all teachers were familiar with a range of texts and semiotic systems, therefore they were reluctant to use them in their lesson.

The teachers' approaches influenced students' behaviour and attitude towards literacy activities. In particular, it was found that the students showed a general lack of interest in print-based reading and writing activities, and failed to perceive the purpose and relevance in school work; that they made 'minimalistic' efforts to complete and present school literacy tasks; that they were disruptive, easily distracted and difficult to motivate within the classroom; and that they lacked 'self-esteem' and confidence as learners. On the contrary, within the limited opportunities for engaging in multimodal literacies, students seemed far more engaged and interested to participate and teachers

reported positive learning outcomes even for the culturally and linguistically diverse students. Students' were keen to use digital forms of literacy practice, engage in literacy in active, public ways (such as debating, drama, public speaking), and were eager to engage with 'real-life' literacy contexts and 'real-life' literacy practices. This can clearly be seen as positive aspects of these students' literacy engagement and achievement.

To supplement the observations I conducted focus group interviews with students. In particular, after reading an audiovisual comic strip (Appendix 6A) students were asked to fill in "Diary notes", a short diary of their daily activities in and out of school (Figure 6.6). The intention was to compare how much students learn through attending to still and moving images in their home context and how often these still and moving images are used for learning in classroom and elsewhere; thus revealing their frequency of engagement in literacy practices and the kind of literacies employed. Therefore the students were asked:

- To name a daily activity
- To name the means used to perform an activity (semiotic systems)
- To explain the reason for using/doing this activity

As I wanted to retrieve information on the level of understanding of these students regarding their literacy experiences the following questions typical in a literacy activity were implemented in the retrieval chart:

- To describe something they know from before that helps them complete this activity
- To mention what this activity/task reminded them of
- To describe what needs to be done to complete this activity/task

The important starting point is what students already know, asking them to use prior knowledge and connect this with new knowledge. This is referred to by Cope and Kalantzis (2005, p.45) as a "knowledge journey" which is a common activity in a

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Pedagogy of Multiliteracies. The former is of particular importance according to Cope and Kalantzis (2005, p.47) as it can provide unique insight understanding of the person's thoughts and ideas when experiencing the known and how this links to new knowledge.

Activity	Symbol-means	Reason for using it	Something that I know and helps me complete the activity	This activity reminds me of...	To complete this activity I must...
Finding pages on the web that have information on animals in extinction -that habitat in Cyprus	*Visual, linguistic, auditory*	*To find information for my assignment in Science lesson.*	*How to use search machines and how to save a file/image.*	*The last time I had to look up for something on the web for Science lesson.*	*Choose among animals in extinction only those found in Cyprus*

Figure 6.6 Diary Notes Worksheet with examples for each category (Pre-test)

Based on the students' answers in relation to their literacy practices in the 'Diary Notes' Worksheet, there was an indication that most of these students were becoming multimodally literate; it was derived from their answers that they engaged in digitally mediated practices on a daily basis. Despite this, it was noteworthy that they had difficulty analysing their literacy practices and be critical on their decisions which suggested a low level of higher order thinking. Importantly, the discussion with these students indicated that those coming from different cultural and linguistic background appeared to have more difficulty than others finding examples to justify their responses and express their ideas, probably because they lacked the necessary vocabulary. Considerably, these students' family backgrounds and the support their families provided them were also significant frameworks to consider in regards to their lack of engagement and achievement in conventional literacy work (Alloway et al., 2002).

The findings from the interviews prompted the idea that teaching explicitly based on the content and form of multiliteracies pedagogy might be challenging for students who have limited experience in developing a metalanguage – to describe and evaluate meanings created by the relationships between image and word, or between images themselves (Kress and van Leeuwen, 1996). A review of provincial documents for the introduction chapter had confirmed that the Cypriot school curriculum had only started to include lessons targeted at multiliteracies in 2011. Therefore, ways to develop a learning design that would accommodate the age and cognitive development of the primary students in the sample while serving the purposes of the learning framework and the research overall were explored.

In addition, ability levels, and the interaction of ability and home environment, constituted the most important reasons why they lacked confidence in their literacy practices. All these parameters together with discussions with the school principal, teachers and parents as to gain more in depth information on the students' background informed the design of the project. The support from the school and their openness to allow to the research were critical to the success of the intervention. It was the data about students' classroom behaviours and low achievement, which informed the design of the museum-school partnership in Phase 2 of the research to construct appropriate programmes of interventions.

6.4 Implementation of the LMP: Major Literacy Events within the virtual museum making practice

This section provides a short overview of the LMP (version 3) involving work with the 17 students and two schoolteachers described above. The decision was that I carry out 13 sessions as part of the Living Museum Partnership. For each lesson I prepared a flexible plan of action together with the school teachers and engaged in informal discussions after each lesson and planned for the next lesson. The intervention was delivered between 27 September and 27 December 2012, the components and activities of which are presented in Table 6.4.

Table 6.4: Intervention schedule for the field stage of the LMP

Date	Activity
27/9/2012 4/10/2012	Week 1+2 *Induction stage* "Making sense of the world"
11/10/2012 18/10/2012	Week 3+4 *Immersion stage* "Resource Collection"
25/10/2012	Week 5 Prior to museum visit *Immersion stage* "A world full of museums"
1/11/2012	Week 6 Museum Visit *Immersion stage*
8/11/2012	Week 7 After the museum visit *Immersion stage*
15/11/2012 22/11/2012	Week 8+9 After the museum visit *Creative stage*
29/11/2012 6/12/2012	Week 10+11 *Creative stage*
13/12/2012 20/12/2012	Week 12+13 *Transformation stage* Resource Collection
27/12/2012	*Museum day* Follow-up interviews with teachers and students

The weekly sessions took place during normal school time and within the 80 minute periods of a single subject. The content of the lessons was designed to align significantly with the national curriculum for Environmental Education in Grade Five and Six, based on a common chapter "Endangered species". Above all, the attempt was to implement the project without causing disruptions in the normal class routine. This was succeeded with the assistance and openness to the research exhibited by the two schoolteachers immediately affected. Nevertheless, it was a complicate task as the student group comprised of students in two classes. Due to financial constraints and difficulties in relation to interrupting the school programme, the decision was to undertake a single museum visit in Week Six.

One significant point in the field study for the evaluation of the LMP was the discussion of the progress of the project with both teachers and students. Longer periods of reflective meetings with the two teacher participants in the class and museum, as well as reflection during recess with students were valuable to ongoing evaluation and arranging the next steps of the learning process as well as ensuring a more relaxed atmosphere and establishing a greater level of trust, feelings of belonging and bonding. Reflective practice is crucial in the multiliteracies framework of thought as a formative means of assessment.

Part Two: Evaluation of the intervention

The remainder of this chapter addresses the practicality and effectiveness of the intervention through emerging themes identified from the evaluation of the LMP using the criteria described in Table 6.1. Supplementary to the observational field notes and the active participation as a teacher-researcher, the teachers and students were asked to express their views within the parameters of the LMP through means of interviews, focus group discussions and storytelling completion.

6.5. Evaluation of students' cognitive learning outcomes

This section examines aspects of the cognitive level evaluation and learning variables (Table 6.1) to address the links between the intervention and improvements in student learning outcomes. Despite there was not sufficient time to assess student learning outcomes in the multiliteracies framework of thought applied, still it was important to see the practical knowledge and skills gained following the LMP. Nevertheless, summative indicators of student achievement such as assessment results, scores or grades through standardised examination (Guskey and Spark, 2002, p.5) were not preferred to measure the learning outcomes. Instead, Bloom's Digital Taxonomy proposed by Churches (2009) and ongoing assessment of students' work was thought more appropriate within the parameters of the partnership as measures of students' attitudes, study habits, and classroom behaviours (Guskey, 2000; Joyce and Showers, 2002). Therefore, the impact of the LMP on student learning outcomes was examined using findings from Bloom's Digital Taxonomy Activity Analysis Tool (Appendix 2K), the students' attitude questionnaire (Appendix 2Fa and 2Fb), and the school teachers' follow up questionnaire (Appendix 2G) and reflective interviews (Appendix 2Hb).

Bloom's Digital Taxonomy Activity Analysis Tool by Churches (2009) was used to measure student learning and understanding of the topic of '*ecosystems and endangered species'.* This type of assessment of the students' attained performance is useful for lesson planning, rubric making, and any other task involving planning and assessment strategies. Its particular focus is on using technology and digital tools to facilitate learning. The span of the digital taxonomy begins with lower-order thinking skills (LOTS) starting from remembering and moves on to creating and higher-order thinking skills (HOTS). The Activity Analysis Tool (Appendix 2K) was completed for each of the activities of the LMP and evaluated using the respective elements of each of the power verbs according to the Bloom's Digital Taxonomy. This aligned with the multiliteracies framework of thought. The end goal within the transformed practice component complies with the higher end of Bloom's Taxonomy. These are the problem solving and critical thinking skills the students need.

Table 6.5 The construction of the achievement test based on Bloom's Digital Taxonomy Analysis

Subtopics Covered	Assessed Bloom's Digital Cognitive levels						Total Test Items
	Remembering	**Understanding**	**Applying**	**Anlysing**	**Evaluating**	**Creating**	
Concept of classification as endangered, vulnerable, threatened, near extinction	1	-	-	1	-	-	2
Classification systems	2	2	-	2	2	-	8
Major groups of:	1	3	-	2	1	1	8
Ornithologists	-	2	1	-	1	2	6
Aquatic biologists	1	1	2	1	1	1	7
Zoologists	1	2	1	1	2	-	7
Fast facts	1	-	1	1	-	1	4
Total items by weight	**7 (16,7%)**	**10 (23,8%)**	**5 (11,9%)**	**8 (19%)**	**7 (16,7%)**	**5 (11,9%)**	**42 (100%)**

Findings in Table 6.5 suggest that the students' performance was measured against the six levels in the Bloom's Digital Taxonomy namely; remembering, understanding, applying, analysing, evaluating, and creating (Anderson and Krathwohl, 2001). Remembering measured the ability of students to recall definitions, facts or lists in the topic of 'endangered species' and 'ecosystems', understanding measured the ability to explain the ideas or concepts taught, applying measured students' ability to use the knowledge or procedures learned from the topic in everyday situations for products like models, presentation, interviews and simulations. Analysing involved breaking down the concepts learned into parts, and determining how the parts relate or interrelate to one another or to an overall structure or purpose. This stage involved differentiating, organizing and attributing as well as being able to distinguish between components. Evaluating, which was the next step in Bloom's taxonomy, involves making judgements based on criteria and standards through checking and critiquing. Finally, the next step which adheres to higher-order thinking skills refers to putting together elements to form a coherent or functional whole; reorganising elements into a new pattern or structure through generating, planning or producing.

Analysis of the scores for each of the cognitive level in Bloom's Digital Taxonomy was conducted using the statistic software IBM SPSS. The descriptive (mean and standard deviation), and inferential statistics (independent samples *t-test*) were used to determine whether there was a statistically significant difference between prior and after the implementation of the LMP (Pallant, 2007). Bloom's cognitive levels informed the comparison of the two stages for the students involved. The results from this analysis are presented in Table 6.6.

Table 6.6: An independent samples t-test results for the achievement test

Test items and cognitive levels	Prior to implementation of the LMP N = 17		Following the LMP N = 17		*	**Effect size (*eta squared*)
	Mean	Std. D	Mean	Std. D		
Remembering (5 items)	3.8	1.13	3.0	1.45	001	.09
Understanding (13 items)	7.8	1.96	4.9	2.80	000	.26
Application (5 items)	2.4	1.07	1.8	1.19	009	.05
Analysing (7 items)	7.5	1.94	4.9	2.50	004	.26
Evaluating (9 items)						
Creating (5 items)	2.4	1.17	1.5	1.13	009	.05

Note: *is significant at p < 0.05 (2-tailed) **effect size: .01 = small effect size; .06 = medium effect size; .14 = large effect size (Cohen, 1998).

What is evident from the results in Table 6.6 is a statistically significant difference in the mean scores between the two stages in terms of the measured Bloom cognitive levels, (i.e. *p < 0.05).* The effect size statistic (Cohen et al., 2007) which refers to *eta-squared for the t-test* intended to find the magnitude of the differences between the mean scores for each of the cognitive levels addressed. The effect size for the understanding, applying, and analysing levels was significantly larger and indicated increased levels of understanding of the topic of '*ecosystems and endangered species'* by the students.

6.5.1 Students' perceptions and experiences with the new approaches

In order to address the effectiveness of the LMP, a post-intervention story completion using the multimodal tool and three focused group discussions with five or six students each (Appendix 2Ic) investigated the learning and affective outcomes such as students' attitudes towards museums and ecology as well as the new approaches implemented during the partnership. These findings were employed to triangulate findings from Bloom's Digital Taxonomy Activity Analysis Tool and gain in-depth students' perceptions and experiences about the museum multiliteracies-based approach and the LbD Model. Findings from the focus group discussion were distinguished in: students' reactions to the LMP components and activities, students' opinions about learning from the LMP, students' perceptions of their teachers' role as a facilitator.

6.5.1.1 Students' reactions to the workshop components and activities

A post-intervention questionnaire conducted at the end of the LMP was used to elicit data on students' reactions to the different aspects of the partnership (Appendix 2Eb). Findings suggested that the students' overall impression about the LMP was positive (Table 6.7). Students' reactions in terms of their stated views are summarised in Table 6.7 using the modes and the frequencies.

Table 6.7: Students' overall perception of the workshop (N = 17)

LMP workshop	Mode	Frequency
Was according to my expectations	4	7
Was useful to know what is a virtual museum	5	9
Was relevant to my previous experiences	4	10
Enhanced my digital skills	5	8
I found it interesting and fun	4	7
LMP classroom based sessions		**Frequency**
Were according to my expectations	4	12
Were meaningful to learn about creating a virtual museum	5	7
Were relevant to my previous experiences	4	9
Enhanced my awareness of endangered species	5	11
I found them interesting and fun	4	4
LMP museum educational programme		**Frequency**
Was according to my expectations	5	6
Was useful to know about endangered species	4	12
Was relevant to our virtual museum project	5	9
Enhanced my awareness of museums	5	10
I found it interesting and fun	3	9

Note: 5 = strongly agree; 1= strongly disagree

Findings in Table 6.7 suggest that the LMP workshop met the expectations of 15 students out of the 17 (Mode = 4). Twelve of the students stated that the workshop was

useful to enlighten them about what is a virtual museum, and enhanced their digital skills on how to develop virtual museum exhibits (Mode = 5). Students' opinions on the extend they valued the 13 sessions of the classroom based sessions are summarised in Table 6.8.

Table 6.8: Students' opinions about the classroom based sessions (N = 17)

Classroom based components	**Mode**	**Frequency**
Situated practice	4	8
Overt instruction	5	11
Critical framing	3	4
Transformed practice	3	5
Feedback and reflection	4	6

Note: 5 = very good; 1 = very poor

As it appears from findings in Table 6.8, the overall opinions of students about the classroom based sessions and activities was positive. Students appreciated the alternative approaches and the connections with their real-life experiences during the situated practice stage (Mode =4). In addition, they appeared confident about the activities related to conceptualising by naming and by theorising which adhere to the Overt Instruction component (Mode =5). Although they found it a bit more difficult to engage in activities during the Critical framing (Mode=3) and Transformed practice (Mode=3) stages, students' impression and feedback was also overall positive. Even among the culturally and linguistically diverse students it was evident that they felt comfortable and gained confidence in their competencies which derived from the museum multiliteracies-based approach and the LbD Model. For example in the focus group discussions, it was mentioned by two students (S4, S9) that:

> Our work during the lessons is not as interesting. I enjoyed using the WebQuest, it was more fun. I liked the activities and it was great that we got to work with pictures, video, sound and more (S4, from Grade Six).

I would prefer that the lessons are always like that, using computers. I particularly liked how the WebQuest was built, I think it helped me during the process and it developed our creativity skills (S9, from Grade Five).

In addition to these, students perceived engagement in the virtual museum making practice as of the most interesting topics they had engaged with in the current school year. One of the students stated:

I was quite impressed by the way virtual museums work and thought it was fascinating we could actually create our own museum. I loved the way the lessons were planned, it didn't feel like school at all. (S5, from Grade Five).

In the same vein, five students (S1, S2, S4, S6, and S7) from the second focused group indicated that the way the lessons unfolded enhanced their thinking. Indicatively, one of these students stated that:

I thought every lesson was so well organised and it was never boring. I couldn't wait for the next week's lesson. (S6, from Grade Six)

6.5.1.2 Students' opinions about learning from the LMP

To judge the impact of the LMP at the cognitive level according to Collins et al. and Rogoff's level 1 (Table 6.1), I focused on students': acquired knowledge and enhanced understanding in terms of the new knowledge and taught concepts for 'ecosystems and endangered species' as well as for 'virtual museum making practice'. This refers to what they believed they learned from the LMP in their own words in terms of new knowledge and their demonstrated understanding of the concepts taught.

Students' opinions about their learning during the LMP was measured using closed ended statements in the multimodal tool sequence used and open question posed during the group discussions (Appendix 2Ic). Table 6.9 shows the students' responses to

the closed statements.

Table 6.9: The students' opinions about learning from the LMP (N = 17)

LMP components and activities	Mode	Frequency
After participating in this project I feel more aware of what ecosystems are and endangered species	5	12
The workshop activities and using the WebQuest were really helpful for me to be better prepared on how to create the virtual museum exhibits	5	9
After studying the materials provided in the WebQuest with my team, we were able to respond appropriately in the different activities	4	10
Preparing storyboards and diagrams was useful for our planning in the group and assisted me personally to understand more about the topic of our project	5	9
After completing this project I am confident I can create any type of virtual museum exhibits using the online tools and other strategies learned	5	8
I think that I have actually learned stuff which are meaningful and would like to know more on my own about endangered species	5	9
I believe I have understood most of the concepts discussed and explored during the project	5	10

Note: 5 = strongly agree; 1= strongly disagree

One inference from the findings from Table 6.9 is that students were particularly intrigued by the concept of the virtual museum. They felt that they could appropriately

engage in the development of any sort of virtual museum (Mode=5) and were able to respond adequately to the activities involved in the WebQuest. Through the web museum platform students could learn at any place and any time provided that they had internet access. Students seemed engaged by this idea. This alternative means of using materials for their learning, supported the unobstructed access to learning, characteristic of ubiquitous learning (Cope and Kalantzis, 2008, p.579) in that it blurred the boundaries between the school and the outside world. One student characteristically notes:

> I think museums are nice places but I prefer online ones now that we have created our own because I can enter from the screen of my computer at home and learn everything. It's easier and more fun like that. (S11, from Grade Six)

Noticeably, students reported accessing the WebQuest from their homes to continue working on the project or show their work to their parents. In this sense, the WebQuest contributed to creating a link between these students' schoolworld and their lifeworld (Cope and Kalantzis, 2000). As answers to question 7 indicate, the students considered that they learned meaningful stuff and were keen to explore more about endangered species.

> I enjoyed the lessons and the topic in particular as I love animals. I used to go home and do extra search online to see what more I could find out that would make our virtual museum wing better (S12, from Grade Five)

Students generally expressed the perception that the WebQuest was helpful, and when asked more specifically, they mentioned that the visual nature of the WebQuest enhanced their understanding. The former confirms other research that the visual, kinaesthetic and auditory forms of computer-assisted activities motivate students (Passey, Roger, Machell, McHugh and Allaway, 2003, p.7).

6.5.2 Teachers' perceptions about the LMP

To triangulate the findings from students' interviews and the field notes, I conducted reflective interviews with teachers to understand their viewpoints regarding the implementation of the LMP and the prospect to incorporate the museum multiliteracies-based approach in their classroom practices. Findings from the discussion were distinguished in: teachers' perceptions about the changes in students' attitudes and the prospect of using the new approaches in their teaching.

6.5.2.1 Teachers perceptions about the changes of students' attitudes

What was evident from the two schoolteachers' reflective interview (Appendix 2Hb) is that students' active engagement and positive stances towards the sessions and the LMP overall, inspired teachers to consider a more systematic implementation of the museum multiliteracies-based approach and the LbD Model. The following quotes were provided by teacher T1 from Grade Five.

> My students seemed to have enjoyed every session. I could see their smiles before and after the session. They were genuinely interested to participate in the classroom activities from asking questions, to filling in diagrams, drawing on the storyboards and presenting their findings to their peers … Especially when engaging activities using the WebQuest, it was evident that they were intrigued and motivated whereas during the regular lesson I have to beg for their involvement (T1, from Grade Five)

Similar to T1, T2 from Grade Six affirmed that students were enthusiastic and proud about their participation in the museum-school partnership. He mentioned:

> I sincerely felt that my students, even those with low performance were keen to be engaged in almost all of the activities. The willingness was there unlike usual lessons. I thought they were even more confident in explaining lesson concepts and ideas during the project, and critically reflected on others' presentations or

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findings (T2, from Grade Six)

These findings from teachers' reflective interviews complied with the findings from classroom observations, field notes and students' group discussions regarding enhanced student involvement in the learning process with positive outcomes.

6.5.2.2 Teachers' perceptions about the activities and the use of the new approaches

Teachers were asked to comment on the content, process (delivery), and context of the LMP. Their perceptions were examined by the closed statements presented in Table 6.10.

Table 6.10: Teachers' perceptions about the content, delivery, and context of the LMP (N = 2)

LMP content, process, and context	Mode	Frequency
Content		
The knowledge and skills gained from the LMP are useful for improving my teaching practices	5	1
My time as a facilitator was well spent	5	1
Delivery		
The LMP activities were well planned and organised	5	2
The museum multiliteracies-based approach supported by the LbD Model and the lesson materials are immediately useful to my teaching	4	1
Sufficient time was provided for accomplishment of activities	5	1
The researcher was well prepared	4	2
Context		
The resources and facilities were sufficient	4	2

Note: 5 = strongly agree; 1= strongly disagree

Findings from Table 6.10 suggest both teachers found the knowledge and skills gained from participation in the LMP as facilitators as useful to their teaching practice.

They agreed that each of the session activities were well organised and addressed explicitly the learning and affective goals of the partnership, as indicated by T1:

> I know we can definitely benefit from using this approach in our teaching. I am confident that it is this sort of teaching and learning practices which can help us teach for the 21st century. (T1, from Grade Five)

Discussing on the efficacy of the new approaches, teacher T2, mentioned:

> I learned that the museum multiliteracies-based approach and the implementation of the LbD make students actively engaged in the lesson while it enhances their understandings of the concepts taught compared to the method I used before. (T2, from Grade Six)

Concerning the LMP programme setting, both teachers posited that the learning environment was conducive in terms of venue, resources, and materials. In respect to students' involvement in the LMP and learning from session activities, T1 expressed her view that the new approaches facilitated students' motivation and they seemed especially interested in the digital elements of the project:

> I learned many useful things on how to incorporate use of multimodal other than print texts in my teaching. I feel that students were both motivated and learned more easily when engaged in this sort of practical work. They enjoy the lesson and become interested in taking up different tasks, even difficult ones (T2, from Grade Six)

An important point was raised with regards to the situated practice component as teachers addressed how students' prior knowledge and experiences was meaningfully incorporated into teaching and learning practice to introduce students to the topic and was followed through as an approach throughout the LMP:

I was particularly intrigued by the LbD instructional sequence…the knowledge processes are a clear pathway for teachers to plan their lessons and I could see how theory was turned into practice. Importantly for my students, incorporating the situated practice element by considering their previous experiences is key to get them motivated and I should identify experiences they bring to the lesson (T1, from Grade Five)

Both teachers appeared inclined to use the experiences of the LMP and curriculum materials to guide implementation of the new approaches in their classrooms (this finding complemented the last statement in Table 6.9). The following quotes by the two teachers from Grade Five and Six respectively are characteristic on how they expected to integrate the new approaches in their daily lesson planning and teaching:

I think it will be challenging at first yet I would like to try for planning supporting materials for my lessons since I would like to consider using students' prior experiences as well as implement use of more digital sources and museum learning (T1, from Grade Five)

Yes I will uptake this approach since I could see how it benefited my students. I have struggled to help them, especially those coming from backgrounds other than the dominant one, and I genuinely feel that the approach implemented will improve their performance. (T2, from Grade Six)

On the other hand, T1 was not as positive that teachers would have enough time to prepare adequately and with such detail for every lesson according to the MMP. She cautioned that based on her experience, it could be difficult for students to adapt in this kind of teaching in all subjects and it would take time for them to become active participants. Overall, findings in Table 6.11 indicate that both teachers agree to plan and teach differently based because of the knowledge and skills acquired from the LMP (Mode = 5). To a larger extend, these findings suggest that the LMP altered teachers' preconceptions on their lack of sufficient knowledge and skills to plan and organise lessons

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based on multiliteracies pedagogy.

6.6 Evaluation of students' interpersonal development

This section addresses aspects of evaluation at level 2 of Table 6.1, looking at student-student and student-teacher interactions during the implementation of the LMP. The intention was to analyse the data derived through means of observations during the fieldwork and supplementary focus group discussions in respect to how well teachers and students interact and how they bonded with each other in a way they extended their respect and helped each other as the partnership unfolded.

6.6.1 Student to student interactions

An important inference from the LMP was that students engaged with their peers and within the broader environment of the partnership with improved confidence while also demonstrated personal self-esteem and good social organisation skills. Characteristically, teachers drew attention on two students who lacked self-esteem and appeared to benefit in their literacy learning and the literacy classroom during the LMP. This self-esteem problem was thought to affect these CLD students' performance in other areas as well as other aspects of their behaviours at school, such as their willingness to read aloud and show up in class which seemed to have improved over the course of the LMP. Indicative of this improved performance are the following teachers' statements:

> It is certain that for Lisa, there is a lack of self-esteem problem … still definitely has a low self-esteem, very low self-esteem yet it was visible that during the workshop and for the computer lab activities, he was able to communicate more effectively with his peers and bonded with his team members. I was impressed. (T2, from Grade Six)

> My low literacy students, for instance Marco, a lot of it results from having low confidence and low self-esteem in speaking in public since his first language is

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Russian. Nevertheless, despite his initial hesitation, I could see how he gradually improved since the LMP was initiated and he is now more willing to read aloud and be present during the different group activities rather than be invisible. (T1, from Grade Five)

Teachers specifically mentioned how they had tried different strategies to enhance students' confidence yet without much success and the approaches during the LMP seemed to have restored up to a certain degree their lacked confidence. Overall, there was an indication that the CLD students were more engaged in the intervention than they were in their everyday school activities and felt comfortable sharing their personal stories and experiences (observation notes, week four). Indicative is the statement from the Grade Six Teacher. He noted that:

> I could not believe that E. was so enthusiastic about it all. She is usually distracted and does not show interest nor is confident to participate in any of the classroom activities. So surprised to see him behaving so well and contributing to the class (T1, from Grade Six)

The previous statement is only one example of a student who was characterized by both the principal and the classroom teacher as a 'troubling case' because of her behaviour and lack of interest as she did not know the Greek language and spent most of her time disturbing her classmates. Surprisingly, over the LMP this student unfolded many aspects of his personality and blended well with her peers. Her progress during the intervention was noted by other students as well.

> At first she sat next to me because I was the only one she talked to. Later, she didn't need me, she was comfortable talking to more people and helped us a lot with the stories she told us from her country's traditions. (S2, from Grade Six)

I did not know she knew so many things, she was always distant and not easy to talk to. I was surprised to see she could help us with all the information we had to gather for creating the museum room. (S9, from Grade Six)

Findings from this interpersonal aspect of the evaluation of the partnership indicated that the intervention evolved as a community of practice in that students appeared to benefit from the collaborative learning dimension (Kuhn et al., 2000; Vygotsky, 1978) of the project both by learning on their own but also while learning with others in the group (Looi, Chen and Ng, 2010). The next section addresses student to teacher interactions which were also considered as elements of the community of practice nature of the intervention.

6.6.2 Student to teacher interactions

An important and clear inference from students' responses regarding their perceptions from the interactions with myself and other teachers was how they seemed to benefit and appreciate this sort of scaffolding and support. The instructional approach whereby the teachers acted as facilitators of learning rather than authoritative to the students' work, seem to create a learning environment which allowed students to provide their prior knowledge and experiences while enabling a dynamic student role. Findings of classroom observations and field notes confirmed that the new approaches enhanced student involvement in the learning process. This permeated all of the activities in the WebQuest as students immersed into the process of design and creation of the virtual museum exhibit as both novices and facilitators (Savva, 2016b). Students were able to lead their own investigatory activity and were actively involved in constructing their own knowledge rather than being passive listeners (Kuhn et al., 2000, pp.496–497). The following quotes were provided by students about teachers' facilitation:

I thought it was great that we got to decide the topic for our museum and then which pictures to load, how many information to put in the labels for each object at the museum, well I enjoyed that. This is not how we do the lesson usually (S4, from Grade Six)

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I thought it was great the way the teacher left us work on our own and only interfered to correct our mistakes or encourage us to ask questions if we didn't understand anything about the lesson. (S2, from Grade Six)

Another student commented on teachers' support during the lesson:

It was great that the teacher only provided instructions through the WebQuest. I found it interesting and I could see he was trying to guide the practical activities, yet he was not interfering as much like usually in the lesson and we could test our ideas more freely (S3, from Grade Five)

These findings indicate overall positive gains that parallel technologically-enhanced intervention studies which facilitated WebQuests through student engagement in group work with more student 'ownership and responsibility for their own learning' (Looi et al., 2010, p.24) and for their peers. Responses from the post intervention student evaluation questionnaire indicated that 13 of 17 students were positive regarding the teachers' approaches.

Teachers' reflective interviews suggested that similar to the students, teachers also gained a sense of contentment and thought their role as facilitators was meaningful to CLD students in particular. Commenting on student-teacher interactions, teacher T2, reported:

I felt that I was much more helpful with this type of scaffolding approach and also that you (the researcher) were also better communicating with the students through your supporting approach. (T2, from Grade Five)

The other teacher, (T1) expressed her feelings on how teacher-students interactions were more genuine and meaningful during the LMP. This was reported in this quote:

I got to appreciate students' voices, I felt that the role of the facilitator is far more

suited to these students' needs and encouraged them to engage in practical work and express themselves (T1, from Grade Six)

6.7 Evaluation of students' group/classroom development

The assessment of the intervention at the third evaluation level (Table 6.1) addressed issues of participant structure, group identity, and authority relationships. The intention therefore was to evaluate group dynamics as a whole using observations and field notes, as well as insights from teachers' reflective interviews. The emerging themes from this type of analysis into the LMP resulted in findings concerned with issues of a sense of belonging in the group, levels of participation and engagement and the discourses within the peer groups and overall partnership.

Observations of group dynamics suggested that students were conversant in, and confident with, discourses of their community and peer groups. In the pre-intervention interviews, both teachers reported how in many occasions, these CLD students were effectively engaging in their local communities, yet were often ineffective in their school communities. In other words, while these students were competent and effective language users in their social and cultural contexts, in the unreal language contexts of the classroom, they were failing to effectively participate and master language requirements. Teacher's 1 from Grade Five comments are characteristic:

> You will be surprised to see them in action. These students work great under pressure in their local communities, I have seen how they interact with their peers and elders and it is nowhere near the way they function at school. When it comes to the structured format of the lesson, it is there where they are underperforming. (T1, from Grade Six)

Nevertheless, within the 13 weeks of implementation of the LMP, it appeared that the boundaries between the schoolworld and the lifeworld of these students were blurred.

Positive benefits of group work were observed which ranged from teamwork and collaboration and these were confirmed by students:

> It was great that we could share our ideas in the group and combine them to create the rooms and the gallery. I think that the guidelines on the WebQuest helped us a lot to work together. Some of the tasks were difficult and I don't think I could do them on my own. Listening to others' ideas about it was great because I learnt a lot from them. (S4, from Grade Six)

> It was better to work with my classmates than alone. In this way everyone is assigned roles and has their own piece to contribute… and then we put all these together to make something really good! (S9, from Grade Six)

In addition to learning more from their peers:

> In the group you can see who is good in what areas and thus gets to work on that more. And then if you are weak at something, you will not be that involved, you do other things. (S3, from Grade Five)

> It helps us learn more about each other working in the group, we have to understand each other. And now that the project is over we know more about what things each likes, for example preferences for animals, feelings etc. (S5, from Grade Five)

There was also evidence of emotional support in the group:

> At first I didn't like working with other because I did not like all the people in my group. As the time passed, we learnt to work with each other and it was not easy but we succeeded a lot and I became friends with some of them [the students]. (S11, from Grade Six)

The field notes and observations in the classroom indicated high levels of group talk and participation during the completion of tasks. Students would talk to each other, raise arguments and ask questions, even provoke each other to find solutions to solve the problem (Kuhn et al., 2000). Through exposing different views in the group, students improved their capacity to acknowledge different perspectives on the same problem or situation and how to use this knowledge creatively to revise their ideas. In this sense, learners became designers of their experiences while working in groups, as collaborative knowledge makers (Cope and Kalantzis, 2008, p.581).

Another inference from observations of the group interactions is that students were provided with opportunities to express and celebrate their individualism with others and were acknowledged for their personal attributes. This points towards the realisation of being responsive and reflective to the "various 'subjectivities'-interests, intentions, commitments, and purposes – students bring to learning" (NLG, 1996, p.72). In this sense, for the majority of the CLD students involved in the LMP, they exhibited empowered subjectivities. Within the premises of the LMP, the students believed they were re-introduced to the school environment starting from a clean sheet when they engaged in this project, and thus felt comfortable sharing their personal stories and experiences. According to Cope and Kalantzis (2008, p.576) 'recognizing learner differences and use them as a productive resource', is characteristic of ubiquitous learning and can be promoted through multiliteracies pedagogy.

> I think that the best part was that I got to do what I was interested in. I could even talk about my trip last year to my dad's village and how people there support each other…And then I got to hear other children talking about what they remember from their home countries and we shared our ideas about how to create the virtual room (S1, from Grade 5)

Elements of the LMP like the workshop and the participation in groups for the activities of the WebQuest resulted in students starting to behave as scientists while they collaboratively identified problems through observation and inference, form and test

hypotheses, and deduce evidence based conclusions about underlying causes (Dede, Clarke, Jass Ketelhut, Nelson, and Bowman, 2005). Further to these, interaction with peers enhanced classroom participation and acquiring a sense of belonging, a satisfying identity, and stimulated imagination in particular for students who were coming from varied background. Participants revealed generally positive gains through the collaborative learning environment that was mediated via the WebQuest. The following are characteristic of students' views:

> I really felt great being part of the group. It is usually difficult for me to follow because of the language but in the group we were all keen to create the best room and I could contribute to the team because it was not all about writing… (S10, from Grade 6)

> I found the WebQuest really helpful to search for pictures and videos, the rest of the group wanted my help because I am good with computers, it was nice to be able to show them stuff (S12, from Grade 6)

> Above all, within the approach adopted in the intervention, it was important that all members of the group felt equal among others.

6.8 Evaluation of resources management

Another important level to consider for the effectiveness of the design of the intervention according to Collins et al. (2004) is the fourth one (Table 6.1). This refers to the available resources during the lessons and how well they fit into the learning process which in this study were examined through looking data gathered from field notes, interviews and surveys.

6.8.1 Students' lesson activities

One of the intended learning outcomes of the intervention was to develop multimodal awareness. The former was pursued through students' exposure to a range of semiotic resources using the WebQuest, as well as in the workshop and during the museum

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educational programme, and sensitivity to semiotic affordances and constraints, aligned with New Literacies (Gee, 2008) focal interests and emphases. The students were provided with opportunities to visualise and explore ideas or models embedded in visual imagery during the search for content for the galleries for their virtual museum. The sessions included writing tasks although these were minimal comparing to multimodal activities which are consistent with multiliteracies pedagogy. Findings of the post-intervention student evaluation questionnaire (Appendix 2Ea) indicate that students were actively engaged in the lesson activities. Table 6.11 provides lesson activities favoured mostly by students with sample reasons.

Table 6.11 Students' lesson activities mostly favoured with sample reasons (N = 17)

Doing practical work like experiments, investigations and other hands on activities (N=13)	- It was easier to understand concepts taught when immersed in actual work ourselves because we could see the changes happening - Having the teacher(s) show examples of 'real' work or models helped - We enjoyed working with materials to create the collections' room at the museum.
Working with digital and multimodal means (N=13)	- It was great that we could elaborate using digital means but also researching online. - We understand more by viewing rather than written form - The digital means and the WebQuest helped learn more things about animals with less effort
Discussions as part of their group (N=11)	- It was good to be involved in group discussions since we could share ideas - Facilitated understanding of the concepts taught by the teachers when our fellow students explained what they knew about the lesson
Presentation after discussion (N=10)	- It was a good idea to share the group ideas with the rest of the class to help us learn from others, and become more confident to present our own findings
Session delivery (N=10)	- Starting the lesson with the teacher showing pictures, a museum exhibit, a video or something similar online was a great way to motivate us and get us interested in the new lesson. - It was great that the concepts taught through different activities were connected with our lives. It made everything more meaningful - The reflective practice helped us realize what we had learned and where we lacked knowledge so that we go back the next time and learn it - The questions asked by the teacher and overall support was discrete and not pressing. It was helpful for us.

According to the findings in Table 6.11 most students preferred doing practical work and using digital and other multimodal means, such virtual exhibit creator software. A smaller number of students (N = 10) mentioned how they appreciated engaging in group discussions after presentations to their peers. The findings from the field notes and the final product created (the virtual museum) suggested that students' choice of multimodal resources focused on use of video and animated clips apart from still images. These findings are in contrast with Ho et al.'s (2011) research where students used predominantly still images and made limited use of other multimodal resources such as 3D models for AR artifacts. It is possible that focused and systematic exposure to multimodal sources would broaden even more students' frequency of adoption of multimodal resources.

The use of the WebQuest within the principles of the MMP framework served to fulfill the potentials of multiliteracies pedagogy through engagement of students with a variety of texts of great linguistic and cultural diversity, displaying knowledge and representation in multiple forms: print, images and combination of forms in the digital context. In this sense, it can be derived that there was 'a broadening of the range and mix of representational modes', which according to Cope and Kalantzis (2008, pp.579-581) relates to moves characteristic of ubiquitous learning. The process of compiling sources for the virtual museum using the links and guidelines from the webquest facilitated reflection on ways they articulate messages conveyed by visual culture.

> I think that pictures are very powerful, more than written text for sure. While when I read a text, I have to be much focused to understand it and sometime the language doesn't help (S10, from Grade 6)

During the process of selection of multimodal resources, students displayed a level of increased understanding of the intertextual nature and dynamic character of electronic texts. Specifically, they reported a level of 'critical awareness of and uptake of multimodal texts by taking into perspective the social aspects of literacy' (Savva, 2016b) and the impact of multimodal forms of expression:

I think that it was best to use as many ways as we could to make the virtual museum because people have different preferences and so they might like watching a video more, or listening to music than reading a text. So yes, it was important to use many means to make the museum easier to understand (S6, from Grade 5)

It can be derived from the above that students took the first steps towards becoming critically literate about the texts and social practices found online. This proved to be a significant step to critically engage with the text they employed or the choices they made.

I noticed how the author of the article I wanted to use for the museum was from Africa. I think it showed in the way he spoke in his text about freedom and I thought he must have experienced something that made him talk like that (S3, from Grade 5)

Table 6.12: Lesson activities less favoured by students with sample reasons (N = 17) from Appendix 2Ea.

Sharing teaching and learning resources (N=14)	- Due to lack of resources such as computers it was difficult to work collaboratively on different tasks. The classroom arrangement in the computer lab was such that did not allow to work as effectively in groups
Difficulty with some of the activities during the critical framing and transformed practice stages (N=11)	- It was difficult to respond to some of the questions and critically reflect on the lessons - It was unusual to engage in these sort of activities and not as fun because we could not reach to a conclusion easily

Findings in Table 6.12 show that most students (N = 14) indicated that they were not happy with sharing teaching and learning materials and resources during experimentation. Similarly, eleven students (N = 11) indicated their disappointments with some of the activities specifically during the critical framing and transformed practice stages. Both teachers' and students' responses to question No.5 in this questionnaire (Appendix 2Ea) about challenges or problems encountered when doing lesson activities indicated that the move from viewing semiotic resources as discrete units to making

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meaning through establishing purposeful interactive links across various resources (Luke, 2003) required further work. Although there was an intention to help students represent their knowledge in complex manners and encourage higher order skills, there was an apparent weakness in achieving higher-order abstraction and metacognitive strategies which are considered possible based on the affordances of ubiquitous learning.

> I just wrote the text as I would for any school task. I didn't look deep into why somebody wrote these things… I was only interested in writing the important parts and that is all (S1, from Grade 5)

> I don't think that it makes much difference having so many different media in the museum. Of course it is fun but I cannot think of any other reason for using them (S12, from Grade 6)

This indication of a lack of capacity for higher order thinking which was also evident in Bloom's Digital Taxonomy Analytical Tool, using deep understanding in new ways' (Anstey and Bull, 2006, p.60) could be explained in terms of students' lack of systematic engagement with similar activities in class (MOEC, 2012) and also the lack of sufficient time due to the nature of the intervention. The challenge was for students to work towards a meaningful synthesis, that is, shifting 'from collection to connection' (Luke, 2003, p.400) to establishing links and coherent flows across varied multimodal resources. It was not possible to a maximum degree for texts to be studied in their social context and from a range of contemporary social perspectives (Moore, 1997, Pope, 1998). The above suggest that there is still space for broadening students' perspectives on semiotic affordances and constraints (Norman, 1988), utilising various semiotic resources for metacognitive benefits.

6.9 Evaluation of institutional development

The last of the criteria addressed to assess the effectiveness of the LMP in this research was the institutional or school level. This fifth criterion according to Table 6.1 asks to consider how the institution's organisation and outside community influence the design's implementation process. This is assessed in this study through

the reflective interviews with the two teachers (Appendix 2Hb) on school culture and peer support for using the new approaches:

i) Resources – teachers' opinions that there were adequate resources, time or materials to facilitate the design and organisation of student lesson activities;

ii) School culture and peer support according to teachers' perceptions for implementing the museum multiliteracies-based approach and the LbD.

6.9.1 Teachers' perceptions about resource support

A total of six closed statements in the school support questionnaire were used to assess teachers' opinions and perceptions about the provision of materials and supplies necessary for implementation of the new approaches (Table 6.13).

Table 6.13 Resources support for school teachers (N = 2)

Resources support statements	Mode	Frequency
i) The physical conditions of the school environment enhanced my enactment of the pilot lessons	3	1
ii) Necessary facilities of schools were accessible when I needed them	3	2
iii) I had sufficient materials to use for planning and organising students' lesson activities	4	2
iv) I had a quiet place available to plan and discuss important elements of my work	5	1
v) I had sufficient time to plan and organise students' activities	4	1
vi) I had plenty of time to reflect on the museum multiliteracies approach and learning and adapt appropriately	4	2

Note: 5 = strongly agree; 1 = strongly disagree

Findings from Table 6.13 indicate that teachers were in general pleased with the physical conditions of their school and support in terms of materials for organising their lesson activities. On the other hand, reflection interviews with these teachers indicated that they were not confident that the school could adequately respond to the needs for implementing a museum multiliteracies-based approach on a daily basis. They considered that due to the scarcity of funds in these schools, it would be difficult to get the required materials or resources. Nevertheless, they felt it was possible to improvise and enact the new approaches as long as they thought it was meaningful for their students.

> It has never been easy to get funds for implementing a teaching method. Nevertheless, it is possible to find alternative ways and be practical with inexpensive solutions that will provide the same outcome. (T1, from Grade Five)

6.9.2 Teachers' perceptions of school culture and collegiate support

A positive school culture is key to educational innovations. This research explored the extent to which teacher participants in this research consider that their school administration and colleagues would support their efforts in implementing the new approaches. Table 6.14 presents findings about the nature of school culture and peer support.

Table 6.14: Aspects of school culture and collegiate support (N = 2)

School and collegiate support statements	Mode	Frequency
i) The school supports innovative and alternative approaches to teaching and learning	5	2
ii) The school administration was open to recommendations for improving instructional practices	5	2
iii) Fellow teachers supported my enactment of the new approach and appeared enthusiastic	4	2
iv) We frequently shared our ideas about improving our teaching practices	4	1
v) My colleagues frequently asked about improvements with my students	4	1
vi) I was able to visit the classroom of my colleagues and observe their teaching	2	0

Note: 5 = strongly agree; 1 = strongly disagree

It was evident from teachers' responses in Table 6.14 that the AP school encouraged teachers to implement the new approaches in their classrooms. This was affirmed by the informal discussions I had with the school headmaster prior to commencement of the LMP and the overall support to my research. In addition, most teachers in the school were supportive of the project and encouraged the teachers to participate in the implementation of the partnership and share their experiences with them. Myrto, teacher 1 from Grade Five, in discussing how their efforts were appreciated by their schools held:

> Yes, our headmaster was so enthusiastic of the project and encouraged us to participate in the research and see if we could implement the new approaches as he is interested into culturally responsive teaching and student centered approaches. (T1, from Grade Five)

Moreover, findings in Table 6.14 indicate that teachers do not often have the

opportunity to conduct peer classroom observations. This was attributed to heavy teaching duties and how it was not a common practice in Cypriot schools unless it was part of an official exemplary lesson for assessment purposes. In this perspective, peer meetings as part of the reflective process following each session and observing my enactment of the LMP was reportedly beneficiary and a valuable experience.

> My impression is that peer meetings enhanced my understanding of what previously happened in class and also how to use this feedback and reflective practice to enhance my teaching beyond the LMP in my classroom. It was great that I got to discuss with Andrew and yourself about the problems and challenges faced over the course of a session. (T1, from Grade Five)

Andrew (T2) emphasised on the benefits from sharing teaching experiences during peer meetings:

> Notably, it is great that we get to have these gatherings and reflect upon the sessions previously held. I consider it valuable since we could share insights and experiences with Myrto while plan ahead with you the learning materials for our lessons. (T2, from Grade Six)

In general, teachers indicated that there was a positive school culture and collegiate support and I could confirm the latter during the course of the 13 weeks I visited the school for the research.

6.10 Summary and critical reflection of the chapter

The implementation of the LMP using the museum multiliteracies-based approach driven by the LbD Model aimed to investigate the practicality and effectiveness of the programme in terms of improving the teachers' instructional approaches and students' learning while expanding their repertoires of literacy practices. Collins' et al. (2004) and Rogoff's five levels of evaluation as well as dependent variables guided the analysis of

qualitative and quantitative data derived from the fieldwork at the different stages of implementation.

Findings from the pre-intervention observations and interviews suggested that these students lacked confidence in engaging in multiliteracies due to limited exposure to the approach. Further, their museum familiarization was also limited or none, which was challenging in terms of getting them to engage in higher order thinking, which was a learning goal of the LMP.

Findings from the post-intervention evaluation suggested that students benefited in terms of the learning and affective outcomes from the LMP. In particular, they appeared to have gained an increased understanding of the concepts taught and an enhanced awareness on the topic of 'endangered species'. They were also confident in their ability to construct any type of virtual museum exhibits based on the knowledge gained from participation in the workshop activities as well as the rest of the classroom based sessions. Overall, they expressed positive feelings and increased interest and motivation to participate.

The implementation of the new approaches further indicated that this group of students, including the CLD, displayed improved subjectivities and were able to express themselves more freely during their interactions in the classroom or museum setting. Findings from the observations supported by teachers' reflective interviews cohort that students' appeared more confident and gained self-esteem during the LMP. Group work and researcher's and teachers' scaffolding encouraged students' to direct their own learning, meaningfully interact with their peers and resulted in improved collaborative practice.

Another inference elicited from findings from the resources evaluation of the LMP is that the multimodal engagement enhanced the meaning making practice of students although it was not possible for all students to reach higher order thinking. Nevertheless, it was perceived that a prologue engagement to the museum multiliteracies-based approach and the LbD would facilitate a more effective implementation of the LMP principles.

Finally, findings from the observation regarding the institutional support suggested that it would be possible for the teachers to adopt the proposed approaches for their teaching since for the most part, the school administration and colleagues were supportive of these initiatives. The two schoolteachers involved in the fieldwork, overall felt that the partnership was successful in its goals and was feasible to implement again in the near future. Despite their concerns and doubts to implement the pedagogies behind the LMP, both teachers were positive towards the prospect of using the MMP framework. The following chapter addresses specifically students' literacy performance in regards to the final implementation of the LMP.

Chapter Seven - Evaluation of students' repertoires of literacy practices

7.1   Introduction

The museum-school partnership, as argued in the previous chapter, with its design and implementation, proved to be effective. Given the philosophical standing of this research, tracking students' performance in particular through their literacy engagement and transformations was an essential part of the learning process (Kalantzis and Cope, 2005, p.89). In this respect, findings in this chapter answer the fourth research question: *How does the museum-school partnership affect students' repertoires of literacy practices?*

The chapter is divided in two parts: the first part after a brief explanation of the theoretical framing of the analysis and rationale for assessment, presents an overview of the findings from this evaluation for the participants involved. The second part, delves deeper into the findings focusing on one group's engagement in the museum-school partnership to examine the impact on these CLD students' literacy performances.

7.2 Theoretical Framing of Analysis

The notion of a 'repertoire' refers to a toolkit (Gutiérrez and Rogoff, 2003), 'an orchestrated set of capabilities and dispositions for acting purposefully in the world' (Alloway et al., 2002, p.127). In other words, it is people's ways of engaging in different activities as a result of participation in a range of cultural practices and thus developing 'cultural capabilities' (Pacheco and Gutiérrez, 2009, p.74). Mastery "of a repertoire is demonstrated in effective performance across a *range* of pieces and settings" (Alloway et al., 2002, p.127).

In terms of school learning, educators and practitioners should work to promote an enhanced view of literacy that seeks to expand students' repertoires of practice and reach their academic potential (Pacheco and Gutiérrez, 2009, p.74). Developing "such rich repertoires of practice" on behalf of the teacher can result in being better equipped to appropriately and effectively respond to the challenges of working with people from diverse backgrounds, cultures, and interests (Kalantzis and Cope, 2005, p.257). These students have already developed particular literacies in their families and communities as 'funds of knowledge' (Pacheco and Gutiérrez, 2009, p.75). The school based activities 'should add to this repertoire which continues to expand during and beyond school' (Pacheco and Gutiérrez, 2009, p.75).

On the contrary, for the most part, up until now, as the literature and preliminary context analysis indicated, approaches to literacy learning across all educational levels, have been overwhelmingly based around print literacy and written communication (Bailey and Pointon, 1994). Russell (2000, p.205) argues that "educational institutions have been dominated by a hegemonic print discourse". This has resulted in ignoring the resources available from students' out of school repertoires of literacy practices (Pacheco and Gutiérrez, 2009, p.74). Nevertheless, literacy instruction is and should change as a result of emerging technologies to provide educators with opportunities to enhance meaningful literacy practices (Leu, 2002) and 'learn *about*, *from*, and *with* their students' (Pacheco and Gutiérrez, 2009, p.74).

Crucially, Kalantzis and Cope (2005, p.160) suggest that the Learning by Design Model which was employed in this research is a means of expanding one's repertoire of practice. Grounded in both experience and theory, this approach facilitates "to decide which Knowledge Processes to deploy, using what tools or tactics, in which circumstances for what purposes" (Kalantzis and Cope, 2005, p.80). The following section will explain the rationale for assessment of students' literacy performances to evaluate whether the intervention using the LbD within the museum multiliteracies approach succeeded to expand students' repertoires of practice as they relate to changes in their literacy performances.

7.2.1 Multiliteracies Performance Assessment Zones (MPAZ)

In addressing the LMP in terms of its contribution to expanding CLD students' repertoires of literacy practices, essentially this chapter aims to analyse the changes over time on students' knowledge processes as the implementation of the LMP evolved. Kalantzis et al. (2005, p.87) clarify how the knowledge processes are "not a sequence to be followed". They refer to it instead as a kind of meta-pedagogy, a schema against which any pedagogy can be mapped" (p.87). In this sense the Knowledge Process framework, as "an analytical, diagnostic lens" (Kalantzis and Cope, 2005, p.148) becomes a tool for a knowledge process analysis/ evaluation for teachers to perform a diagnostic assessment of language and literacy programmes.

These conceptualisations were taken into consideration in this research. To assess how each student meets the criteria in each of the knowledge processes and define their level of performance, I developed the Multiliteracies Performance Assessment Zones (MPAZ). This tool derives from the 'Learning by Design Criteria for Measuring Learning' (Kalantzis and Cope et al., 2005, pp.95-97). According to Kalantzis and Cope, the assessment schema using a teacher rating sheet (TLS) (Appendix 2La) used to gauge the effectiveness of the LMP in the virtual museum making practice. Kalantzis and Cope (2005) posit that the TRS is an effective tool to evaluate changes in students' repertoires of literacy and this was confirmed in this research as it allowed to track students' performance in each of the knowledge processes, namely demonstration of experiential knowledge, conceptual knowledge, analytical knowledge and applied knowledge, as well as the multiliteracies experience of students (Table 7.1).

Table 7.1 Assessment criteria in the teacher rating sheet (TRS) (Source: Kalantzis and Cope, 2005)

Assessment Criterion The student demonstrates that he/she can:	Evidence
Demonstrate Experiential Knowledge *Students' ability to use their previous and new knowledge to interpret the virtual museum topic*	- Experiencing: The Known - Experiencing: The New
Demonstrate Conceptual Knowledge *Students' ability to understand the requirements of the topic after researching*	- Conceptualising: By Naming - Conceptualising: By Theorising
Demonstrate Analytical Knowledge *Students' ability to select appropriate ideas in relation to the topic after researching*	- Analysing: Functionally - Analysing: Critically
Demonstrate Applied Knowledge *Students' ability to construct museum wings, fill in the different rooms and enrich them with supporting details and fulfil the requirements of the writing genre*	- Applying: Appropriately - Applying: Creatively
Multimodal representations **Museum Multiliteracies** *Students' ability to integrate multimodal meanings in their various presentations; graphics, gestures, spatial, linguistic, visual and audio*	- Linguistic - Visual - Audio - Gestural and Spatial

In regards to each of these processes, three levels of performance exist that define how a student moves from the competence to think and act with assistance, to the competence to think and act independently, and finally the competence to perform collaboratively. These are described as: 1) assisted competence, 2) autonomous competence and 3) collaborative competence, with the former being considered the most difficult and higher order level to achieve. Figure 7.1 provides a description of each of these levels of performance.

Assisted competence
•Needs explicit instruction or support from the teacher or peers to be able to undertake the task or activity.

Autonomous competence
•Can figure out how to undertake the task or activity by themselves, and complete it successfully (their own work, or a part of a joint piece of work).

Collaborative competence
•Can work effectively with others, including people with less or different knowledge and expertise than themselves, to produce an excellent piece of work (their own, or a joint piece of work).

Figure 7.1 Literacy performance levels (Source: Kalantzis and Cope, 2005)

To explore the four interrelated dimensions of multiliteracies and the exhibited level of performance, I pertained also to the work of Hill (2005) who proposed the use of an analytical tool called a Multiliteracies Map. This tool was based on the renowned Four Resources Model adapted by Luke and Freebody (1990) involving namely: the functional dimension, the meaning making dimension, the critical dimension and the transformative dimension (Explained in detail in Chapter Three, Section 3.8.1, p.89). My proposition is that each of these dimensions combined with the knowledge processes reflect a zone of multiliteracies competence. The elements of the MPAZ are shown in Figure 7.2.

Figure 7.2 The Multiliteracies Performance Assessment Zones (MPAZ) (Savva, 2016a)

Since literacy practices are realised in particular events, the unit of analysis with the MPAZ were the major literacy events within the virtual museum making practice to elicit insights into the students' literacy performances within the Multiliteracies Zones. The findings are thus organized so that each of the literacy events are assembled together through a narration and thick description incorporating quotations to chronicle the literacy learning opportunities students engaged in – both multimodal and print-based during the LMP. The focus is on the extent to which the students were able to manage the basic codes of reading and writing, their capacities to understand the meaning making systems behind texts they read and write, their abilities to use texts across a range of social purposes including an understanding of the relationships between the forms and functions of different text-types and genres; and their capacity to think critically in the analysis of how texts build up their meanings, and the

consequences of different choices that authors make in the construction of texts
(Alloway et al., 2002, p.128). Intersected in the narrative are quotations, analysis and
interpretation, with the emphasis being on interpretation over analysis. The observations
and viewpoints derived from interviews, extensive field notes, photographs and audio
recordings intend to reveal how teaching strategies facilitated students' improved
performance in relation to each of the zones addressed in the MPAZ.

Part One: Findings on students' literacy performances during the LMP

7.3 Students' literacy performances

This part highlights findings from each of the four categories of performance in
which students exhibited a range of abilities and possibilities of expressing and
representing their knowledge, exhibiting complex literacy practices.

7.3.1 Demonstrations of experiential knowledge

The evaluation of the qualitative content analysis of data from the observations
and interviews with students suggested that the majority of them exhibited improved
performance in regards to the demonstrated experiential knowledge drawing on the LbD
Model. In particular, findings suggested that fifteen of the seventeen students moved to a
higher level of performance in regards to their experience of the known and the new but
existed at different levels: Ten students who were at the assisted competence level in
need of explicit instruction or support from the teacher or peers to be able to undertake
the task or activity moved to the autonomous level. At this level of performance,
students could figure out how to undertake the task or activity by themselves, and
complete it successfully; whether it is their own work, or a part of a joint piece of work.
In addition, five students who were at the autonomous level moved to the collaborative
competence level where they were able to work effectively with others, including people
with less or different knowledge and expertise than themselves, to produce an excellent

piece of work (their own, or a joint piece of work). Finally, two students remained at the same level, one at the assisted competence level and one at the autonomous competence level. The following paragraphs describe students' literacy repertoires in relation to each level of performance to show how these expanded or not.
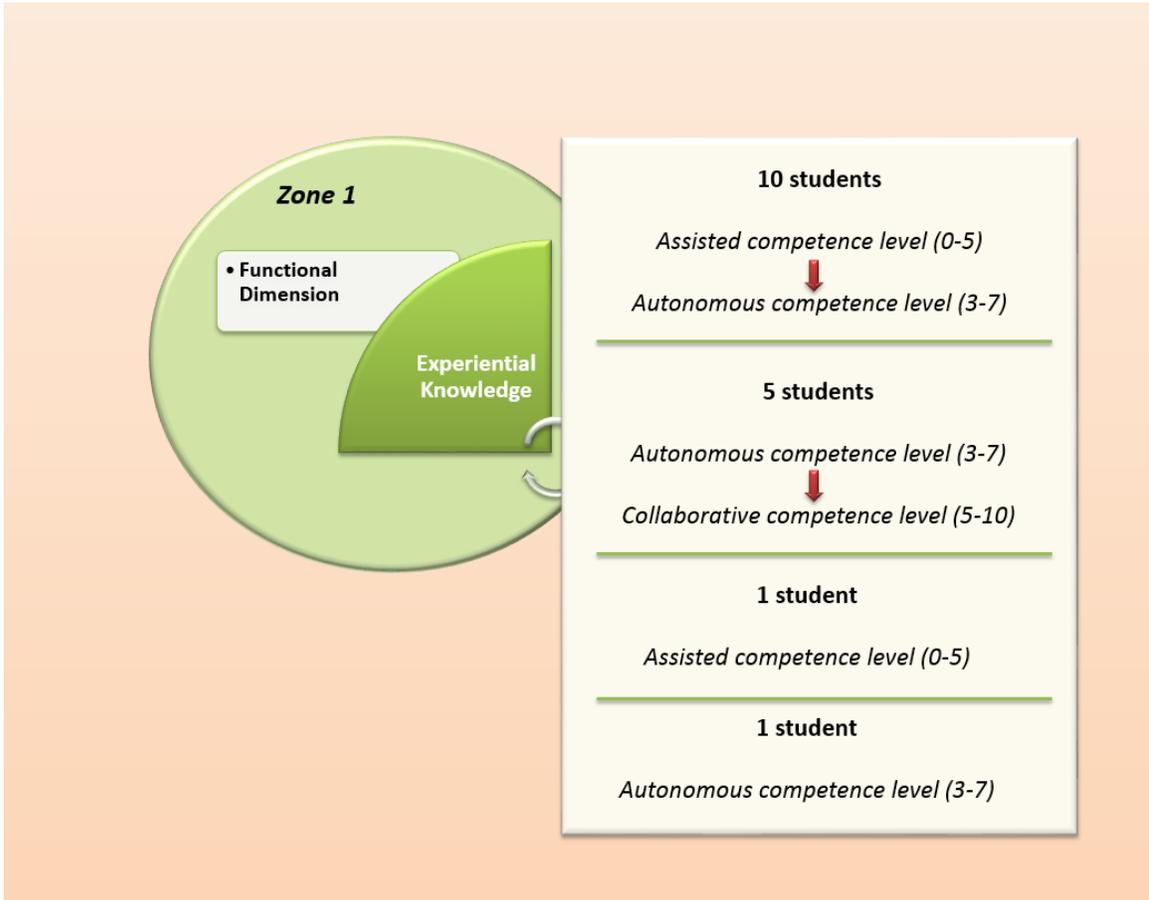
Figure 7.3 Zone 1: Students' performance level in experiential knowledge following the LMP (n=17) (Savva, 2016a)

7.3.1.1 Students' literacy repertoires

As Figure 7.3 demonstrates, the majority of the students (10) prior to the enactment of the museum-school partnership were graded at the assisted competence level (Rating: 0-5). Following the LMP, according the assessment schema these students exhibited an improvement in their performance in both experiencing the known and the

new reaching at the autonomous competence level (Rating: 3-7). In regards to *experiencing the known*, while previously they needed prompts from the teacher or peers to make a connection between their everyday life experience and the learning task, it was evident that the museum multiliteracies approach benefited them as they were able to figure out for themselves the connection between their own everyday life experience and the learning task.

Morever, these students improved in *experiencing the new*. Whereas before the intervention they needed scaffolds by the teacher or peers to make sense of an unfamiliar text, place, activity or group of people, following the LMP, they were able to make enough sense on their own of an unfamiliar text, place, activity or group setting to be able to understand its general gist. In other words, students' assessed demonstrated autonomous competence was profound in their ability to figure out for themselves the relevance between their personal experiences and using those experiences to relate to the virtual museum topic while simultaneously connecting new ideas relevantly to the thesis statements, topic sentences and supporting details.

Five students were graded at the autonomous competence level during the preliminary context analysis of this research (Rating: 3-7). Following the implementation of the final prototype, these students showed a significant improvement in terms of their literacy practices. In particular, they were graded at the collaborative level (Rating: 5-10), the highest performance level in relation to the assessment criteria proposed by Kalantzis and Cope (2005, pp.95-97). This level in terms of *experiencing the known* meant that the students were able to demonstrate to others the connections between the learning task at hand, and their own or the other person's everyday life experience.

Assessing the students' performance was evidently improved during *experiencing the new* as the data indicated. Students advanced competencies were observed as they were able to function beyond making enough sense on their own of an unfamiliar text, place, activity or group setting to be able to understand its general gist,

to engaging in and with this text, place, activity or group in such a way that they actively interact with it or add meaning based on their own perspective, knowledge and experience. These students were therefore able to use their previous knowledge to engage with the different activities from the WebQuest and concurrently engage with the main ideas interactively based on their research. In addition, students in the groups reaching the collaborative level could showcase their ability to use previous and new knowledge to discuss during the debate activity on different statements, classification of species and supporting details in relation to these categories.

Two students maintained the same level of performance despite the new approach. In particular, one student remained at the assisted competence level and the second one at the autonomous competence level.

Findings from the reflective interviews with teachers revealed how the instructional approach during the intervention facilitated students' existing knowledge while also encouraged students to research ideas that were relevant to the virtual museum making practice. According to Andrew, the teacher from Grade Six (T2):

> Normally, the lesson plan is such that will leave little room for engaging in activities that are relevant to the students' lives and personal literacy experiences. The approach within the LMP was such that it enabled to connect their experiences and stimulate their interest. Culturally relevant themes during the induction session of the project made a huge difference. I felt that it helped some of my students to evolve as autonomous learners without as much need for scaffolding as they would have needed… I could see how they took a step further using both previous and new knowledge to interpret the topic for the virtual museum and especially some students were able to reach at the collaborative level during the debate activity.
> (T2, from Grade Six)

Similar to T2, Myrto (T1) from Grade Five affirmed students' improved performance during the situated practice stage which addresses experiential knowledge. She mentioned:

> I could sense that most of my students were gradually immersed into the activities stemming from their own experiences. Although this was not the case for all of them, for those working previously as assisted learners, they seemed to not explicitly need prompts to connect their everyday experiences and the learning task provided. This enhanced their confidence in writing in concrete ways as the Web of Life activity showed. (T1, from Grade Five)

It was evident that students' were engaged in collaboration, discussion and listening during the situated practice stages. Building on their own ideas and listening to others' in the group and how to use them through *experiencing the known and the new*, students didn't 'leave behind their individual attributes.

7.3.2 Demonstrations of conceptual knowledge

Another level of analysis of the impact of the implementation of the LMP was with regards to the conceptual knowledge process. The analysis indicated that twelve of the seventeen students demonstrated an increased level of performance with regards to *conceptualising by naming* and *by theorising*: Nine students who were at the assisted competence level moved to the autonomous level. Another three students who were at the autonomous level moved to the collaborative competence level. The remaining five students maintained the same level of performance, which was four at the assisted competence level and one at the autonomous level. The paragraphs that follow describe the students' literacy repertoires in relation to each level of performance to show how these expanded or not.
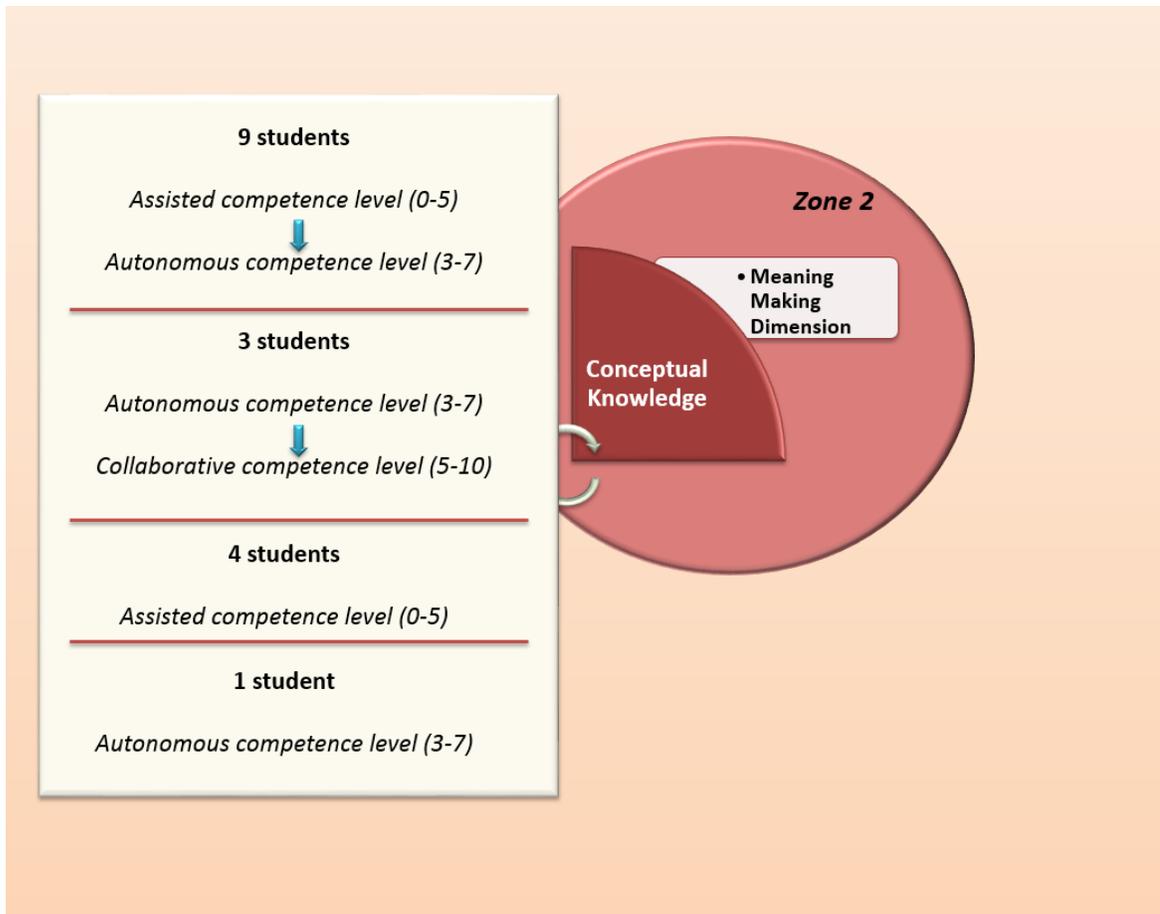
Figure 7.4 Zone 1: Students' performance level in conceptual knowledge following the LMP (n=17) (Savva, 2016a)

7.3.2.1 Students' literacy repertoires

The majority of the students (9) were graded at the assisted competence level prior to the enactment of the museum-school partnership (Rating: 0-5). Following the LMP, these students exhibited an improvement in their performance derived from the assessment schema in both conceptualising by naming and by theorising reaching to the autonomous competence level (Rating: 3-7). In regards to *conceptualising by naming*, previously once explained to them, the students were able to use a concept appropriately in context, and generalise effectively using this concept. It was evident that the museum multiliteracies approach enhanced this understanding as they were able to work out for

themselves the meaning of a concept from the context of its use or by looking up its meaning, and then use that concept to make an abstraction.

Further to this, these students improved in their conceptualising by theorising. Whereas before the intervention they could see the connection between two or more concepts once this was pointed out to them, following the LMP, they were able to work out for themselves the connections between concepts in a theory.

Three students were graded at the autonomous competence level in regards to conceptual knowledge during the preliminary context analysis of this research (Rating: 3-7). Following the implementation of the final prototype, these students showed a significant improvement in terms of their literacy repertoires. In particular, they were graded at the collaborative level (Rating: 5-10), the highest performance level in relation to the assessment criteria proposed by Kalantzis and Cope (2005). This level in terms of *conceptualising by naming* meant that the students were able to put concepts together in a theory and explain that theory to another person.

Assessing these three students' performance was evidently improved during *conceptualising by theorising* as well as the data indicated. Students' advanced competencies were observed as they were able to function beyond working out for themselves the connections between concepts in a theory, and being able to put concepts together in a theory and explain that theory to another person.

Five students maintained the same level of performance despite the new approach. Four students remained at the assisted competence level and one at the autonomous competence level.

Findings from teachers' reflective interviews following completion of the TRS suggested both teachers found the knowledge and skills gained from participation in the LMP as facilitating to expanding their students' literacy performance. As indicated by Myrto, T1:

I could see how even the students who did not improve in terms of the TRS were more actively engaged in the activities and with some help from a teacher were able to list new vocabulary and define key terms such as ecosystem, extinct and endangered species, curator, exhibitions, and more, although they could not explain the theory adequately (T1, from Grade Five)

Discussing on the impact of the new approaches on students' conceptual knowledge, Andrew (T2), mentioned:

I found a noticeable difference in the vast majority of my students with respect to how they engaged in exploration and discussion of concepts. The way they discussed about their diagram and categorized types of animals in concept maps showed they were able to move beyond the assisted level to acting as autonomous and collaborative learners. I could hear their discussions on how they figured out the meaning of a concept without my help and at times abstract based on that definition (T2, from Grade Six)

7.3.3 Demonstrations of analytical knowledge

In the implementation of the museum multiliteracies-based approach, critical framing is the component that relates to analytical knowledge. The analysis suggested that nine of the seventeen student participants in the research demonstrated an increased level of performance with regards to *analysing functionally* and *critically*: Six students who were at the assisted competence level moved to the autonomous level. Another three students who were at the autonomous level moved to the collaborative competence level. The remaining eight students maintained the same level of performance, which was the assisted competence level for five of them and the autonomous level for the remaining three. What follows is discussion of students' literacy repertoires in relation to each level of performance to show how these expanded or not.
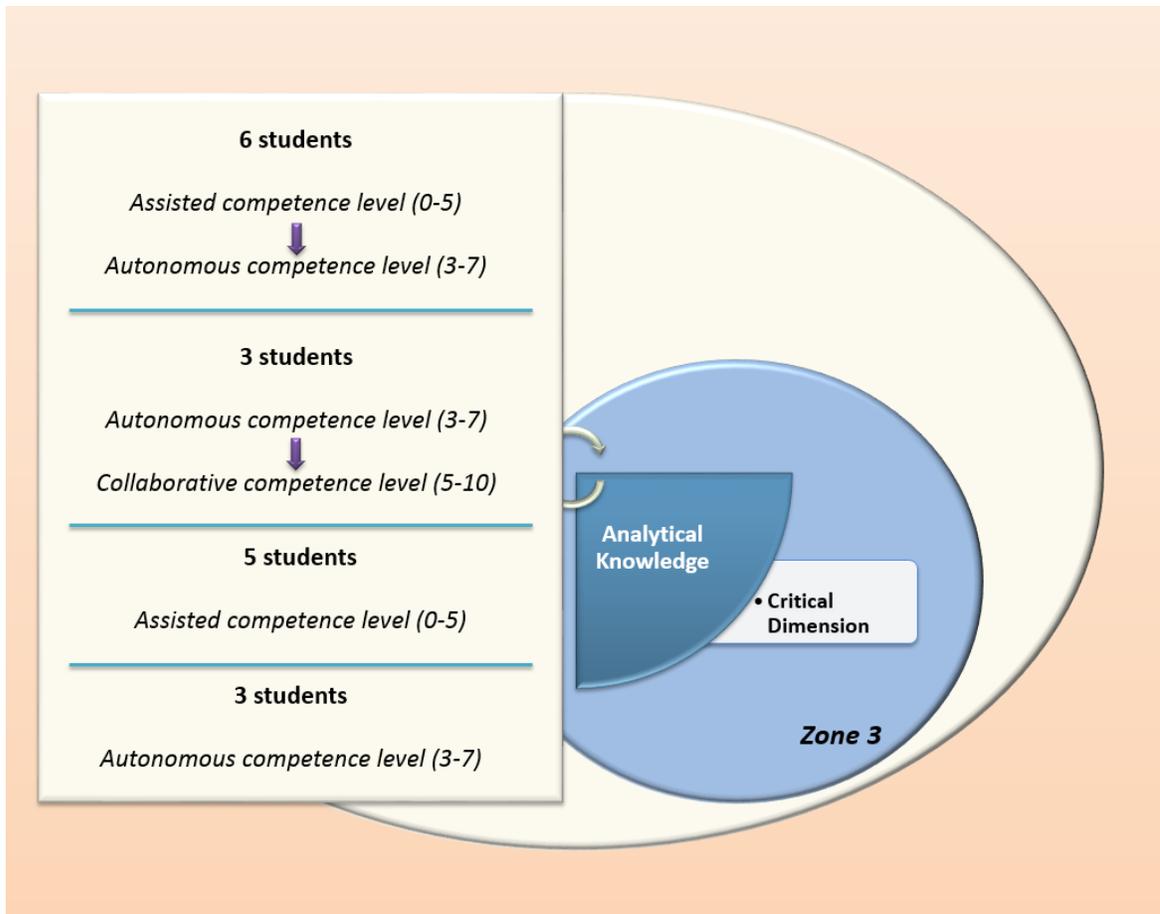
Figure 7.5 Zone 1: Students' performance level in analytical knowledge following the LMP (n=17) (Savva, 2016a)

7.3.3.1 Students' literacy repertoires

Six of the seventeen students prior to the enactment of the museum-school partnership were graded at the assisted competence level (Rating: 0-5). The analysis derived from the data of the research suggested that these students improved in their performance reaching to the autonomous competence level (Rating: 3-7) in both *analysing functionally* and to a certain extent at analysing critically. In regards to *analysing functionally*, previously they were able to understand, once pointed out to them, the general function or purpose of a piece of knowledge, text or human activity, or causal connections. Following the LMP, it was evident that they benefited as they were able to analyse causal connections for themselves.

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In addition, these students improved in *analysing critically* although not at the expected degree. Whereas before the intervention they could comprehend, once explained to them, some of the obvious human interests and agendas behind a text, action or piece of knowledge, following the LMP, they could construct a plausible interpretation of the underlying motives, agendas and interests driving a text, action or piece of knowledge.

Three students were graded at the autonomous competence level in regards to analytical knowledge during the preliminary context analysis of this research (Rating: 3-7). Following the implementation of the final prototype, these students improved and were assessed at the collaborative level (Rating: 5-10), the highest performance level in relation to the assessment criteria proposed by Cope and Kalantzis (2005). This level in terms of *analysing functionally* meant that the students were able to work with others to figure out and demonstrate the way they see causal connections to people who may not see them the same way.

Assessing these three students' performance was evidently improved during *analysing critically* as well as the data indicated. Students' advanced competencies were observed as they were able to work with their group members to demonstrate collaborative competence. Students were able to effectively select appropriate ideas and make causal connections, corroborate ideas from multiple sources and analyse ideas.

From the rest of the group, five students were graded at the assisted competence level during the preliminary context analysis of this research (Rating: 0-5). Following the implementation of the final prototype, there was no difference noted in their performance. Still they needed scaffolding in understanding causal relations pertaining to the virtual museum topic, and their understanding was checked through the relevance of ideas selected and presented during the various activities.

Another three students who were reported as belonging to the autonomous competence level of performance, also maintained the same level of performance.

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Teachers in their interviews revealed how some of their students successfully undertook both functional and critical analysis demonstrating an improved performance in terms of their analytical knowledge:

It was profound how some of these students, including the ones exhibiting low performance during normal school routine, could uptake the task of exhibition designers and this activated their agency and promoted task ownership. Those showing to operate within the automous level, could plan the next activities into manageable tasks while making causal connections, and analysed ideas without scaffolding. (T1, from Grade Five)

Likewise, Andrew, the teacher from Grade Six, identified challenges and improvements in his students' literacy performance due to planning and teaching:

I would say some of my students appeared to have difficulty in dealing with these tasks, yet they delivered the task of assigning roles in their groups according to people's interests and skills, without much help (T2, from Grade Six)

7.3.4 Demonstrations of applied knowledge

The final stage of the intervention involved the transformed practice. During this stage students are engaged in *applying appropriately* and *creatively*. According to the results from the evaluation of students' performance, the analysis pointed out that ten out of the seventeen students demonstrated an increased level of performance with regards to applied knowledge: Eight students who were at the assisted competence level moved to the autonomous level. Another two students who were at the autonomous level moved to the collaborative competence level. The remaining seven students maintained the same level of performance, which was the assisted competence level for three of

them and at the autonomous level for the remaining four. The paragraphs that follow students' literacy repertoires in relation to each level of performance to show how these expanded or not.
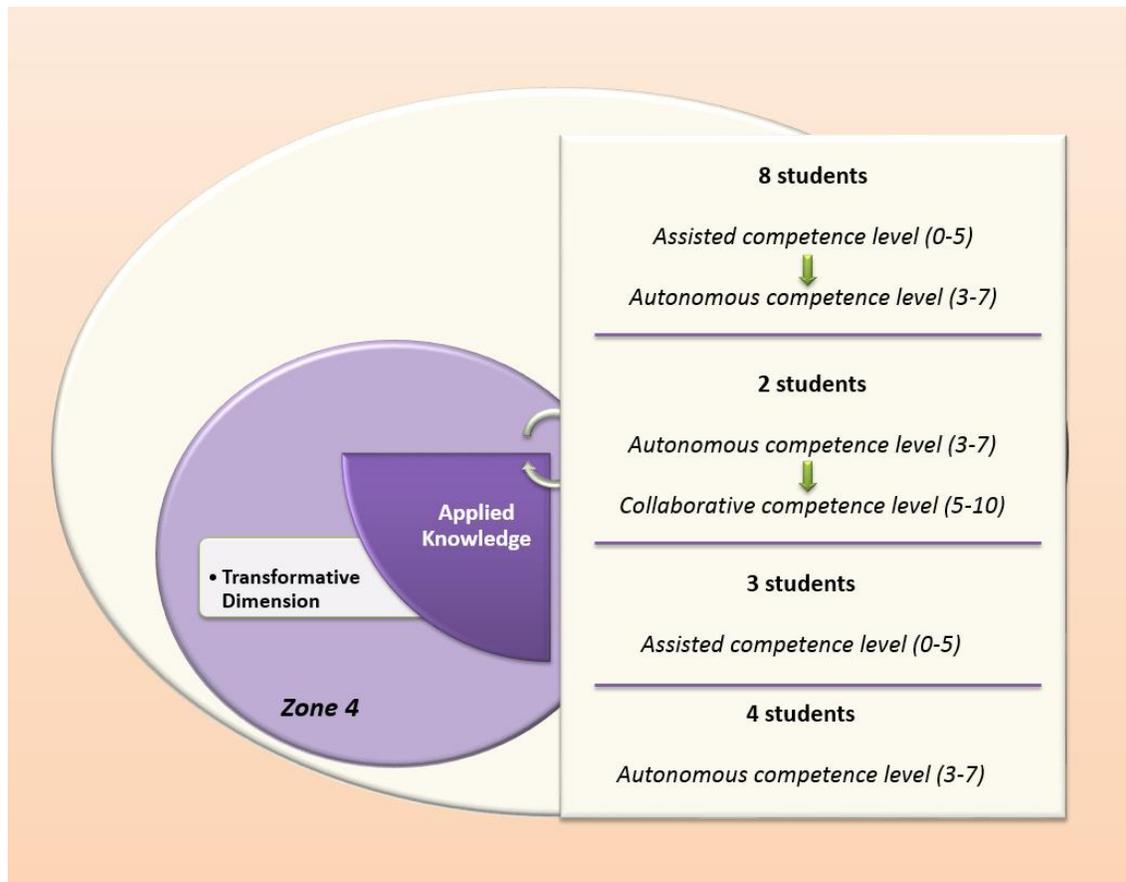

Figure 7.6 Zone 1: Students' performance level in applied knowledge following the LMP (n=17) (Savva, 2016a)

7.3.4.1 Students' literacy repertoires

Context analysis prior to the enactment of the museum-school partnership indicated that eight students were graded at the assisted competence level (Rating: 0-5). Following the LMP, according the assessment schema these students exhibited an improvement in their performance in both *applying appropriately* and *creatively* reaching to the autonomous competence level (Rating: 3-7). In regards to *applying appropriately*, while previously they were able in a supportive and structured

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environment, to communicate or act in ways which conform to conventions or textual genres, it was evident that the museum multiliteracies approach benefited them as they were able to progress and independently and without explicit scaffolds or instructions, communicate or act in ways which conform to conventions or textual genres.

Further to this, these students improved in *applying creatively* as the LbD describes this step of the knowledge processes. Whereas before the intervention they were able, in a supportive and structured environment, to put together in a meaningful way, two or more conventional forms of communication or action, following the LMP, they were able to independently and without explicit scaffolds or instructions, put together in a meaningful way, two or more conventional forms of communication or action, fulfilling the requirements of the various genres through the construction of the wings and rooms of the virtual museum satisfactorily.

Two students who were at the autonomous level moved to the collaborative competence level, indicating a significant improvement in terms of their literacy practices. In particular, in terms of *applying appropriately* this meant that the students were able to master a convention or a genre to the point where they become fully fledged members of a new community of practice.

Assessing the students' performance was evidently improved also during the *applying creatively* as the data indicated. Students' advanced competencies were observed as they were able to progress beyond putting together in a meaningful way, two or more conventional forms of communication or action, independently and without explicit scaffolds or instructions, to creating a hybrid text, action or group environment which involves a genuinely original combination of knowledge, actions and ways of communicating. This level of group work reflects students' ability in mastering the requirements of each genre and their creativity in outlining the framework of their rooms.

The remaining seven students maintained the same level of performance, which was the assisted competence level for three of them, and for four of them the autonomous level. For the students in the assisted level of observed group work, it was obvious that they needed scaffolding in enhancing their understanding of particular genres and construction of the virtual museum.

Results from the reflective interviews revealed that the two teachers participating in the LMP found various skills were acquired by the students during the transformed practice stage that related to applied knowledge. According to Myrto, T1:

> It was evident that students exhibited creative skills through the writing up of the newspaper articles for the news room. As autonomous and collaborative learners, my students could show coherence and unity in each paragraph and I could see this during the drafting stage of their essays. The different activities prior, while and after writing helped them become more creative (T1, from Grade Five)

Further findings from the interviews confirmed results from the TRS completed by the two teachers and myself. It was evident that the average and weaker students gained confidence and improved their style of writing. The sessions during the transformed practice using the MMP framework were found as facilitating for students to create hybrid texts such as the virtual museum galleries and video rooms. This comment by Andrew (T2) was characteristic:

> It was not easy to complete all wings of the museum. Some groups struggled and needed scaffolding, which belonged to the assisted level. On the other hand, the knowledge processes in the LMP made a great difference for other groups since students, mostly as autonomous learners mastered the requirements of each genre and their creativity in developing the layout and writing the stories for the 'News stand' of the virtual rooms. (T2, from Grade Six)

7.3.5 Demonstrations of museum multiliteracies knowledge

The final evaluation criterion in the MPAZ involved assessing in particular students' museum multiliteracies knowledge. During this stage students were rated in their participation during group work in communicating meaning using multiple modes of meaning which encompass the linguistic, visual, audio, gestural and spatial aspects of the sessions. According to the results from the evaluation of students' performance (Figure 7.7), the analysis pointed out that eleven of the seventeen students participating in the multiliteracies activities were given an excellent rating by both teachers and myself (collaborative level). Another four students' work was rated as good (autonomous level) and one student's work was deemed as being average, thereby considered as an assisted learner.
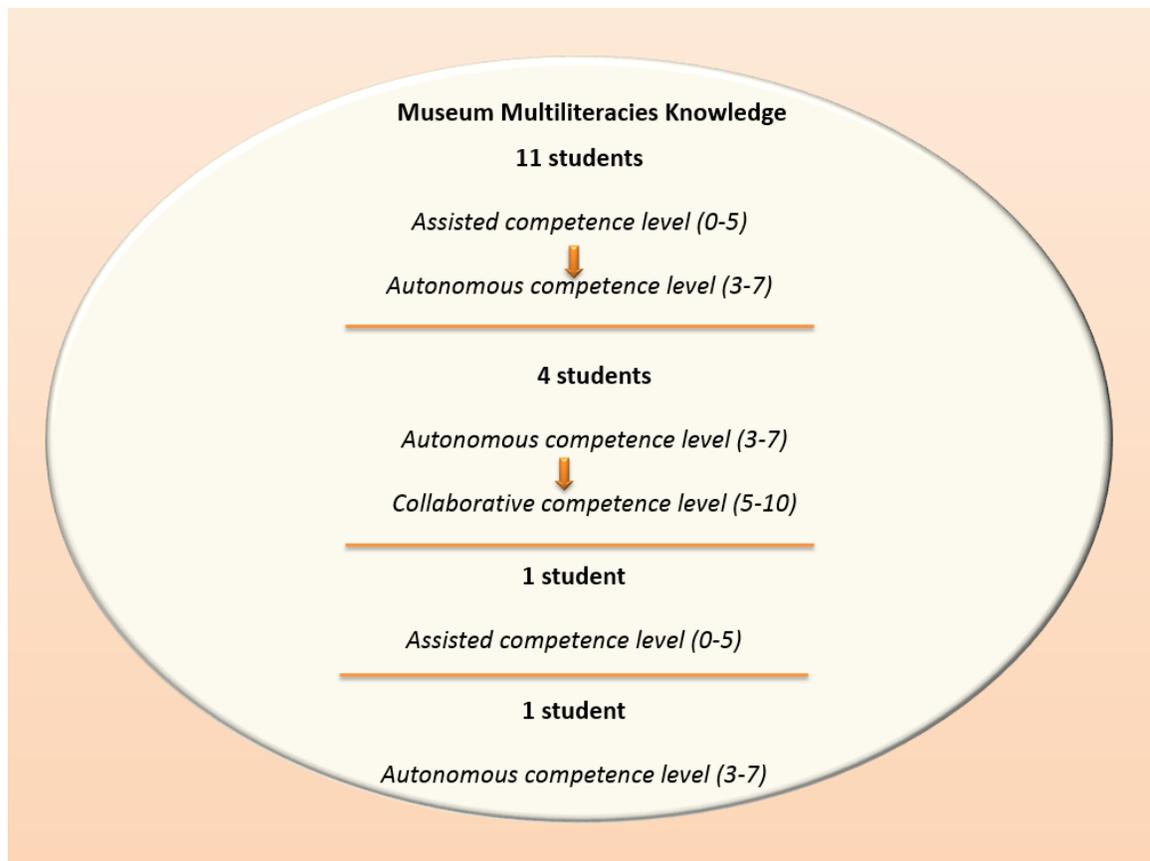
Figure 7.7 Students' performance level in multiliteracies knowledge following the LMP (n=17) (Savva, 2016a)

7.3.5.1 Students' literacy repertoires

When the two teachers where probed to comment on how they perceived the use of technology and engagement in multiliteracies influenced students' performance, both pointed explicitly to the benefits including learning outcomes gained from multimedia, and multimodal activities during the LMP.

> It was evident that students benefited from the multiliteracy nature of the activities for the virtual museum making practice. I always knew they could benefit from using ICT in my teaching, yet I was timid to try new things and perhaps disappointed overall by their attitude. Yet I would say the most important benefit came in terms of their improvement in their writing performance (T2, from Grade Six)

> Students were enthusiastic about using the WebQuest and writing on the computer. I was very impressed by their creativity of researching ideas which helped you to achieve the writing outcomes. (T1, from Grade Five)

A common observation among the teachers was that attempting to improve literacy outcomes by expanding repertoires could be achieved even for the weaker students since new technologies and multimodal activities stimulated students' interest. T2 stated:

> While at times I get demotivated myself when I see my students inattentive and not willing to engage in any activity, when you introduced multiliteracies activities for the museum, my students were delighted and excited so much that kept working even during recess. (T2, from Grade Six)

An indicative statement from T2 was:

Obviously, using ICT and multimodal modes of literacy made an impact in many

ways, especially in terms of students' motivation to write. Their engagement level was high and resulted in working as autonomous and collaborative learners which surprised me in a positive way (T2, from Grade Six)

Both teachers identified that they and their students had limited access to new technologies, particularly those that would encourage the development of newer forms of multimodal literate practices due to lack of resources yet it was necessary to undertake such initiatives that would supplement such multiliteracies teaching to engage in potentially transformative pedagogies.

Museum multiliteracies is one way of making literacy 'relevant' to students. Obviously they are exposed to multiliteracies outside school yet I have not being using it systematically in my teaching. This will change. (T1, from Grade Five)

Now that I've seen first-hand the improvement in their performance, especially in terms of using visual, audio and gestural aspects such as through the videos, images and role play activities, I shall implement it in my teaching (T2, from Grade Six)

7.4 Discussion of the first part

The MPAZ was integrated in the DBR as a research instrument to gauge possible improvements in terms of the students' literacy performances. Based on the evaluation from the combined TRS, and teacher interviews, as it is displayed in Figure 7.3 (Experiential knowledge), Figure 7.4 (Conceptual knowledge), Figure 7.5 (Analytical knowledge), Figure 7.6 (Applied knowledge) and Figure 7.7 (Museum Multiliteracies knowledge), it was obvious that students in their majority benefited from engagement in the LMP. Effective pedagogy should take into account students' funds of knowledge or else their background knowledge, and this was pertinent in planning and advocating the pedagogical practice in this research (Kalantzis and Cope, 2005). Indeed the evaluation using the MPAZ suggested a significant proportion of students benefited from using

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relevant experiences to their lives as they moved to a level where they could act with little or no scaffolding (autonomous and collaborative levels).

In some cases, the collaborative activities suggested the LMP and in particular digitally mediated activities through the WebQuest achieved the impact of promoting a positive learning environment where the average and weak students gained self-esteem which in turn enhanced their literacy performance in particular in writing and multimodal tasks. Kellough and Kellough (2008) make the point that teachers should use effective teaching approaches which can lead to a positive classroom environment. It was evident that the various activities in the LMP paved the way for students to research ideas, act creatively and perform better using the five aspects of multiliteracies through the computer as a medium and to later present their work.

The following section serves as an illustrative example of students' improved performance through a narrative of specific literacy events within a group's work during the LMP.

Part Two: Analysis of a group's multiliteracies experience

7.5 The Group's student profiles

The expanding of students' literacy repertoires involved in the unit may be revealed by analysing one group's experience through a narrative approach to documented assessment termed 'learning stories' (Carr, 2001). Students' key learning dispositions are the key learning outcomes of interest (Carr, 1998). In relation to learning stories, these draw on a sociocultural context and have been defined as including 'situated learning strategies plus motivation—participation repertoires from which a learner recognises, selects, edits, responds to, resists, searches for and constructs learning opportunities' and, as 'being ready, willing and able to participate in various ways' (Carr, 2001, p.21).

This section provides a brief outline of the profiles of the three student participants in Group A coming from culturally and linguistically diverse backgrounds

with varied learning levels and difficulties. The focus is particularly on these students' literacy performances within their group as one of the premises of the MMP framework is to provide a meaningful multiliteracies learning experience that is culturally responsive and inclusive of diverse students. Before discussing their knowledge journey during the LMP, Group's A students' literacy identities are profiled to provide a glimpse of their past experiences with aspects of their existing literacy repertoire during everyday school activities, previous education, and socio-economic and cultural background as individuals (Table 7.2). These insights were developed from intensive observation throughout the field study and from informal interviews with teachers and the students' families.

Table 7.2 Profiles of students in Group A

	Sergey	**John**	**Olga**
Family background	Both parents work Second born of three Christian Orthodox	Both parents work First born of two Christian Orthodox	One parent works First born of two Christian Orthodox
Interests/lifeworlds	Music Football	Music Computers	Art Fashion
Preferred multiple intelligences	Kinaesthetic Intrapersonal	Logical Linguistic Intrapersonal	Kinaesthetic Logical
Academic performance	Low – prefers and excels in practical activities	High – enjoys solving problems, Excels in Maths and Science	Indifferent to most subjects except artistic ones
Literacy performance on MPAZ prior to the enactment of the LMP	Assisted level competence	Autonomous level competence	Assisted level competence
Literacy performance on MPAZ prior to the enactment of the LMP	Autonomous level competence	Collaborative level competence	Autonomous level competence

As shown in Table 7.2, the students in Group A had similar family and cultural backgrounds, and socioeconomic status. Their diversity was in terms of their different individual attributes evident also in the 'Diary Notes' activity prior to the enactment of the LMP. Their interests ranged from art and fashion to music, football, and computers. These students were originally assessed by their teachers as belonging to the assisted competence level (Sergey and Olga) and the autonomous competence level (John). Following the enactment of the LMP, John reached the third and higher level of performance (collaborative competence level), while Sergey and Olga were mainly assessed as belonging to the autonomous level. The excerpts and discussion that follows

indicates these students' knowledge journey over the course of the LMP through the different literacy events.

7.5.1 The learning stories

Experiential knowledge

The design of the induction session of the LMP involved connecting the learning to the diverse lifeworlds of the students through activities such as the "Mystery Box" which enquired into students' personal experiences with museums ('experiencing the known') and reading and commenting on fictional characters' experiences of museums during the "Stick to it" activity ('experiencing the new'). In this sense, it was possible for the students, including those in Group A to draw on prior knowledge and lifeworld experiences of museums, which was a step away from the boundaries of their schoolworlds towards making their own connections to the learning. The following excerpt is from a literacy event between members of Group A and myself during the Museum box activity.

> *Seeing the box. Enthusiasm. Talk about the content. Reluctant to reply. Opening and picking the questions provided to their team…Some disappointment for the long questions* /FN, Gr.5].

> *Hesitant and with difficulty…*Olga: What was the most impressive thing that you found in a museum? What did you like the most?
> *No answer.*
> John: Interesting things?
> Stefania: Exactly.
> John: Like ... I've seen a big picture, it was nice, and it was so big.
> Stefania: You mean like a painting?
> John: Yes.
> Sergey: The first iPhone.
> Olga: The mouth of a shark.

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Stefania: Where was that?

Olga: I was in a Russian museum…

….

John: What would you like to see in a museum? Hm, I know!

Stefania: Wait, let's see what the rest can think of first.

Sergey: I want to see a научная фантастика[29]… *He turns over to John, who speaks Russian and tells him.*

John: Oh, he means like fantasy, hm like a science fiction museum.

Stefania: That's fantastic. Have any of you been to such a museum?

Olga: I have been to a movies museum. It was great!

John: It is not really the same but you can see science fiction in this sort of museums.

Slowly but with a steady tone. Sergey: What does a museum feel like?

John: A giant place.

Stefania: Does it feel nice?

Olga: A little bit boring.

Stefania: You say it's boring.

Olga: A little bit.

Stefania: Does it have to do with what you see?

Sergey: Yeah!

Olga: It's an ancient place.

John: If it's about old things, it's boring. If it's about technology and science, animals maybe it's more interesting.

Stefania: Do you know any famous museums like that?

John: No.

Through 'experiencing the known', the teacher provided 'access without children having to leave behind different subjectivities' (New London Group, 2000, p. 18). Even for Sergey and Olga who were having difficulty expressing themselves

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[29] Science fiction in Russian.

belonging to the low-ability group as assisted learners, this activity enabled them to show aspects of their personal stories and feel relax to suggest. Sharing their ideas within the group allowed them to take benefit of John's abilities and knowledge as autonomous learner. The experiential knowledge therefore provided with scaffolding and engagement for these students. This engagement with learners' identities is described by Kalantzis and Cope et al. (2005, p.37) as 'belonging'. They argue that 'a sense of belonging is crucial to effective learning as it engages the learner's identity' (Kalantzis and Cope et al, 2005, pp.37, 64). Kalantzis and Cope et al. (2005, p.51) refer 'to this engagement with learners' identities as the learner's knowledge, experiences, interests and motivation'.

In 'experiencing the new', the students took turn to read the story about Demos and Marlen (presented in a Prezi format), two imaginary characters I created for the project. These characters talked about their experiences in a museum, how in a museum you can learn in many different ways, on what kind of museums exist, and talk on terms like collections, objects, types of museums. Following the reading of the text, students used post it notes to mark a word, sentence, or part of a text that they didn't understand. If they read on and the question was clarified, they removed the post-it note. After reading, each group work to discuss the post-it notes that remained and clarify their questions. The following excerpt is from this discussion between members of Group A and myself during the "Stick to it" activity (Image 7.1).

> John: Did you understand what a collection is?
> Olga: I am not sure. I think we should put it aside.
> Stefania: Perhaps talk about it a bit. Have a look at your handout.
> Olga: Hm, see there are people who like to gather things and...
> Stefania: Collectors are very important yes.
> Sergey: Yeah…
> John: There wouldn't be a museum without them, they donate collections to museums.
> Stefania: Why do they do that?

Olga: To thank them.

Sergey: To remember them.

I was able to record over the audio text multiple times during students' discussion until they had no post-it notes left and had attained a 'collaborative level of competence'; which means they could produce a joint piece of work effectively with others, including those with different knowledge to their own (Kalantzis and Cope, 2005, p.95).

Image 7.1 Students working during the "Stick to it" activity

Through the "Stick to it" activity, students found out new information; this 'new' knowledge soon became 'known'. Kalantzis and Cope et al. (2005, p.48) describe this as: 'The place to which you travel becomes part of you, part of your repertoire of life experience, and in fact another aspect of your identity'. The use of multimodal modes of literacy such as the PowerPoint enabled to address students' identities "realities of difference" (Kalantzis and Cope et al, 2005, p.51) and individual attributes such as experiences, interests and interpersonal styles. Supporting their "mental files" before reading (Keene and Zimmermann, 1997) with this sort of multimodal activities

facilitated students' learning. Students should be able taught to consciously activate relevant schemas (prior knowledge) to comprehend new information from texts (Shallert, 1982). The use of the multimodal texts was a stimulating repertoire of "before reading" activities so that students have the essential resources to make meaning from the text.

Conceptual Learning

In the conceptual learning, the students following the guidelines provided in the Process Stage 2 of the WebQuest were assigned a scientist role (Ornithologists, Aquatic Biologists, Zoologists) and had to research online for species that belonged to the researcher's field of expertise to complete a Web of Life noting some fast facts about the chosen species. This was a *conceptualising by naming* activity, which enabled the students to explore concepts and develop vocabulary to discuss key facts about endangered animals they researched and their impact on their environment. The following excerpt is from this discussion between members of Group A and myself during the "Web of Life" activity (Appendix 4I, p.412).

> John: I think we must start writing facts like its size, color, habits etc.
> Olga: I am not sure. I think we should put it aside and first note about why the animal is endangered.
> John: Perhaps we can do both. Did you find any useful information so far? Sergey?
> Sergey: I found this. Why it is called a carnivore, because it eats meat. Shall we put it?
> John: Yeah, I think so, sure. And there is that point there, the diet, there, put it, see.
> Sergey: Yeah … I understand.
> John: So, first add this here so that we don't forget. Then, look at this about the anatomy, it's great.

Olga: Yes, we need this with that, gill slits. And the habitat, found near shore along most of the temperate

Sergey: Okay, I will write this too then here.
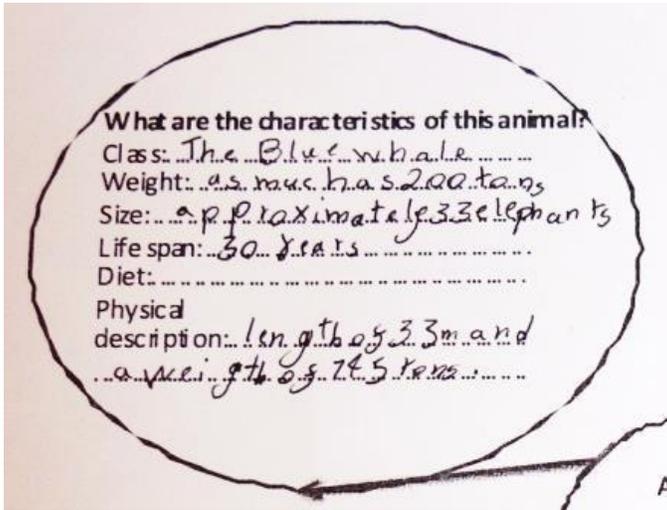
Image 7.2 Web of Life
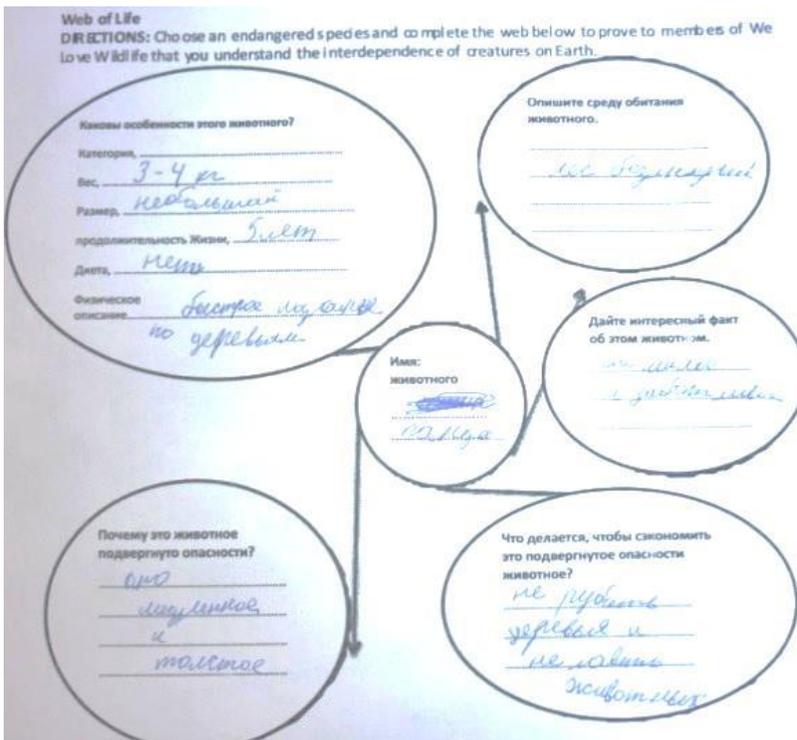
Image 7.3 Web of Life completed in Russian by Sergey

Following 'The Web of Life' activity students examined the effect of disturbances throughout the whole food chain during the 'Consequences/effect wheel' activity where they thought and wrote a direct consequence of 'Animals' extinction' in an oval and connect it to the centre with a single line (first order consequence). They repeated this for more first order consequences and jogged them down. The next step involved discussing and recording second order consequences which join to the first order consequences by a double line. The following excerpt is from this discussion between members of Group A and myself during the "Consequences/effect wheel" activity.

Olga: I am not sure about whether this is a first order consequence.

John: I am not sure either. I think it's here though.

Stefania: You can read it carefully and decide then.

Olga: Hm, see there is this article about how whaling affects the ecosystem...

Stefania: Exactly.

Sergey: It says that whales are vital to the food chain.

John: It regulates the food flow of the ocean.

Stefania: How do they do that?

Olga: I can't find it.

John: Here, I know, "they consume a whopping 40 million krill".

Olga: Wow! So is this a first or second order consequence? I think it is

John: It is a first, right?

Sergey: Yes, I think so too.

Olga: Okay, let's add it then.

This sequential activity covering two sessions involving both conceptualising by naming and theory described above, supported students to structure their thinking and research through developing their viewpoints and individual meaning making. The cooperative learning structures ensured that all students were able to have input and this was a way to open up learning to diversity. Going back between experiencing and

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conceptualising supported students to build an increased understanding and positioned them as active learners. 'Weaving' (Luke et al., 2003) between back and forth in the LMP using different activities helped students achieve their learning goals. Drawing on students' prior knowledge first and building on it to deepen students' conceptualisations is a meaningful way to address diversity. Hence, through the conceptualising knowledge process derived from the 'overt instruction' the focus is on going beyond assimilation and teacher-centred transmission (Mills, 2006b). The students were thus able to access and participate in the activities regardless of their knowledge level using their own meaning making resources.

Analytical Learning

In the analytical knowledge processes, students in Group A explored a range of texts from the museum visit, including labels, videos, pictures, media articles and essays. Students engaged in activities such as the "Juxtaposition" where they compared and contrasted two museum texts in terms of content, structure and language features (analysing functionally) and taking a stance on the use or not of labels in museums by standing in a corner of the room during the "Four corners" activity (analysing critically). The following excerpt is from this discussion between members of Group A and myself during the "Juxtaposition" activity.

> Stefania: How is reading this essay different from watching the video with the text?
> Olga: There is movement in the video.
> Sergey: And you see more things happening.
> Stefania: Yes!
> John: You get more information from a video.
> Sergey: People talk and you hear sounds.
> Olga: Yeah … It is more interesting.

John: You also understand the meaning easier because you see and hear and all, the tone is different. So I think this is why they chose to use this at the museum.

Image 7.4 Students watching a video at the museum, which they later discussed in class having seen it once more (provided by the Museum)

Analysing functionally through juxtaposing primary and secondary sources, novel and film versions enable this group of students to focus on the language and visual features of these texts. The significance of this process lay in preparing students for creating their own texts in 'applying'. Concurrently, *analysing functionally* also enabled the students to understand how the curators of the exhibition decided to use each text and position visitors in particular ways in *analysing critically* and gradually involve them in a variety of cultural knowledges and perspectives. This was evident in the 'Four Corners' activity. Each group decided on whether to go for 'agree', 'strongly agree', 'disagree', 'strongly disagree'. Each corner's group discussed the statement and developed a collective response to be shared and debated. The excerpt that follows is from Group A's discussion while trying to prepare their argument.

John: So, we are claiming labels are important in museums …
Stefania: Why is that?

Olga: There are labels in other places and are important there. Like a bus stop.

Stefania: Okay right, that's called a sign but it is similar.

John: There are people who don't know what an object is about. And the museum has to teach them.

Olga: You explain things with writing.

Sergey: And it is sometimes interesting to know about an object's story.

John: Yeah, when something happened and what era does it belong.

Olga: So labels are important in a museum.

Students as shown above asked questions about whose interests are served in using labels in a museum and how they can be of use. In this sense, they were empowered to critique the approach of some curators to leave out labeling from exhibitions. Students indicated signs of agency not only as critical readers in and beyond school, but also in developing their own texts, which is an indication of acting as learner transformers (Gee, 2000; Comber and Kamler, 2005). Importantly, the critical framing stage which adheres to 'analysing', according to Cloonan (2007, p.4), leads to students learning to detach from what they have learned and critique the learning already gained through situated practice (experiential) and overt instruction (conceptual). In this way the analysis builds on the experiential and the conceptual. Students in Group A were able to progress from a superficial knowledge to a deeper understanding by denaturalising and assessing learning 'in relation to the historical, social, cultural, political, ideological, and value-centred relations of particular systems of knowledge and social practice' (New London Group, 2000, p.34). For example, John was able to see how some people would appreciate information in labels since they might not have sufficient knowledge about an object. He also appreciated that other children in his age from other cultures might also like to read the labels in a museum like himself.

Image 7.5 A student reading the labels during the museum visit

Applied Learning

The final transformative stage within the LMP process involved 'applied' learning. Students moved to a level of being able to create and become knowledge producers. This was achieved using a range of modes and media, which in turn catered for a variety of 'learning styles' or multiple intelligences (Gardner, 1999), including the visual, auditory, linguistic, spatial and gestural (Kalantzis and Cope, 2005, p.239). In particular the "Curator for a day" activity, during the museum educational visit, and the presentation of their work for the Living Museum during the Museum Day are evidence of Group's A collaborative work and advancement of literacy repertoires.

The following is an excerpt of the "Curator for a day" activity while students worked individually on developing a room based on a hypothetical scenario they had previously thought of in their Groups during the museum visit taking inspiration from an exhibited work (Image 7.6).

> Sergey: I think the background is wrong.
> Olga: I am not sure. We should ask the teacher.

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John: I like the colours, and you have placed the objects in a nice way. It looks real...

Sergey: Do you prefer that I add one more chair here?

John: No, it looks great as it is. Mine is not as good, it's overwhelming. I will figure it out.

Olga (*while gluing*): I love this. It's probably the best activity so far!

Image 7.6 Taking inspiration from the exhibits

Image 7.7 Taking inspiration from the exhibits, "Curator for a day" activity

It was evident from the three focal students' performance in *applying appropriately* that despite their difference in abilities and subjectivities, the activities suggested an improved performance. Looking at Olga's collage, it was evident that she had produced a high quality work, based on the background, the colours, and arrangement of objects (Image 7.8). She also understood the layout and the genre. She was interested in design and fashion, which was what she was passionate about. She was detailed in every aspect of placing the objects and resulted in a realistic scene. John on the other hand was not as detail prone and his creation was somewhat confusing due to the choice of colours and background (Image 7.9). It was clear that he was keen to incorporate many elements in his collage, yet he found it challenging to make the final piece of work. Finally, Sergey's collage was simple yet with a good balance as far as the background, the colours, and arrangement of objects (Iamge 7.10). During the process of constructing their room, John encouraged Sergey by stating how well he was doing, and being overall more apt to lead the group, coordinated the other two to achieve the planned objectives. Sergey was pushed yet prompted by his classmates was able to complete the task as an autonomous and active learner. What was profound in this activity, is how Olga showed a much more positive attitude to contribute to the lesson, unlike usually during the first couple of weeks of the LMP when she was timid and not

as interested to participate. This was attributed to her feelings of competence and increased self-esteem due to her personal interest in the task.

Image 7.8 Taking inspiration from the exhibits, Olga's version

Image 7.9 Taking inspiration from the exhibits, John's version

Image 7.10 Taking inspiration from the exhibits, Sergey's version

The final piece of the puzzle of the LMP included the presentation of each group's work during the Museum Day. Group A presented their work by having John introduce the museum wing for aquatic biologists (Image 7.11), and discussing how his group went about to think of what content to include in their museum and how to present it and why in terms of print and multimodal ways of communication (Images 7.12 and 7.13). Olga presented more specific information about how the three set up the fast facts page and interview with an aquatic biologist (Images 7.14).

Image 7.11 The aquatic life wing developed by Group A (PowerPoint presentation)
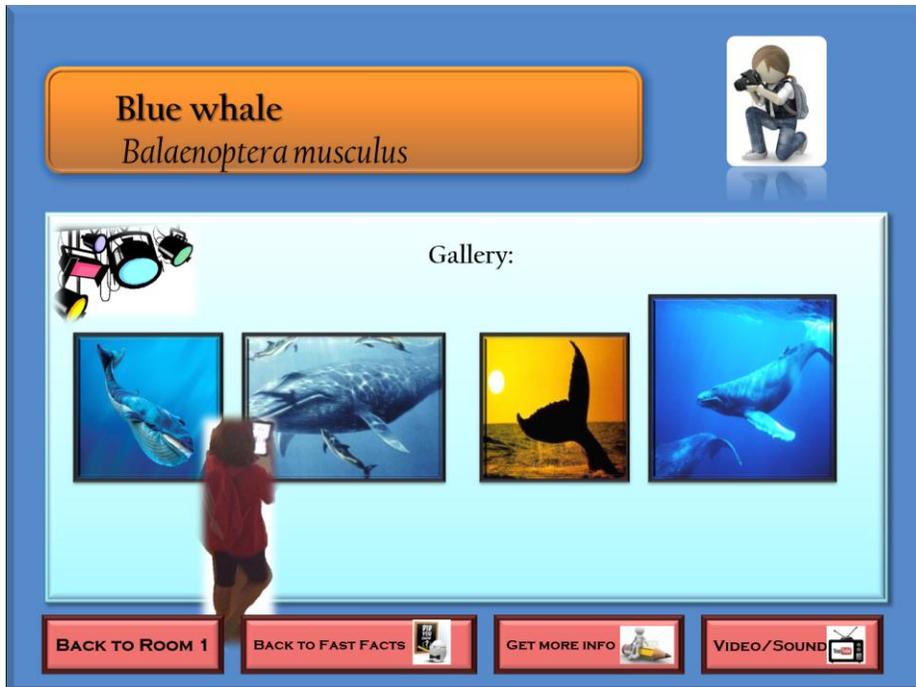
Image 7.12 Gallery room of the virtual museum developed by Group A for the Blue whale (PowerPoint presentation)

Image 7.13 Multimedia room of the virtual museum developed by Group A for the great white shark (PowerPoint presentation)
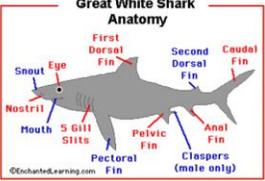
Image 7.14 Fast facts sheet developed by Group A for the great white shark (PowerPoint presentation)

Image 7.15 Interview with an aquatic biologist developed by Group A (PowerPoint presentation)
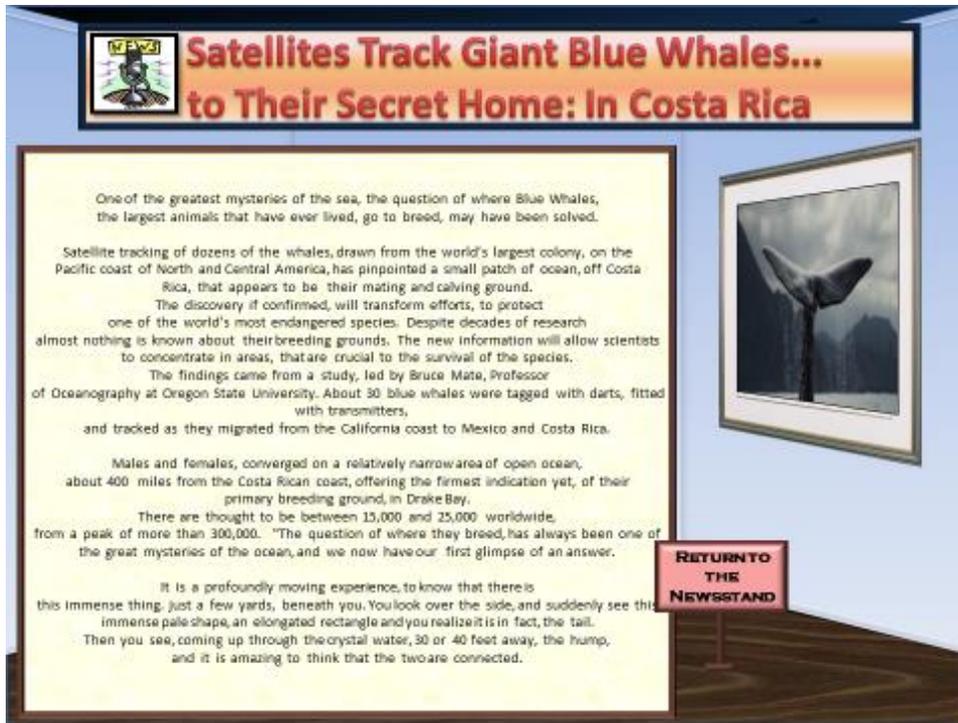
Image 7.16 News coverage on blue whales developed by Group A (PowerPoint presentation)

What was evident from this group's PowerPoint presentation and performance overall during the LMP is that the use of the knowledge processes benefited students in terms of agency – the shift from the teachers to the students led to effective transformation and improved repertoires of literacy. Scaffolding students' agency through the knowledge processes, resulted in higher levels of autonomy and empowered subjectivities as confirmed by students' and teachers' reflective interviews. It is crucial that this type of agency is embedded in teaching and learning. Importantly, what the final presentation pointed out is that these students were able to gain a deeper understanding on how and when to apply the strategies attained in different contexts rather than reducing them to "school activities" or "timefillers" (Anstey and Bull, 2004, p.160).

7.6 Conclusions

The MPAZ tool was developed drawing on theoretical insights to inform evaluation of students' literacy performance in relation to the knowledge processes of the LbD Model. Importantly, through the MPAZ tool I was able to communicate about learning to teachers who were able to gain a deeper level of understanding regarding the knowledge processes and how these could be practically used to plan explicit instruction and assessment. The four zones had different focus in each drawing on the components of multiliteracies pedagogy and Luke and Freebody's (1990) Model of literacy practice:

- the functional user or operational skills;
- how students make sense or meaning from the text;
- the critical aspects to using technology; the cultural perspectives; power and positioning;
- the transformative aspects of the computer: how students have taken their new learning and used this in other ways.

What the evaluation suggested is that students' repertoires of literacy practice did expand during the LMP. Different indicators of students' learning in relation to the knowledge processes were presented in this chapter drawing on the MPAZ tool and further discussion of major literacy events focusing specifically on one's group multiliteracy experience. It was evident that the three students in Group A, despite their differences in terms of their literacy performance and background, were able to perform well together and improved from the levels they were prior to the enactment of the LMP.

Different aspects of the LMP contributed to students developing their skills in collaboration and group work; problem solving and thinking; analysing and research skills; print and multimodal literacy; speaking and listening; and critical thinking and reflective practice. Greene (1995) stresses the importance of considering students' funds of knowledge or the lived realities of culturally and linguistically diverse students.

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Greene (1995, p.120) asks educators to "find ways for the young to find their voices, to open their spaces, to reclaim their histories in all their variety and discontinuity" because, she writes, "teachers will confront thousands and thousands of newcomers in the years ahead: some from the darkness and dangers of neglected ghettos, some exhausted from their suffering under dictators, some stunned by lives lived in refugee camps, some unabashedly in search of economic success".

Another important aspect of the instructional framework that contributed to expanding students' repertoires was engagement with multimodal texts across all stages of the LMP. Students were motivated by the use of digital texts yet more importantly the different modalities catered for their variant learning styles and low linguistic performance. Baker (2010, p.67) states that "meaning expressed in one mode cannot be directly and completely translated into another". The use of verbal modes (reading, writing, listening and speaking) as well as non-verbal modes (visual, embodied, audio, gestural, tactile and spatial) are an integral part of multiliteracies pedagogy and in particular museum with its unique nature has a lot to contribute towards addressing multimodalities.

As far as the focal student group described in this chapter, Sergey and Olga were rated mainly at the assisted competence level at the beginning of the partnership. By the end of the LMP, they had moved to the autonomous competence level or at least higher levels of assisted competence. John on the other hand begun the project at the autonomous competence level and completed it at the collaborative competence level or higher levels of autonomous competence. These findings supplemented by the evaluation of student work samples, as well as the rest of the ratings using the MPAZ tool indicated transformation of all the students through the knowledge processes of Learning by Design implemented through the MMP. Standardised testing could not show the extent of learner transformation since it is one dimensional and does not address diversity or capture the learning that students can demostrate (van Haren, 2010, p.267). An increasing body of research studies affirm on the need to use authentic assessment and measurement of achievement against starting points instead of state

averages to address diversity (Newmann, 1996; Strong et al., 2001; Comber and Kamler, 2004; Black and Wiliam, 2009; Hayes et al., 2006).

Chapter Eight - Discussion and conclusions

8.1   Introduction

This research stemmed out of the following question: How can a museum-school partnership be designed and implemented to enhance the literacy repertoires in particular (but not exclusively) for culturally and linguistically diverse (CLD) students?

Within this context, the research was guided by four further research questions:

1) What are the characteristics of an effective museum-school partnership that adequately supports 21st-century multiliteracies learning for CLD students in Cyprus?

2) How can a museum-school partnership programme be theoretically and practically designed and implemented to enhance the pedagogical strategies for multiliteracies-based teaching?

3) What is the impact of a museum-school partnership on teaching and learning?

4) How does a museum-school partnership affect students' repertoires of literacy practices?

The 'Museum Multiliteracies Practice' (MMP) framework and its implementation through the Living Museum Partnership (LMP) developed as a response to the need for relevant and inclusive theory-based museum teaching and learning from a school-based perspective. To test the feasibility of the framework, a Design-Based Research methodology was employed (Wang and Hannafin, 2005; McKenney and Reeves, 2012) through form of consecutive iterations and a final field study that was carried out for four months in a primary school in Limassol, Cyprus involving three phases (Section 2.5, p.45):

i) Preliminary analysis; aimed at gathering a set of understandings on the issue of CLD students and literacy learning in the available literature and within the Cypriot context through fieldwork.

ii) Design/prototyping of the supporting materials and pilot LMP; developing and trialing classroom interventions, and evaluation and documentation of their effectiveness.

iii) Evaluation of implementation of the LMP; final implementation of the LMP and analysis and evaluation of its practicality and effectiveness.

Throughout the research, interpretation and analysis drew from both qualitative and quantitative data collection tools followed by a thematic analysis using a hybrid combination of inductive and deductive approaches to research was applied to relevant segments of the data.

This final chapter seeks to discuss the findings and conclusions of the research. At first the main findings are presented followed by the conclusions and implications of the research. The next sections describe how this research contributes to knowledge in terms of methodology, theory and practice of museum-school partnerships. In this chapter I also proceed to present the limitations of the study. My intention is to further note recommendations for future research, policy and practice of museum oriented teaching and learning in Cyprus and abroad. I conclude this thesis with a final reflection on the research.

8.2   Discussion of the main findings from the research

The discussion in this section aims to summarize key findings from the investigation to provide answers to the research questions that guided the thesis. The discussion evolves through a dialogic process of engaging with relevant literature in the field.

8.2.1 Characteristics of the LMP programme

This section discusses the first research question: What are the characteristics of an effective museum-school partnership that adequately supports multiliteracies learning for CLD students in Cyprus?

Wolton's (2009) research found that an effective learning partnership will have four basic elements: mutual goals, communication plan, key leader support, planning and research, and four interpersonal elements: personal responsibility, honesty, communication at the intimate level, and trust. In this research, some of these characteristics were confirmed during the implementation of components of the LMP involving a virtual museum workshop, supporting materials for 13 classroom sessions, a museum educational programme and a Museum Day (Section 4.4.3, p.124). The main characteristics of the museum-school partnership of the research are described below (Figure 8.1).

Figure 8.1 The main characteristics of a successful museum-school partnership

8.2.1.1 Common educational goals –communication and expectations

The most important part of the research involved cultivating a culture of dialogue between all parties involved. Lehman and Igoe (1993, p.15) point out that it is essential to identify the needs and options available for the two institutions (museums and schools) as well as to define the issues they want to address, analyse elements of the programme, develop the course of action and investigate resources. The above procedures were followed throughout the DBR process in this research, by allowing teachers to express their views from early on and testing the materials themselves, all the way to the implementation and evaluation stage of the final version of the LMP programme. This communication and panel discussions and meetings following each session, were instrumental to the success of the partnership as it informed my understandings, knowledge and skills in designing the LMP programme and materials, as well as on specific strategies used to support the instructional approach during the implementation.

8.2.1.2 Coherent planning and research of the partnership

The LMP partnership was the result of coherent planning and an interdisciplinary theoretical ground. The IMLS, already from 1996 stated that it is necessary to set realistic, concrete goals through a careful planning process. It is also essential to integrate evaluation and ongoing planning into the partnership (IMLS, 1996; Wolton, 2009), an approach followed thoroughout the LMP as a result of a collaboration among teachers, staff, and myself including discussion about the design, content, delivery, and challenges during the prototyping and implementation stages. Importantly, each session of the 13 weeks of enactment of the LMP, was embedded in the teachers' timetable and were carried out during school time. In this sense, the intervention was compatible to everyone's programme. All components responded to the LbD Model sequence and the components of the multiliteracies pedagogy as addressed in the MMP framework. Barragree (2007) highlights how educational guides developed through research and development methodology offer museum and public school personnel practical and

valuable products for improving education. Despite the coherent planning of the intervention, still the programme was designed to offer flexibility and creativity through adjusting the activities, so that the museum-school partnership could tailor its project to the needs of the teachers and students involved while meeting project goals. The latter was pursued through ongoing dialogue with teachers and students during reflection meetings and interviews.

8.2.1.3 Content focus on students' real life experiences

For Wenger (1998) school is not the privileged focus of learning, but part of a broader learning system that involves life itself. Barton, Hamilton and Ivanič (2000) speak of merging students' schoolworlds and lifewords so as to expand their repertoires of literacy. This is a fundamental principle within the MMP framework. Both museums and schools must find ways to make connections to the lives of students, to enable richer, deeper, and more engaging experiences (Bevan, 2003; Hirzy, 1996; Patchen, 2002).

In this research, the supporting materials for the topic of 'ecosystems and endangered species' were inspired by students' real life experiences based on the school curriculum for environmental education in compliance with museum content. These were integrated into the LMP through the WebQuest as the content of the sessions and workshop in the form of museum multiliteracies-based lessons.

Findings from the research indicate that teachers appreciated the content of the supporting materials and the instructional sequence such as the knowledge processes, since these provided a step-by-step guide to support the planning and executing of museum multiliteracies-based lessons. Barragree's (2007, p.2) research confirms indeed that museum and public school personnel benefit from quality resource step-by-step guides as it has led to fulfillment of the learning objectives met. Barragree (2007, p.3) further stresses that these sort of partnerships can help public schools create motivational curriculum materials whilst making almost every subject more relevant to

students' lives, increase students' interests, and make learning more effective. Indeed, findings from this research confirmed students' enhanced motivation and improved learning outcomes as a result of their engagement in the LMP.

8.2.1.4 Active, experiential participation of students

An effective museum-school partnership provides students with opportunities to engage in active learning, direct different activities and draws students into reflective practice. In this research, the activities involved in the LMP (Table 6.4, p.222) enabled students with opportunities to:

- Lead their own investigatory activity following guidelines from the WebQuest;
- Immerse into the process of design and creation of the virtual museum exhibit;
- Participate in discussions and make decisions regarding the project.
- Complete a reflective evaluation worksheet.
- Engage in the redesign of texts through multimodal meaning making
- Public presentation of performed modes of literacy

Students were actively involved in gaining deep understanding of the concepts taught while increasing their new knowledge and skills about creating virtual museums. They also enjoyed the public presentation modes of literacy which involved them to 'perform' – to role-play, debate, dramatise, and express themselves.

8.2.1.5 Inclusive teaching and participation

It has been proposed that one of the elements of effective inclusive school transformation is inclusive policy structure and practice (e.g., Burrello, Sailor, and Kleinhammer-Tramill, 2013; Kozleski and Smith, 2009). Museums, through their particular qualities of their environments, can nurture inclusive learning. Baldino's research (2010) on museum learning and autism demonstrates the efficacy of museums

for inclusive learning and the significance of a secure museum-school partnership. This research confirmed the inclusive possibilities offered within museum learning practice while concurrently addressed and affirmed the inclusive potentialities of multiliteracies pedagogy. Evidence suggested that the culturally and linguistically diverse students involved in this partnership benefited both in terms of cognitive and affective learning outcomes while it facilitated their active participation and understanding, as part of their respective groups or as a whole in the classroom. This changing practice was noticeable from teachers who gained confidence and improved self-efficacy as they felt that they could make a difference to these students' learning.

8.2.1.6 Multimodal meaning making and engagement

In this research I position my lens for investigation within a multimodal literacy framework. Positioned within this framework, I "understand communication and representation to be more than about language" (Jewitt, 2009, p.14), but rather involving also image, gesture, posture, sound, and movement (Walsh, 2011). My belief is that engaging students in museum learning constitutes a multiliteracies practice which is imperative in developing 21st century museum-school partnerships. This aligns with the view of the Institute of Museum and Library Services (IMLS) in Washington DC (2009) which has proceeded to adapt for Libraries and Museums one widely accepted framework that defines "21st-century skills" offered by the Partnership for 21st-Century Skills (P21). This framework suggests that museums may offer important possibilities for engaging in various literacies providing additional and alternative cultural capital to supplement that of traditional academic literacy (Eakle 2009, p.205). The above ideas are also addressed by Schwartz (2008) who speaks of a museum-based pedagogy as opposed to traditional museum education. Schwartz highlights 'the teaching of verbal, visual, technological, social, and critical literacies; not museum literacy, which is the ability to access the museum's cultural and intellectual resources' (Stapp 1984; Schwartz 2008, p.29).

The findings in this research confirmed that a successful museum-school partnership for the 21st century should pertain to multiliteracies pedagogy. Students were given the opportunity to engage with various composite discourses that came from the students' own multicultural, multilingual and technologically literate background. They used a variety of multimodal texts, displaying knowledge in multiple forms: print, images and combination of forms in digital contexts. Emphasis was given on multimodal meaning making and critical thinking through primarily the WebQuest, aspects of multiliteracies pedagogy embedded in the MMP framework. During the process of creation of the virtual museum, writing became "multi-vocal" and intertextual (Snyder, 1996). Students took the first steps towards becoming critically literate about the texts and social practices in cyberspace and engaging in intercultural communication in global virtual communities (Luke, 1997).

When students studied multimodal texts, the intention was for texts not to be studied in isolation, but to a certain extent, in their social context and from a range of contemporary social perspectives (e.g. Moore, 1997, Pope, 1998). These findings confirmed other studies such as Nelson et al.'s (2011) exploring multi users' virtual learning environments (MUVE) impact on scientific literacy. They elicited how engagement in the specific environment was motivating for all students, including students who had been characterized as "low ability", based on grades. This evidence cohorts with findings from Ho's, Nelson's and Müeller-Wittig's (2011) case study on MUSE, a Museum-based Multimodal Learning Initiative.

8.2.2 Design and implementation of the LMP programme

The development of the museum-school partnership was succeeded through a prototyping approach and formative evaluation (Chapter Five, Section 5.2, p.149). The activities at this stage were guided by the second research question: How can a museum-school partnership programme be theoretically and practically designed and implemented to enhance the pedagogical strategies for multiliteracies-based teaching?

The findings from this study indicate that the iterative activities conducted during the prototyping stage provided with some valuable insights which were instrumental to ensure the validity and practicality of the supporting materials and the programme (Sections 5.3, p.159 and 5.4, p.162). The use of external expertise in the design of the partnership could be seen as both a source of technical expertise as well as an agent of change (Cordingley et al., 2003). A number of suggestions for improvement of the supporting materials and the virtual museum workshop were adopted in a way that would be feasible to practically implement them in the Cypriot context.

In addition to seeking the feedback of external parties, advice was sought from teachers and students as target users to ensure that the elements of the programme could be implemented in a school context. Findings from the research demonstrate that teachers engaged in the prototyping phase by undertaking the following roles:

i)   Engaged in critical panel discussion to provide their opinions on developing the supporting materials and organise the partnership; and

ii)   Testing of the supporting materials and the workshop to provide their feedback.

It seemed that the teachers' involvement in developing the supporting materials for the interventions proved beneficial in terms of stimulating their interest, allowing for their voices to be heard and share suggestions within realistic expectations to facilitate teaching and learning (McKenney and Reeves, 2012, p.129). This direct involvement and commitment as discussed in the previous section is found to be key for the sustainability and successful delivery of museum-school partnerships (IMLS, 1996, p.50; Hirzy, 1996; Sheppard, 1993). In particular, it helped them gain more confidence and understanding of this alternative instructional approach that could be utilised to improve CLD students' literacy performance. Concurrently, teachers' insights and explanations of their students' backgrounds contributed to the improvement of the supporting materials and the rest of the components of the LMP programme. The

successive iterative cycles of the prototyping approach produced the final refined intervention which was undertaken during September – December 2012 (Table 6.4).

8.2.3 The impact of the LMP on teachers' pedagogy and student learning

This section provides information that answers the third research question: What is the impact of a museum-school partnership on teaching and learning?

The LMP programme was developed as a museum-school partnership intended for supporting diversity and multiliteracies driven practice. The central element of this approach was the LbD Model within the MMP framework which supported planning and teaching museum multiliteracies-based lessons. Collins et al.'s (2004) and Rogoff's (1995) five levels of evaluation of effective design based interventions facilitated the evaluation of the implementation of the LMP: cognitive, interpersonal, group, resource, and institutional level (Table 6.1).

8.2.3.1 The impact of the LMP on students' learning outcomes and attitudes

Bloom's Digital Taxonomy Activity Analysis Tool (Appendix 2K) and focused group discussions post-intervention with students enquired into students' reactions to the LMP components and activities, students' opinions about learning from the LMP, and students' perceptions of their teachers' role as a facilitator. The results presented in Chapter Six and Seven suggest that students participating in the museum-school partnership maintained positive stances towards the components and activities of the LMP (Table 6.7). The findings (Table 6.6) suggested a statistically significant difference in the mean scores between the two stages in terms of the measured Bloom cognitive levels (i.e. $p < 0.05$). Although it is possible that other factors such as students' social background, initial levels of attainment and intrinsic motivation may have contributed to these results, the enactment of the museum multiliteracies approach appeared to have a positive influence on students' understanding of the topic. Nevertheless, there was

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indication of a lack of capacity for higher order thinking within the critical framing and transformed practice stages. This difficulty to reach deep understanding in new ways' (Anstey and Bull 2006, p.60) could be explained in terms of students' lack of systematic engagement with similar activities in class (MOEC, 2012) and also the lack of sufficient time to familiarise with the activities of the intervention.

What the evidence shows is that the LMP workshop met the expectations of the vast majority of students who appeared to benefit and feel empowered by the alternative approach to teaching and the relevance of activities to their real-life experiences. According to Cope and Kalantzis (2008, p.576) 'recognizing learner differences and use them as a productive resource', is characteristic of ubiquitous learning. Indeed, there was evidence that students' subjectivities were empowered. Further to this, they appeared more confident to engage in the session during the LMP partnership, although they found some of the activities in particular those related to the critical framing and Transformed practice stages, as more challenging and difficult to complete.

Overall, these CLD students, found the computer-mediated activities using the WebQuest as more fun and motivating while stated an increased confidence in appropriately engaging in the development of any sort of virtual museum. Furthermore, it was evident that students were able to respond adequately to the activities involved in the WebQuest. The processes within the WebQuest method allowed the teacher's role to be supportive to the students' work acting as a facilitator between new technologies and the students (Papanicolaou and Gregoriadou, 2006). As an inquiry-driven form of learning (Dewey, 1938, 1991; Kuhn, Black, Keselman and Kaplan, 2000), the use of the WebQuest in this research confirmed findings from similar technologically-enhanced intervention studies which sustain that engagement in WebQuests through student engagement in group work results in student 'ownership and responsibility for their own learning' (Looi et al., 2010, p.24) and for their peers. There was indication of students starting to behave as scientists while they collaboratively identified problems through observation and inference, form and test hypotheses, and deduce evidence based

conclusions about underlying causes (Dede et al., 2005). Noticeable, students reported accessing the WebQuest from their homes.

To further substantiate the findings, reflective interviews (Appendix 2Hb) with participating teachers were carried out. Their statements confirmed students' active engagement, enhanced motivation in using digital modes of literacy and positive stances towards the sessions and the LMP overall. In addition, this change in attitudes inspired teachers to consider a more systematic implementation of the museum multiliteracies-based approach and the LbD Model in their everyday practice. Teachers were asked to comment on the content, process (delivery), and context of the LMP (Table 6.10). Findings suggested that both teachers found the knowledge and skills gained from participation in the LMP as facilitators useful to their teaching practice. They agreed that each of the session activities were well organised and relevant to the learning and affective goals of the partnership, whilst the learning environment was conducive in terms of venue, resources, and materials. Both teachers appeared inclined to use the experiences of the LMP and curriculum materials to guide implementation of the new approaches in their classrooms.

8.2.3.2 Students' interpersonal involvement

An important inference from the LMP was that students gained confidence in engaging with their peers and within the broader environment of the partnership while also demonstrated personal self-esteem and good social organisation skills. The instructional approach whereby the teachers acted as facilitators of learning rather than authoritative to the students' work, seemed to create a learning environment which allowed students to provide their prior knowledge and experiences while enabling a dynamic student role.

Findings from this interpersonal aspect of the evaluation of the partnership indicated that the intervention evolved as a community of practice in that students appeared to benefit from the collaborative learning dimension (Kuhn et al., 2000;

Vygotsky, 1978). They seemed to benefit and appreciate this sort of scaffolding and support of the project which allowed them to improve both by learning on their own but also while learning with others in the group (Looi et al., 2010).

8.2.3.3 Evaluation of group engagement

The assessment of the intervention at the third evaluation level (Table 6.1) addressed issues of group dynamics. Findings from the observations and field notes, as well as insights from teachers' reflective interviews suggested an improved sense of belonging in the group, with increased levels of participation and engagement. The field notes and observations in the classroom indicated high levels of group talk and participation during the completion of tasks. Students were conversant in, and confident with, discourses of their community and peer groups.

They would talk to each other, raise arguments and ask questions, even provoke each other to find solutions to solve the problem (Kuhn et al., 2000). Through exposing different views in the group, students improved their capacity to acknowledge different perspectives on the same problem or situation and how to use this knowledge creatively to revise their ideas. In this sense, learners became designers of their experiences while working in groups, as collaborative knowledge makers (Cope and Kalantzis, 2008, p.581).

Another inference from observations of the group interactions is that students were provided with opportunities to express and celebrate their individualities with others and were acknowledged for their personal attributes. This points towards the realisation of being responsive and reflective to the "various 'subjectivities'-interests, intentions, commitments, and purposes – students bring to learning" (NLG, 1996, p.72).

8.2.3.4 Evaluation of resources management

The participating teachers suggested that it would be difficult to implement the instructional approach proposed due to the scarcity of funds in these schools. Nevertheless, they felt it was possible to improvise and enact the new approaches as long as they thought it was meaningful for their students.

As far as the resources used, since one of the intended learning outcomes of the intervention was to develop multimodal awareness, students were exposed to a range of semiotic resources using the WebQuest during the virtual making practice, as well as in the workshop and during the museum educational programme. Through this engagement, students gained a sense of sensitivity to semiotic affordances and constraints, aligned with New Literacies (Gee, 2008) focal interests and emphases. In particular they were provided with opportunities to visualise and explore ideas or models embedded in visual imagery during the search for content for the galleries for their virtual museum. Most students preferred doing practical work and using digital and other multimodal means, in addition to engaging in group discussions after presentations to their peers (Table 6.10). It could be claimed that during the process of selection of multimodal resources, students displayed a level of increased understanding of the intertextual nature and dynamic character of electronic texts.

8.2.3.5 Evaluation of institutional engagement

It was evident from teachers' responses in Table 6.14 that the AP school encouraged teachers to implement the new approaches in their classrooms and further to these all colleagues helped towards a smooth operation of the LMP whilst exhibited interest for the research. Following the Museum Day which concluded the project with a presentation of the Living Museum, several teachers approached me to ask further details on the instructional approaches used and expressed an interest to learn more on how to embed it in their teaching.

8.2.4 Students' literacy performance in the LMP

In this research a repertoire of practice refers to people's ways of engaging in activities stemming from their participation in a range of cultural practices (Pacheco and Gutiérrez, 2009, p.74). In terms of school learning, a well-developed and expansive repertoire of practice on behalf of the teacher can result in being better prepared to respond to the needs and challenges of teaching students from diverse backgrounds, cultures, and interests which in turn can help expand their repertoires of literacy.

The aim of this research was to demonstrate how (rather than why) these students used the semiotic resources available to them (van Leeuwen, 2000, p.303) in their multimodal virtual meaning making practice. To address the effectiveness of the LMP in terms of its contribution to expanding CLD students' repertoires of literacy practices, I developed the Multiliteracies Performance Assessment Zones (MPAZ). The tool was primarily based on the Assessment Schema proposed by Kalantzis and Cope (2005, p.95-97) and Luke and Freebody's Four Resources Model (1990) which was incorporated into the planned intervention. The MPAZ allowed to track students' performance in each of the knowledge processes, namely demonstration of experiential knowledge, conceptual knowledge, analytical knowledge and applied knowledge with respect to three levels of competence (assisted competence, autonomous competence, collaborative competence) (Figure 7.1).

Evidence from the MPAZ, interviews, and in-depth observations of focal students' group suggested overall that the majority of the students exhibited improved literacy performance. In particular with regards to the demonstrated experiential knowledge, findings suggested that fifteen of the seventeen students moved to a higher level of performance in terms of *experiencing the known* and *the new*. Further to these, five students who were at the autonomous level moved to the collaborative competence level where they were able to work effectively with others, including people with less or different knowledge and expertise than themselves, to produce an excellent piece of

work. Finally, two students remained at the same level, one at the assisted competence level and one at the autonomous competence level.

Another level of analysis of the impact on students' repertoires of literacy was with regards to the conceptual knowledge process. Findings indicated that twelve of the seventeen students demonstrated an increased level of performance with regards to *conceptualising by naming* and *by theorising*: Nine students moved to the autonomous level and three more moved to the collaborative competence level. The remaining five students maintained the same level of performance.

The third stage of the museum multiliteracies-based approach, involves critical framing which relates to analytical knowledge. The analysis showed that nine of the seventeen student participants in the research demonstrated an increased level of performance with regards to *analysing functionally* and *critically*: Six students moved to the autonomous level while another three moved to the collaborative competence level. The remaining eight students maintained the same level of performance (the assisted competence level for five of them and the autonomous level for the remaining three).

The final stage of the intervention involved the transformed practice. According to the results from the evaluation of students' performance, the analysis pointed out that ten out of the seventeen students demonstrated an increased level of performance with regards to applied knowledge: Eight students moved to the autonomous level and a further two students who were at the autonomous level moved to the collaborative competence level. The remaining seven students maintained the same level of performance (the assisted competence level for three of them and at the autonomous level for the remaining four).

Participating in the type of practices within the LMP 'provided opportunities for students to develop a literacy toolkit with resources that can help them navigate the intercultural exchanges of everyday life' (Pacheco and Gutiérrez, 2009, p.60) whilst also improved their understanding of a range of semiotic tools and texts. Importantly,

Pacheco and Gutiérrez (2009, p.60) further posit that a focus on students' repertoires of practice such as was the case in this research draws away from deficit explanations of students' performances attributed to students' membership in particular cultural communities. It is important to acknowledge that while classrooms are places that host a range of students' cultural practices, yet at the same time teachers and students have the power to jointly construct and participate in the culture of the classroom (Gallego, Cole, and Laboratory of Comparative Human Cognition [LCHC], 2001). To understand how and why students engage in certain literacy practices, it is important for teachers to pay attention into how the histories of communities—local or global—make such practices salient and significant (Johnson and Cowles, 2009, p.419). It is these realisations that were applied in the design and enactment of the LMP which led to expanding students' repertoires of literacy.

The enactment of the museum multiliteracies-based approach introduced students to multimodal communication, breadth and flexibility as a goal in language instruction while teaching the environmental topic. It should be noted that teachers choosing these texts, therefore, would need to be culturally sensitive in the options for assessment offered to students (Jetnikoff, 2003, p.4). In this research, rubrics, and self-evaluation sheets using storytelling where thought as the most appropriate means of assessing CLD students' work. The analysis pertained to a sociocultural perspective. Johnson and Cowles (2009, p.411) argue this approach has been useful for studying how patterns of in-equity are reinforced through literacy (Brandt, 2001) for "how we interpret texts depends on the meanings we attach to the signs and symbols that surround us" (Edmondson, 2003, p.12).

8.3 Conclusions and implications of the research

The literature contends that exposing students to experiences that are relevant to their lifeworlds and cultures can motivate them and provide with opportunities to engage in the lesson in a more meaningful way (González et al., 2005, p.6). The evaluation of the findings from this research indicate that the research-informed LMP programme can

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potentially help schooteachers' learning and implementation of museum multiliteracies-based lessons in their classrooms to support CLD students' expansion of repertoires of literacy.

In this research, the LMP was designed to bridge the gap on theory-based museum learning practice using multiliteracies pedagogy. The preliminary context analysis of the research indicated that the dominant teaching method in primary schools focused on print texts rather than multimodal texts which was not helpful for CLD students to learn and provided limited literacy experiences. In contrast, the enactment of the LMP provided these teachers with a path for learning and practicing effecting teaching methods utilising the approach proposed to take advantage of the multimodal literacy meaning making potentials of museum learning. The research proposed the Learning by Design Model employing the knowledge processes to provide support for teachers in the sort of content, planning, implementation, and assessment when implementing the museum multiliteracies-based approach.

Importantly, a significant component in this framework of thought is the 'situated practice'. My adoption of the situated practice stage and subsequent stages in the LbD Model contributed to increasing teachers' repertoires of pedagogical practice with specific instructional sequence. These strategies included experiencing the known and new with scaffolding of students' learning. They are considered incremental to teacher's classroom instructions as they provoke students' interest in contemporary 'real life' tasks and connect previous knowledge with the new. Further to this, the use of scaffolding and undertaking a facilitative role moved away from the overly didactic practices often seen in the pre-intervention classroom observations (Section 6.3.2, p.218). Having the two teachers participate in my enactment of the approach and reflective discussions following each session gradually prepared them towards employing museum multiliteracies-based teaching and learning approaches in their everyday activities as Chapter Six highlighted.

Findings from post-intervention classroom observations, reflective interviews and my field notes indicate that the LbD Model utilised, supported the enactment of the museum multiliteracies-based approach and contributed to changes in students' learning (Chapter Six, Part Two, Chapter Seven). It was evident that through exciting students over known concepts, this not only helped to elicit their prior ideas and conceptions, but also attracted their attention to the lesson, and generated curiosity. What is more, the systematic use of multimodal literacy modes resulted in increasing students' interest to participate in the activities. Their existing knowledge of, and interest in, computer-mediated literacy modes was matched with new knowledge to undertake different tasks for the construction of the virtual museum. Reflecting upon the use of digital and other multimodal and public forms of literacy such as drama and play, teachers considered computer technology as a motivational thing for their students. Such instructional practices can help maintain students' interest in the lesson and ultimately bridge the gap between the literacy practiced in school and those in their everyday life. In particular for the CLD students in this research, engagement in digital practices such as the WebQuest and the virtual museum workshop enabled them to express themselves more freely and gain confidence in working as part of their groups for completing different tasks. The post-intervention findings indicated improvement from the pre-intervention classroom observations in terms of students' learning and affective outcomes:

i) The use of both print and multimodal modes of literacy stimulated student awareness and curiosity.

ii) Use of hands-on activities and flexibility in undertaking tasks provided students with a dynamic role as they had opportunities for active involvement in the development of conceptual understanding.

iii) Undertaking a facilitative role as a teacher alongside the two schoolteachers using the WebQuest primarily through leading discussions, probing questions, guiding tasks and observations, enabled active participation of students and engagement with ideas.

iv) Students felt empowered as they contributed in the learning process, i.e. through interaction with their teachers, materials and their peers.

v) Reflective self-evaluation of their work and performance, enhanced students' understanding of what had been taught during each session.

The above inferences derived from the combination of data from different sources: field notes; interviews; Bloom's Digital Taxonomy Analysis Tool; teachers' reflective interviews; students' evaluation story completion and students' focus group discussions. What remains to be seen is the extent to which these approaches which positively influenced student learning and affective outcomes can be adopted in the long run in a more systematic way in schools and be sustainable and feasible within routine classroom practice. It is proposed that a longitudinal view of the museum-school partnership to be sustainable is necessary and for students' learning outcomes to continue to improve. Nevertheless, students' improved literacy performance, understanding in the topic of 'ecosystems and endangered species' and positive attitudes are a good sign of possible success in the future of implementing the Museum Multiliteracies Practice as a framework for undertaking successful museum-school partnerships. The requirements, of course, are for the partnership to comply with the principles and characteristics described earlier as prerequisite to maintain the innovation.

8.4   Contribution to educational theory and practice

This research explored the potential for improvement of environmental teaching and learning in Cypriot primary schools. A museum-school programme was designed to enhance schoolteachers' and museum educators' instructional practices which in turn, helped students, in particular the culturally and linguistically diverse learn through museum multiliteracies-based approaches. Hence, the research contributed both to the practice and theoretical insights of the impact of the LMP on teachers' instructional practices and students' learning. In particular, the theoretical framework introduced provides with an alternative approach to undertaking meaningful relationships between museums and schools which are relevant to the needs of today's multimodal learners. In this respect, it is considered that one of the most important contributions of this research to the field is providing a theoretically and empirically-informed interdisciplinary

pedagogical framework for carrying out and assessing effective museum-school partnerships. The interdisciplinary nature of the work undertaken is of importance in view of the need for museums to justify their role through an approach that merges the needs of inclusive education and curriculum standards with the contemporary digital and multimodal competencies required for 21st century learners.

An important part of the intervention was to facilitate teachers' understanding of the innovation (museum multiliteracies-based approach and the Learning by Design instructional sequence) which was augmented using the design guidelines for the supporting materials and the LMP programme. These specifications provided teachers with the knowledge and procedures towards the intended improvements of the instructional approaches proposed in accordance with the current Cypriot environmental education curriculum. The LMP was the first step towards the aim of establishing a long-term relationship between the schools and museums. Informal discussions with the teachers following the implementation of the intervention showed how a more systematic use of the principles of the framework introduced to the teachers were implemented in their daily teaching as well as through enactment of other projects in the form of partnerships. In addition, a year after the fieldwork was completed, one of the two participating museums initiated an educational programme inspired by the multiliteracies framework of thought utilised during the research.

The research adopted the Learning by Design Model (Cope and Kalantzis, 2000b) as a framework to support enactment of the sociocultural museum multiliteracies-based approach during the LMP. The intention was to provide with new knowledge and skills to build their instruction in meaningful ways based on what the students know and support them in their interactions with materials, peers, and their teachers. According to Twiss-Houting, Taylor, and Watts (2010, p.23), theory based museum learning practice is more effective than merely theoretical constructs who cannot be translated into practice. In this sense, this research brings to the surface a renewed perspective on how to implement museum school collaborations as well as develop museum educational programmes. The design based research aspect of the

study with the intervention contributed significantly to teachers' pedagogical knowledge and skills leading to improved learning for the participants involved. Therefore, the findings of this research could be of use to educators, both museum staff and schooteachers looking to implement a systematic pedagogical approach adhering to contemporary learning theories. In addition, the design principles developed could be of relevance to both established and newly-introduced schemes and partnerships looking to develop a deeper relationship between museums and schools. Policy-makers and practitioners can make use of the MMP framework adapted in their local context to nurture meaningful and multimodally-mediated museum-school partnerships.

The above implications are possible through addressing the systematic steps followed in this research. The enactment of the LMP capitalises on the four components of multiliteracies pedagogy by employing the knowledge processes derived from the LbD Model. Students' motivation and enjoyment of learning through scaffolding in the situated practice stage and engagement were considered as a prerequisite for the learning process in order for meaningful and sustainable learning to happen. Lumby (2011) suggests a positive relationship exists between stimulated enjoyment and achievement within an educational context.

Apart from looking at students' prior experiences, this research most importantly suggested the systematic use of multimodal modes of literacy where technology is effectively integrated into the curriculum, a phenomenon which is sometimes scarce and hard to find, especially at a primary school (Labbo, 2006, p.11). The use of the WebQuest which is primarily an inquiry based learning approach proved beneficial as it enabled to utilise students' interest in computer technology for engagement with museum multiliteracies. This confirmed studies that suggest WebQuests "enhance the nature of learning and thinking, problem solving and the integration of knowledge" by providing an authentic, meaningful and contextual learning environment (Miers, 2005, p.1). Students were commonly found working on, and playing with computers during lunch breaks and appeared to prefer to write on-screen rather than by long hand. There was evidence that their stimulated interest stemming from the multimodal representation

of information employed in the WebQuest, served to enhance thinking more about the concepts at hand, which in turn resulted in a deeper meaning making and understanding of the lesson concepts and content delivered (Wilson, 2006, p.2).

The *situated practice* stage provided with opportunities to link students' prior knowledge with new concepts and the topic of 'endangered species'. Connecting the lifeworld experiences of students through situating meaning making in real world contexts stemmed from the knowledge processes of *experiencing the known* and *the new* as proposed by Kalantzis and Cope (2005). These sort of activities that elicited students' prior knowledge are thought of provoking students' curiosity and motivation to connect prior understanding and produce a new world view or conception as described in the following sections.

During the *overt instruction* stage students worked in mixed gender and ability groups of 3-4 students to explore questions related to categorising and classifying items using both new and existing knowledge to extend and utilise what the learner already knows and has attained to some level of proficiency (Kalantzis and Cope, 2000). My role accompanied by the two teachers during this process was to act as facilitators using scaffolding to guide the learners' practice (New London Group, 2000) by asking questions, giving prompts, and supporting experimentation and guidance while students engaged in the WebQuest activities (Appendix 4I). Engaging in overt instruction was essential to focus the learners and organise and guide situated practice (Cope and Kalantzis, 2000b). These activities enabled a solid base of conceptual understanding of the topic under investigation by helping students to understand what they are learning (Henderson and Exley, 2012) and how they are learning (Gee, 2002).

The *critical framing* stage provided students with opportunities to verbalise their analysis of new concepts in functional (e.g. creating flow diagrams) and critical (e.g. storyboards, debate) ways. It encouraged students to interpret the social context and purpose of designs of meaning (New London Group, 1996) through direct involvement in analysing purposes, comparing, critiquing, and discussing consequences and

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evaluating concepts. Through reflection during the activities of the critical framing stage, students could advance their newly structured knowledge into deeper and broader understanding drawing on higher order skills. In this sense it was possible to interpret to a certain degree the historical, social, cultural, political, ideological, and value-centered contexts of designs of meaning (Kalantzis and Cope, 2000, pp.239-247). Nevertheless, for half of these students, the conceptual understandings they demonstrated as a result of the activities performed did not reach the desired standard due to difficulties with language and deeper understanding of the content of the sessions.

The final stage of the MMP involved the *transformed practice*. This stage provided the opportunity for students to work towards the finalization of the construction of their virtual museum through *applying appropriately* or *creatively*. To apply appropriately meant that students sought for conventional or 'correct way' to solve any problems arising in the process of generating the wings of the virtual museum. A second step involved the delivery of a presentation of their multimodal work produced during the Museum Day to their peers and other staff and parents. This stage incorporated an evaluation aspect with students filling in a story-completion evaluation sheet. The findings of the intervention at this final stage suggested that many students were able to transfer to an important degree their knowledge to new, real world, multimodal literacy uses for a multiplicity of cultural purposes (Cope and Kalantzis, 2000b; New London Group, 1996). Concurrently, these students engaged in meaningful reflective practice, despite they could not reach maximum levels of higher order thinking. Kalantzis and Cope (2000) confirm that transformed practice may differ in degrees and types of transformed meanings for different students and for different texts, ranging from close or good reproduction to significant creative change.

The components described above do not constitute a linear hierarchy. They can instead occur simultaneously, randomly or be "related in complex ways [...] each of them repeatedly revisited at different levels" (New London Group, 2000, p.32). Nevertheless, it appeared that the LbD Model instructional sequence incorporated within the components of multiliteracies pedagogy in this research provided the necessary

sequential structure that was needed to bridge students' prior knowledge and the acquisition of new concepts and skills adhering to sociocultural and social semiotic approaches to literacy. The museum multiliteracies-based approach overall as a framework allowed for the changing roles of the teachers from transmitters to facilitators of knowledge. Importantly, through this process students gained a more active role in the sessions and moved away from memorization techniques.

In addition, the research contributed to improve practice through the design, implementation and evaluation of the LMP which supported the enactment of the museum multiliteracies-based approach supported by the LbD Model. A significant component of the successful implementation of the partnership was designing effective supporting materials, reconfirming findings from other empirical studies. The use of supporting materials in the partnership led to improved understanding of the elements of the proposed intervention. Further to this, the experience from working side by side with me during the LMP, provided teachers with opportunities to interact with the materials and locate their weaknesses and strengths first hand. Findings from the post-intervention reflective interviews suggested that the involvement in the LMP was critical for teachers to gain confidence in implementing multiliteracies pedagogy in their teaching specifically for CLD students. Here the research supports Howard (2003) who contends that critical reflection, can assist teachers to recognize whether or not they are undertaking any kind of deficit notions of culturally diverse students.

Importantly, the effectiveness of the LMP derived also from the shared development of supporting materials, reflective meetings, institutional and collegiate support. It was this type of participation on behalf of the teachers that made them feel a sense of genuine ownership of the intervention, which was critical for the success of the LMP.

A crucial characteristic of an effective design based research is the extent to which it leads to design guidelines or principles to guide innovative interventions. This

research generated five design principles grounded in theoretical insights with regard to effective museum-school partnership experience:

i)   The LMP should rely on the principles of effective, staff and students' learning, as well as a transformative approach to pedagogy which pertains to the museum multiliteracies-based approach supported by the LbD Model. The knowledge processes by Cope and Kalantzis (2000a) provide the sociocultural environment for teachers to follow and practice which will in turn enhance students' learning;

ii)   The virtual museum workshop should emphasize developing students' awareness and knowledge, and providing them with opportunities to reflect upon their learning;

iii)   The supporting materials following the iterative design and formative evaluation should be embedded in the LMP process. These materials are crucial for teachers looking to implement the museum multiliteracies-based approach later in their schools;

iv)   Both the supporting materials and the reflective discussions with teachers should provide with necessary instructions and guidance on how to implement the museum-multiliteracies-based approach. The reflective meetings will focus on helping teachers evaluate their practices and refine them accordingly to classroom practice. It is necessary for these meetings to occur so that teachers' concerns on the progress of the partnership are exposed in a non-judgmental way;

v)   It is crucial to have a mechanism in place for ongoing evaluation of the partnership process. This assessment will involve gathering and analysing data to do with students' reactions and learning outcomes, school and collegiate support, teachers' use of new knowledge and skills (Collins et al., 2004).

Van Den Akker et al. (2006, p.73, p.153) stress that guidelines or principles generated from the design and research activities in DRB should not be treated "as 'recipes' for success", but rather as guiding aids for other interested parties to select and enact the most appropriate procedural knowledge using specific design and tasks adapted to suit their own context.

8.5 Methodological contribution

The intention in this research was to provide insights into how innovative museum-school partnership can be designed and enacted to support teachers' learning and practice. The innovation was undertaken within the ground of Design Based Research (DBR). It was considered that this methodological approach was the most appropriate to realise a small-scale example of an intervention and to generate the methodological guidelines for designing and evaluating such interventions (Van Den Akker et al., 2006). The DBR approach allowed for flexibility in developing the LMP programme stage by stage within the premises of the problem context:

- The preliminary analysis with problem identification, diagnosis and design requirements (Chapter Three, Four)
- The design and formative evaluation during the prototyping phase (Chapter Five)
- The evaluation of the implementation of the LMP (Chapter Six, Seven)

These phases are summarised in Chapter One, Figure 1.3, p.36.

The DBR is a rather new approach not frequently used in museum learning research. It was considered useful and appropriate to employ within the context of the Cypriot educational system due to the local relevance of the intervention. In addition, the DBR process enabled with a chance to undertake preliminary work that facilitated understanding of local implementation conditions and the difficulties teachers might come across in the implementation process. This practical aspect of the DBR enable to see from first-hand the challenges and revise the intervention through the formative evaluation and continuous iteration cycles. I employed both qualitative and quantitative methods with an innovative approach through the use of a multimodal audiovisual tool for storytelling. This tool and the overall interactive methodological approach contributes to an increasing field of research conducted taking into consideration multimodal aspects of literacy. All of these instruments allowed for triangulation and an in-depth analysis and interpretation of the findings (e.g Chapter Seven) which

contributed overall to construct validity and credibility. On the other hand, the DBR does not come without its methodological problems and dilemmas, which are addressed below.

8.5.1 The researcher's multiple roles

Although challenging, the nature of the DBR required the researcher to undertake various roles. I was acting as the designer, facilitator, and evaluator of the LMP programme. It was a rewarding experience to accommodate responsibilities for each of these roles, yet at times it created a difficulty to keep an objective distance from the subject and data collected. On the other hand, I benefited significantly from designing the supporting materials, WebQuest and museum educational programme. These procedures were of course carried out through dialogue with experts and users' whose advice and critique was sought and was deemed instrumental to the development and the improvement of the intervention. In this vein, it could be claimed that there could be possible chances of interpretation bias, related to teachers and students' comments which could have been used for improving the quality of prototypes. Nevertheless, an attempt was made to minimize such possibilities through several checks and balances built into the research process:

- The research utilised triangulation of methods, data instruments and ongoing analyses across the iterative cycles in order to connect processes to intended outcomes. Triangulation in particular was introduced based on the premise that the weaknesses of each data source, method, theory and analysis technique are counterbalanced by the strengths of another (Miles and Huberman, 1994; Patton, 1990);
- The data collection instruments employed to answer questions 2 to 4 of the thesis, were guided by the theoretical frameworks following extensive analysis of relevant empirical literature and the design and research activities;

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- All of the procedures for the design and research were made explicit throughout the reporting of the thesis in order to provide with critical evidence on how the outcomes of this research occurred (Yin, 1994).

In contrast, it could be that teachers and students may have exhibited a different behaviour in favour of myself, acting both as the designer of the intervention and concurrently observing how teachers and students are taking the new approach. It is possible that my variant role may have had a positive impact on the teachers' classroom performance resulting from the Hawthorne effect (Krathworhl, 1998; Patton, 2002). To minimise the possible influence of the Hawthorne effect I asked a fellow assistant researcher to be present during the fieldwork, and encouraged an atmosphere in which teachers would continually express their opinions and ideas freely.

8.6 Limitations of the research

A key methodological concern in this research as it is conducted in a naturalistic setting is the extent to which it is possible to generalise findings (Walker, 1992), or in other words whether the findings are transferable in other settings (Lincoln and Guba, 1985). Although it could be that the findings of this research are generalized in situations in other settings, to increase the 'adaptability' in these new settings, "it is essential to provide with guidance on how to apply the findings of this research" (Wang and Hannafin, 2005, p.12). Nevertheless, it should be also noted that given the nature of data collection in DBR, in particular during the formative evaluation stage, "the samples selected are often limited to small figures" (Van der Akker, 2013, p.67). In this sense, efforts to generalise findings should not be based on statistical techniques but rather focus on "analytical forms of generalization" (cf. Yin, 2003; Van der Akker, 2013, p.68). In this respect, intended users should look "to make their own attempts to explore the potential transfer of the research findings to theoretical propositions" relevant to their own settings (Van der Akker, 2013, p.68). It is possible to reach the previous goal through the task of 'analogy reasoning', utilising the clearly defined design principles applied as they are described in reports of DBR, and by reflection on the results

afterwards. These design principles should entail therefore information on both the (substantive) what and (methodological) how of the intended interventions, but also offer theoretical explanations for the research carried out and the innovation (Van der Akker, 2013, p.67).

Another challenge with regards to a DBR approach relates to the most relevant indicators of quality, success, and the impact of interventions. In this research, Collins et al.'s (2004) and Rogoff's (1995) criteria were used as indicators of the success of the framework across its five levels (Table 6.1). Further to these, the more specific assessment criteria for exploring the impact on students' literacy performance derived from the Multiliteracies Performance Assessment Zones (MPAZ) tool (Figure 7.2), a literacy assessment tool informed by Cope and Kalantzis' (2005) and Luke and Freebody's (1990) work. The above frameworks seem to work in the context of this research drawing on the research findings which support the methods used.

One other limitation of the research related to insufficient time to train teachers into using the proposed approaches which resulted in me undertaking more roles during the process. This is because the participating teachers had other teaching commitments and an additional in-service training organised by the school administration which did not permit to engage in other sort of training. In a case where this innovation was not part of a doctoral thesis, the optimum scenario would entail teachers taking up full responsibility for designing all elements of the partnership, including lesson planning, delivering the workshop, sessions etc. This condition would have allowed for in-depth planning and organisation of students' lesson activities. That said, even for myself having a great amount of exposure in the theories explored, it was still challenging to execute the intervention due to the fact that the implementation process was carried out in a socially complex environment with a number of variables while also sharing other roles as already discussed in this chapter (Section 8.4.1.1). The purposive selection to target culturally and linguistically diverse students (coming from different countries and religious backgrounds as Figures 6.3 and 6.4 suggest) who were challenged by the current instructional approaches leading to low performance, was another factor which

made the implementation even more challenging. These students' limited experiences in multimodal modes of literacy due to the predominantly print-based teaching methods, further limited the extent to which the MMP framework reached to its full potential. It was necessary to adjust the components of multiliteracies pedagogy, in particular critical framing and transformed practice as the formative evaluation during the design/prototyping stage suggested students would not be able to respond to the standards originally posed in the different activities designed.

Although teachers appeared willing to implement the new approaches in their classrooms and undertake museum-school partnerships on a frequent basis driven by the compelling initial students' responses and improved performance, concurrently they appeared to be timid over the prospect of embedding this teaching approach on a daily basis across all subjects and doubted the long term impact of a partnership. It is acknowledged that the work of implementation of the MMP is a challenging one; nevertheless, this research suggested it is feasible as long as there is a support system and mutual understanding of the purposes and the theoretical principles that drive the partnership. It was beyond the scope of the present research to explore the long-term impact of the approaches other than within the time frame of the four months of implementation, however it could form the basis for further empirical work in order to develop this field using a larger sample to test transferability of methods. Further research will be required to determine the longterm effectiveness of the Learning by Design Model within the museum multiliteracies framework for teaching and learning on other school subjects.

8.7   Recommendations for improvement of museum teaching and learning in Cypriot primary schools

This research was carried out at a time in Cyprus when a reform was being implement for the second year, asking from teachers to implement practices relevant for the 21st century (Ioannidou, 2012). In particular the focus was on critical literacy, multiliteracies and culturally responsive teaching. Nevertheless, during the first two years of

implementation of the new approach, high levels of failure were noted in terms of implementing the new approaches and regarding students' learning outcomes. Concurrently, the museum education was the only field left untouched from this reform, remaining attached to more traditional approaches. Therefore conducting this research was one attempt to examine potential solutions which could contribute to the improvement of museum education in Cypriot primary schools as well as encourage a more systematic and successful implementation of multiliteracies driven approaches to teaching and learning. In this respect, the research recommends:

i) The primary teachers, museum educators and curriculum developers in Cyprus should reconsider the role of museum-school partnerships for 21st -century teaching and learning. Although there are challenges to adopt museum learning principles, still the museum multiliteracies-based approach offers a framework of practice that could lead to beneficial outcomes. Using the Learning by Design Model to replace existing traditional lesson planning and teaching strategies, will help improve students' conceptual understanding through elicitation of prior knowledge and critical thinking activities;

ii) It is critical that Cypriot providers of in-service training such as the Ministry of Education and Culture, become aware of the importance and potential of museum-school partnerships. In particular it is essential to know the features that constitute effective museum-school partnerships. Elements such as sharing common educational goals –communication and expectations, coherent planning and research of the partnership, active, experiential participation of students, flexibility, creativity, and experimentation of the design of the partnership, content focus on students' real life experiences, inclusive teaching and participation, multimodal engagement are important in the planning of a museum-school partnership for the 21st century;

iii) The museum-school partnership should be based on teachers' and students' identified needs which relate to the curriculum and personal interests and

backgrounds. It is crucial that a clear understanding of the context of the partnership, realistic goals of teachers, students' needs and appropriate theoretical literature should guide the design and implementation of effective museum-school partnerships;

iv) It is essential based on evidence from this research that a high level of collegiate support is maintained throughout the partnership. A culture of dialogue should be cultivated (AAM, 1984; Hirzy, 1996; Sheppard, 1993) among the key persons involved in the partnership and reflective meetings should take place on an ongoing basis. Such strategies should be embedded in the school agenda by the Ministry's providers and curriculum makers to support teachers' learning and update of instructional practices. School administrations can invest in this type of peer/collegiate coaching among teachers with minimum resources required. I found that the meetings with teachers were rewarding in this research for sustaining the partnership, which was also confirmed by their responses in the reflective interview. Sharing their opinions could prove instrumental for teachers to encourage constructive dialogue for refining their pedagogical practices. In addition, it has been found that peer coaching in schools and across schools could be of the most powerful ways for teachers' learning (Jones and Webb, 2006) and can lead to changes in teachers' practice (Cordingley, Rundell, Temperley and MvGregor, 2005);

v) It is significant that developers of museum-school partnerships in Cyprus consider the potential of embedding the development of supporting materials in teachers' museum-school partnership experience as this could provide them with knowledge and confidence to uptake meaningful lesson planning and classroom enactment. The preliminary context analysis (Section 6.3, p.213) suggested that teachers lack in both lesson content knowledge and pedagogical knowledge and skills on how to implement multiliteracies-based approaches. In addition, they are not familiar with museum learning principles that could be embedded in their everyday teaching. It is therefore essential for teachers to be provided with

opportunities to practically test lesson planning through developing specific content materials relevant to their context to encourage the implementation of the proposed innovations.

8.8   Final reflections on the research

Evidence from the research in line with other studies indicate that the characteristics of the design and approaches adopted within the museum-school partnership can support diversity and multiliteracies-based pedagogy for the 21st century. In particular, the evaluation of the LMP demonstrated how the MMP framework facilitated Cypriot primary teachers' transition from the traditional print based literacy approach to the museum multiliteracies-based approach, which is a way to expand culturally and linguistically diverse students' repertoires of literacy through active self-directed learning and multimodal meaning making and awareness. In this sense, it is hoped that the approach proposed in this research is more widely adopted in Cypriot primary schools, and not only, so that future students learn from theory-based museum learning practice and reconnect with museums.

Appendices

Appendix 1A: Supporting Materials

Introduction to the supporting materials for the Living Museum Partnership

The supporting materials included a series of 13 weeks of 80 minutes sessions, a museum educational programme, and a Museum Day. Developed through integration of the museum multiliteracies-based approach and the Learning by Design instructional sequence stemming from the knowledge processes. The intention is to improve current planning and implementation of museum-school partnerships focusing on the potential of the Museum Multiliteracies Practice framework (Chapter Three) to enhance culturally and linguistically diverse students' repertoires of literacy. Supporting teachers to undertake effective museum-school partnerships for the 21st century is crucial. In particular, the materials will enable teachers with:

1. Proposed instructional techniques relevant for teaching on the topic of ecosystems and endangered species;
2. Skills in anticipating, understanding, and dealing with students' ideas about museums, virtual museums and animals;
3. Suggestions on how to elicit students' prior knowledge and expertise to develop a coherent partnership;
4. Leading questions to use for developing lesson plans as well as together with their students;
5. Approaches which will enable students to collect, compile and comprehend information and ideas which facilitate understanding;
6. Guidelines for developing a series of lessons based on a WebQuest process;
7. Suggestions on how teachers can support students using scaffolding techniques and design their own investigations;
8. Suggestions for supporting students to make critical arguments based on the evidence gathered;
9. Suggestions on how teachers can promote students' interest through digitally mediated activities and multimodal engagement;
10. Suggestions on possible activities that take advantage of museum multiliteracies;
11. Methods for developing factual and conceptual knowledge of science content that adheres to higher order skills.

The multiliteracies pedagogy and Learning by Design (LbD) instructional sequence

Stages	Knowledge processes	Summary of teachers' roles and student activities
Situated Practice	Experiencing *The known and* *The new*	The teacher uses short activities to elicit information on students' familiar experiences, interests and perspectives while also generates their interest and curiosity by raising questions that relate to their lives. The activities should make connections between past and present learning experiences, to organise students' thinking and help them develop empathy, concern, and awareness of and about the specific environmental problem in their region, taking inspiration from a local newspaper article.
Overt Instruction	Conceptualising *By naming* *With theory*	The teacher connects previous with new knowledge using categorization tasks and grouping. These activities aim at development of, and teaching to students – a metalanguage – to describe and evaluate meanings on the chosen topic.
Critical Framing	Analysing *Functionally* *Critically*	Students think about how people from diverse backgrounds might interpret their relationship with nature and such environmental problems. They will gain an understanding of what is presently being done to prevent this situation and how different cultures deal with such environmental issues. The activities should encourage students to explore their own cultures and suggest solutions of what needs to be done, as well as what individuals and groups in their community can do, to help.
Transformed Practice	Applying *Appropriately* *creatively*	Based on the knowledge learnt from various text forms and activities, students plan their course of action for the multimodal design and redesign of a virtual museum. The intention is to be able to transfer their learning or make an innovative and creative intervention in the world.

Appendix 2A: Researcher Field Notes (Double Entry Journal)

Indications of learning behaviours	Observed behaviours
initiate their own learning activities	
are actively involved with the activities	
purposefully manipulate the activities	
share ideas with others	
help others during the activities	
show emotive reactions	

Appendix 2B: Classroom Observation Checklists

Prior to the intervention and implementation of the new approach, classroom observations were conducted by the researcher. The intention was to gather information about the teaching and learning practices at the primary schools. This activity took place from May until June 2012. A total of five lessons were observed. The checklist used is provided below:

ANALYSING PEDAGOGIES USED BASED ON A MULTILITERACY PEDAGOGY

ANALYSING TEXT A:

TEXT Details	Lesson 1(L1):	Lesson 2(L2):	Lesson 3(L3):	Lesson 4(L4):	Lesson 5(L5):
Title of text					
Modes (oral, written)					
Type of text (electronic, print, live)					
Delivery platform					
Analysis of Text					
Genres in text					
Purpose of text					
Context in which used					
Learning purpose with text					

ANALYSING TEXT B:

Practices used to complete Task with Text	Resources needed to engage in Practice	
	What students need to know (Knowing what to do)	What students need to be able to do (knowing how to do it)
Code breaker		
Meaning maker		
Text user		
Text analyst		

ANALYSING TEXT C:

Semiotic systems used	1	2	3	4	5
Linguistic (oral and written language)					
Visual (still and moving pictures)					
Auditory (music and sound effects					
Gestural (facial expression and body language)					
Spatial (layout and organisation of objects and space)					

Appendix 2C: Students' Expectation Questionnaire

Dear student,

You are kindly asked to note your expectations regarding your participation at the museum-school partnership. The information that you provide will not be shared with any of your classmates or teachers, but will be used strictly for the purposes of this research.

General information

Name:

Class:

Gender: Male ☐   Female ☐

Favourite subjects at school:

_____

_____

Interests:

_____

_____

Other responsibilities at your school:

_____

_____

1. Have you ever participated in any school activities related to virtual museums? If *yes* could you please state when that was and how did you find the experience?

_____

_____

2. What do you expect to gain from this participating in this museum-school partnership?

_____

_____

_____

3. Could you indicate what your expectations from participating in this workshop are? Please 'tick' the correct box.

To get information on	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
How virtual museums look					
How to plan and organize a virtual museum exhibit					
How to improve their digital literacy skills					
To acquire knowledge and skills in using the virtual museum creator.					

Thank you for completing the questionnaire

Appendix 2D: Teacher Evaluation Questionnaire of the Pilot LMP

The intention of this questionnaire is to collect your opinions regarding this museum-school partnership intervention. Please answer sincerely in each question. Regarding the tabulated questions, read the statements carefully and put 'tick' (√) at the box showing the preferable behaviour of your choice.

1. How did you find the partnership programme overall? Please 'tick' the correct box.

The partnership programme…	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Was according to my expectations					
Was valuable for my professional growth					
Was relevant to my teaching practices					
Enhanced my understandings of teaching methods					
The objectives were met					

Please provide any further comments regarding your experience with the partnership components.

_____

_____

2. What is your opinion for the following components of the partnership? Tick the correct box.

Components of the programme	Very good	Good	Just okay	Poor	Very poor
Theory exploration					
Planning and discussions					
Workshop on virtual museums					
Preparation of classroom based lessons: Lesson plans and teaching and learning materials					
Practice: Enactment of the lessons with students					
Museum visit					
Museum Day					
Feedback and reflection					

3. What were the most effective sessions of this programme? Please explain your answer.

_____

_____

4. What were the least effective sessions of this programme? Please briefly explain your answer.

_____

_____

5. How do you rate the following components of the partnership? Tick the correct box.

Partnership content, process and context	Very good	Good	Just okay	Poor	Very poor
Content *The knowledge and skills explored in the LMP are useful for improving my teaching practices*					
My time in the programme was well spent					
Process *The LMP activities were well planned and organised*					
The museum multiliteracies-based approach and the LbD Model instructional sequence enhanced my teaching					
Sufficient time was given for completing the activities					
The lessons were well planned					
Context *The resources were sufficient and enhanced learning*					

6. Provide any additional comments regarding your experience of the above components of the LMP.

7. Please indicate in the following statements the degree you agree or disagree.

Partnership activities	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
My awareness and understanding of the museum multiliteracies-based teaching and learning approaches was enriched					
The use of a wide range of multimodal means made me consider practicing the museum multiliteracies-based teaching and learning					
Participating in the design of these lessons I believe that I can put it into practice in my class					
The museum multiliteracies-based approach and feedback sessions raised my awareness of my own teaching behaviour and knowledge about alternatives					
I am confident to use the museum multiliteracies-based approach with my students					
Following the LMP, I will start teaching my lessons by eliciting students' prior conceptions in order to make my teaching meaningful.					
I will plan and organise my language arts lessons differently because of this					

8. What other things do you think you have learned from the LMP?

_____

_____

_____

_____

9. Do you think you can use the museum multiliteracies-based approach and LbD instructional sequence addressed by exemplary curriculum materials in your school? Please explain briefly your answer.

_____

_____

_____

_____

Thanks very much for your participation

Appendix 2E: Students' Evaluation

Appendix 2Ea: Student Evaluation Questionnaire

Dear Student,

The questions that follow seek to establish a picture of your impression of the LMP programme in which you participated. Please write your answers in the provided spaces. The information you provide in this questionnaire will only be used to this study and not otherwise.

Preliminary information

Name:

Class:

Gender: Male [   ]   Female [   ]

1. Use the space in the following tables to show with explanations different lesson activities you favoured or unfavoured during the lesson

Table 1: Favoured lesson activities

Favoured lesson activities	Explanations

Table 2: Unfavoured lesson activities

Unfavoured lesson activities	Explanations

2. How did the lesson differ from your regular environmental lessons?

_____
_____
_____

3. Provide examples of the lesson activities you were involved during the LMP sessions

_____
_____
_____

4. In what ways your involvement in the lesson activities has benefited the process of learning and understanding of ecosystems and endangered species?

_____
_____
_____

5. What problems or challenges were you faced with when involved in doing lesson activities?

_____
_____
_____

6. Write down any other suggestions or comments about your involvement in the LMP.

_____
_____
_____

7. Please indicate in the following statements the degree you agree or disagree.

LMP workshop	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Was according to my expectations					
Was useful to know what is a virtual museum					
Was relevant to my previous experiences					
Enhanced my digital skills					
I found it interesting and fun					
LMP classroom based sessions					
Were according to my expectations					
Were meaningful to learn about creating a virtual museum					
Were relevant to my previous experiences					
Enhanced my awareness of endangered species					
I found them interesting and fun					
LMP museum educational programme					
Was according to my expectations					
Was useful to know about endangered species					
Was relevant to our virtual museum project					
Enhanced my awareness of museums					
I found it interesting and fun					

Thank you for you participation

Appendix 2Eb: Student Workshop Evaluation Questionnaire

This questionnaire seeks to collect your opinions about the workshop on virtual museums. Please be honest in your answers. For the tabulated questions read the statements carefully and put 'tick' (√) at the box showing the preferable behaviour of your choice.

Participants' reactions

1. What did you think of the workshop? Please 'tick' the correct box.

The workshop …	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Was according to my expectations					
Was valuable for my learning					
Was relevant to my life					
Enhanced my understandings of virtual museums					
I was able to complete all activities					

2. What is your opinion for the following aspects of the workshop? Tick the correct box.

Components of the workshop	Very good	Good	Just okay	Poor	Very poor
Theory exploration					
Discussions in groups					
Group activities					
Teaching and learning materials					
Virtual museum tools					

Please provide any further comments regarding your experience with the workshop components

_____

_____

3. What were the most effective sessions of this workshop? Please explain your answer.

_____

_____

4. What were the least effective sessions of this workshop? Please briefly explain your answer.

_____

_____

5. How do you rate the following aspects of the workshop? Tick the correct box.

Workshop content, process and context	Very good	Good	Just okay	Poor	Very poor
Content *The knowledge and skills were useful*					
My time in the workshop was well spent					
Process *The activities were well planned and organised*					
The teacher's approach facilitated my learning					
Sufficient time was given for completing the activities					
The lessons were well planned					
Context *The resources were sufficient and enhanced learning*					

6. Provide any further comments regarding your experience of the above aspects of the workshop;

_____
_____
_____

7. What other things do you think you have learned from this workshop?

_____
_____
_____

8. Do you think you can could use the knowledge gained from the workshop elsewhere in your school and other everyday activities? Please explain briefly your answer.

_____
_____
_____

Thanks very much for participating in this research

Appendix 2F: Students' Attitudes Evaluation

Appendix 2Fa: Students' Attitude Questionnaire (Prior to the LMP)

Dear Students, the following statements aim at determining your attitudes towards museums and the teaching and learning process. Please indicate the extent of agreement for each statement by ticking (√) the appropriate box.

Museums sound very interesting to me	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Museums are fascinating and fun					
I enjoy visiting museums					
I have good feelings towards museums					
I would have liked to visit museums more often					
I feel more relaxed in a museum environment than in a school					
Museums are places worth visiting as they are stimulating for knowledge					
I am very interested in doing practical work about virtual museums					

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Appendix 2Fb: Students' Attitude Questionnaire (Following the LMP)

Dear Students, the following statements aim at determining your attitudes towards museums and the teaching and learning process. Please indicate the extent of agreement for each statement by ticking (√) the appropriate box.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Museums sound very interesting to me					
Museums are fascinating and fun					
I enjoy visiting museums					
I have good feelings towards museums					
I would have liked to visit museums more often					
I feel more relaxed in a museum environment than in a school					
Museums are places worth visiting as they are stimulating for knowledge					
I am very interested in doing practical work about virtual museums					

Appendix 2G: Teacher LMP Follow-Up Questionnaire

Based on your experience from the LMP, how much do you agree with the following statements? Please choose one answer for each question.

Did the programme included..........?:	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1. *Exploration and use of literacy and literate practices in a balance of known and unknown, authentic and simulated contexts;*					
2. *Opportunities to consume, produce and transform knowledge about literacy and literate practices;*					
3. *Opportunities to investigate and develop understandings about how literate practices operate and relate in the social, cultural, political, economic and ideological world.*					
4. *The development of understandings about application of critical literacy skills.*					
5. *Opportunities to learn about, interpret, and produce texts that use individual and combined semiotic systems (linguistic, visual, auditory, spatial, and gestural).*					
6. *Opportunities to learn about, interpret, and produce paper, electronic, and live texts.*					
7. *Developing a language for talking about literacy; that is appropriate terminology learned and used in a conversation about literacy.*					
8. *Acknowledging and identifying the literacy identities and literate practices of students to ensure teaching and learning activities relevant and meaningful to students and acknowledge their diversity.*					
9. *Opportunities for students to identify literacy practices they would like to investigate, acknowledging their own interests and literate practices.*					
10. *Emphasis on strategic thinking and problem solving approaches to literacy tasks.*					
11. *Opportunities for students to engage in critical reflection on their literacy learning.*					

Appendix 2H: Teachers' Reflective Interview

The following questions seek to elicit your overall impression about using the museum multiliteracies-based approach and the LbD instructional sequence in the teaching and learning during the Living Museum Partnership.

Appendix 2Ha: Prior to the LMP

1. Could you please describe in your own words what do you think literacy is?
2. Could you please describe in your own words what do you think literate practices are?

3. Do you believe that engaging with literacies in the museum is important? Why?

   Prompts
   ❖ How, if at all is engaging with literacies important in pupils' learning in the museum? Can you mention specific examples to support your view?
   ❖ How if at all do museum based literacies differ to those practiced in a school environment?

4. How often do you come across teaching based on literacies? Based on your experiences.

   Prompts
   ❖ Can you mention what kinds of literacies skills do pupils engage with?
   ❖ Do you implement literate strategies/practices/skills in your teaching for prior to visit preparation, during the visit or after the visit follow up activities? Can you give some examples if any?

5. Do you think that specific theories/strategies are required to implement literacies in the museum or for school teachers before and after the museum visit?

   Prompts
   ❖ Do you believe that teachers' training is important to implementing literate strategies/practices/skills? Why?

6. Do you feel that a museum pedagogy based on engagement with multiliteracies would empower students' learning, in particular the culturally and linguistically diverse? Why yes or why not?

   Prompts

   ❖ What should be the characteristics of a multiliteracies pedagogy that would be meaningful for children's learning?

❖ What are the potentials to implementing literacies more in your teaching if informed/trained in a multiliteracies pedagogy?

Appendix 2Hb: Following the LMP

1. After participating in the LMP, what is your general view about using the museum multiliteracies-based approach and the Learning by Design instructional sequence?

2. How were the supporting materials and the workshop supportive for your preparation and teaching during the LMP?

   Prompts

❖ Did the integration of technology make a difference in the teaching of writing?
❖ You may wish to mention materials used in class, the organisation of
    work in the class, and any particular strategies you have used.

3. How does implementing the new approaches enhanced student participation in your lesson? Were there any difference from the previous/regular lessons?

   Prompts

❖ Do you consider the LbD an important pedagogical tool in the teaching of multimodal literacy?
❖ Does the LbD enable you to achieve your learning objectives?

4. How do you think your students perceived the approaches you have adopted? Please explain your answer.

   Prompts

❖ Can you list the main affective and learning outcomes of your project that you have observed so far?

5. What specific improvements (if any) did you see in your students' development of the various knowledge processes (experiential, conceptual, analysing, applying)?
   Prompts

❖ Do you find the knowledge processes as helpful in planning the lessons in the LMP?
❖ How do the knowledge processes facilitate the planning of reading writing activities?

6. Did any specific problems or challenges occur in using the new approaches with your students or yourself?

Prompts

❖ If you were to begin your project again, what aspects of it would you change or delete?

7. Has your involvement in the project changed the ways in which you think about literacy?

8. Would you consider implementing these approaches in a more systematic manner in your teaching?

Prompts

❖ If you were to begin your project again, what aspects of it would you retain or intensify?
❖ Do you think the museum multiliteracies-based approach can be an effective measure in overcoming CLD students' difficulties? Please elaborate.
❖ Is the LbD feasible to implement in your teaching?

9. Has your involvement in the project changed the ways in which you think about the education of culturally and linguistically diverse students?

10. Has your involvement in the project changed your perceptions about the potential of museum learning to enhance students' learning?

Thanks very much for your cooperation

Appendix 2I: Students' Focus Group Interview Questions

The following questions sought information about how students perceived the use of the museum multiliteracies-based and learning approaches in their classroom prior and after the LMP.

Appendix 2Ia: Students' Focus Group Interview Questions during the Preliminary Analysis

A DAY AT THE MUNICIPAL ART GALLERY

Audiovisual dialogue:

(At the museum) Museum educators: Bye!!

Teacher and pupils: Thank you! Byeee!!

(At school) Orfeas: Grandpa!

Grandfather: Surprise! I came to pick you up! How about we go for a walk by the sea?

(By the seaside) Children, I think I am a bit tired...

Why don't we sit over there grandpa?

Grandfather: Well, Melina, what did you think of the Art Gallery visit?

Grandfather: Have you been to an art gallery or a museum before?

Museum educator: Children, when looking at this painting, does it remind you of something?

Have you seen it before?

Schoolteacher: Have ever seen the bottom of the sea?

Pupil: Who will think of a slogan for our poster?

Pupil: How about..... A title/slogan should be ....

Grandfather: Tell me Orfeas, what did you know from before that helped you complete this activity?

Melina, what do you think was the purpose of this activity?

Pupil: How do you think we should place the images?

Pupil: I would...

Melina: Is it perhaps better to....

Audiovisual dialogue:

Pupil: Does the smell seem familiar? What does it remind you of?

Pupil: I once painted with .....

Grandfather: Why do you think the teacher let you smell the paint and touch the palette?

Grandfather: Melina, did you know what shades are in painting before coming to the Gallery?
Where from did you know?

Grandfather: Orfeas, how did you get along with the rest in your team?

Museum educator: What will you take with you to dive?

Imagine being at the bottom of the sea... What can you see?

Grandfather: Was it hard trying to imagine the bottom?

Grandfather: Orfeas reminds me of a straw boss I had when I was working as a boy in the
fields... Does he play theatre?

Grandfather: Well done, Orfeas! This looks great! Was it difficult to draw taking inspiration
from the paintings at the Gallery?

Melina: Well, I will start from...

Pupil: Amazing job Michael! Michael: Thanks! If I had more time I would...

Grandfather: You have seen and done a lot at the Gallery! Do you think these could be useful
in any way?

Grandfather: Who has created this video and why?

Do you think you will remember this visit to the Gallery?

Appendix 2Ib: Students' Focus Group Interview Questions during the Preliminary Analysis

A DAY AT THE ARCHAEOLOGICAL MUSEUM

Audiovisual dialogue:

(At the museum) Museum educators: Bye!!

Teacher and pupils: Thank you! Byeee!!

(At school) Orfeas: Grandpa!

Grandfather: Surprise! I came to pick you up! How about we go for a walk?

(By the seaside) Children, I think I am a bit tired...

Why don't we sit over there grandpa?

Grandfather: Well, Melina, what did you think of the museum?

Have you been to an archaeological museum or any other museum before?

Museum educator: Children, you will be the pigeons and you...

Pupil: Why do they put stamps on our hands? (Pigeon stamp)

Grandfather: Tell me Melina, do you think the story of Herostratus is real? Who created it?

Museum educator: Children, do you remember any places in the island dedicated to the worship of the Goddess Aphrodite?

Pupil: If I can remember correctly...

Audiovisual dialogue:

Pupil: Does it remind you of any smell you know?

Grandfather: Melina, why do you think they asked you to smell the incense and touch the salt?

Museum educator: Why do you think the liquids don't mix in this vessel?

Museum educator: Have a look at these statues. Which do you think belong to Aphrodite and which not?

Grandfather: Melina, how did you distinguish among the two? Have you ever seen a statue of Aphrodite?

Grandfather: What did you have to do in your team Orfeas? Did you work well with your classmates?...

Grandfather: Was it hard to solve the puzzle? Do you play puzzles?

Grandfather: What did you think of having to pretend you are a statue? What was easy or difficult about it?

You had to dress up as an Ancient Greek follower. How did that make you feel?

Grandfather: I wonder, what did you know about Aphrodite from school?

Grandfather: So you have learnt and did quite a lot at the Museum. Do you think this knowledge can be of help at some point?

Grandfather: Do you think you will remember your visit to the Museum?

Appendix 2Ic: Post LMP Focus Group Questions with Students

1. **Teachers' role as a facilitator**

   a) Do you think your teacher used to prepare herself for language arts lessons? If 'yes' in what ways, could you briefly explain? If 'no' why not?

   b) What were the lesson activities your teacher used to provide in the classroom as he/she started and end the lesson?

   c) Did your teacher help you during different lesson activities? If 'yes' in what ways? Could you explain how? If 'no' why not?

   d) Did your teacher encourage you to ask questions? How?

   e) Did your teacher interact with and respond positively to your questions/answers? Please explain your answer.

2. **Assessment of students' prior knowledge**

   a) Did your teacher and researcher try to find what you already know about the lesson at hand? If 'yes' can you explain how, if 'no' why not? How was that helpful and intriguing for you?

3. **Lesson activities**

   a) Of the activities you performed during the partnership which ones did you like most? Please provide some reasons.

   b) Did you find the activities meaningful in the understanding of the various concepts? If 'yes' could you give some examples? If 'no' explain briefly how the lesson activities were meaningful to you?

   c) Do you think that everybody in the class understood this lesson? Did you feel there was some confusion or problems experienced?

   d) To what extent can you say that the methods used during the LMP differ from your usual everyday lessons and classroom activities?

   e) Do you have any suggestions or comments or any other thing you would like to say about the LMP activities which might be useful to you in the understanding of virtual museums and endangered species?

4. Based on your experience from the LMP, how much do you agree with the following statements? Please choose one answer for each question.

LMP components and activities	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
After participating in this project I feel more aware of what ecosystems are and endangered species					
The workshop activities and using the WebQuest were really helpful for me to be better prepared on how to create the virtual museum exhibits					
After studying the materials provided in the WebQuest with my team, we were able to respond appropriately in the different activities					
Preparing storyboards and diagrams was useful for our planning in the group and assisted me personally to understand more about the topic of our project					
After completing this project I am confident I can create any type of virtual					

museum exhibits using the online tools and other strategies learned				
I think that I have actually learned stuff which are meaningful and would like to know more on my own about endangered species				

Thanks for participating in this research

Appendix 2K: Bloom's Digital Taxonomy Activity Analysis Tool (Adapted from Churches, 2009)

Purpose:

This tool is designed to analyse classroom activities and units for the balance of Higher Order and Lower Order thinking skills (HOTS and LOTS).

Analysis can either be a simple overview of task construction or a analysis of time allocation to each specific taxonomic level.

Process:

1. Enter the learning activities, elements or sequences in the first column of the table.

2. Match each activity to the keyword that best corresponds to it

3. Examine the proportions of the activity at each level.

OPTIONAL: Time Analysis

4. Enter the estimated time spent on each aspect/activity in the columns

5. Calculate the total time spent on each taxonomic level as a percentage

Task/Unit/Learning Activity Date: Grade:

Category	Activity
Creating	Building or compiling mash-ups
	Directing/producing
	Videocasting, Podcasting, Blogging
	Wiki-ing & Publishing
	Mixing & Remixing
	Filming & Animating
	Programming
	Constructing, Inventing & Making
	Designing, Devising & Planning
Evaluating	validating
	Reflecting
	Collaborating & Networking
	Critiquing & Reviewing
	Posting & Moderating
	Detecting &, Monitoring
	Hypothesising, Experimenting &, testing
	Checking & Judging
Analysing	Mind-mapping
	Media clipping
	Reverse-engineering & Cracking
	Integrating, Mashing & Linking
	Deconstructing
	Organising & Structuring
	Comparing & Attributing
Applying	editing
	Uploading & sharing
	hacking
	Playing & operating
	executing, running & loading
	Implementing, carrying out & using
Understanding	Subscribing
	Annotating
	Categorising and tagging
	Blog journalling, Twittering, Commenting
	Advanced & Boolean searches
	Paraphrasing & Summarising
	Classifying
	Interpreting, Inferring, Comparing, Explaining & Exemplifying
Remembering	Searching & Googling
	Social networking
	Social bookmarking & Favouriting
	Retrieving , Locating, Finding
	Describing & Naming
	Listing & Bullet pointing
	Recognising, Highlighting &, Identifying

Learning Activity enter your activities components in the space below.

Time spend

% of Total Time

Appendix 2L: MPAZ (Multiliteracies Performance Assessment Zones)

Appendix 2La: Teacher Rating Sheet (TRS)

DATE:

NAME OF GROUP:

TITLE OF ACVITY:

Activity being reviewed:

PowerPoint Presentation	☐	Graphics Presentation	☐
Mind Map Presentation	☐	Role Play Presentation	☐
Video Clip Presentation	☐	Debates Presentation	☐

ASSESSMENT CRITERION The student demonstrates that she can:	EVIDENCE	RATING
Demonstrate Experiential Knowledge	• Experiencing: The Known • Experiencing: The New	0-20
Demonstrate Conceptual Knowledge	• Conceptualising: By Naming • Conceptualising: By Theorising	0-20
Demonstrate Analytical Knowledge	• Analysing: Functionally • Analysing: Critically	0-20
Demonstrate Applied Knowledge	• Applying: Appropriately • Applying: Creatively	0-20
Multimodal representations Multiliteracies	• Linguistic • Visual • Audio • Gestural and Spatial	0-20
TOTAL		

Adapted from Kalantzis and Cope (2004, p.54)

Assessment Criterion Scalefor each Knowledge Dimension	Rating	Assessment Criterion for Overall Scale	Rating
Excellent	(16-20)	Excellent	(80-100)
Good	(12-15)	Good	(60-79)
Average	(6 -11)	Average	(40-59)
Poor	(>5)	Poor	(>39)

Appendix 2Lb: The Four Resources Model Elements

Practices used to complete Task with Text	Resources needed to engage in Practice	
	What students need to know (Knowing what to do)	What students need to be able to do (knowing how to do it)
Code breaker Identify and use semiotic systems in texts. Make sense of marks, gestures, is the resource knowledge of all semiotic systems, how texts work.		
Meaning maker Context is important. Exploring the meaning making resources, from which a major resource is the person's literacy identity (all previous literacy social, cultural technological experiences). Different groups have different literacy identities and thus different meaning.		
Text user Use of texts in real life situations. Instructions, negotiations, working collaboratively. Multiple modes exist (listening, speaking, viewing, writing) use multiple semiotic systems, multiple types of texts.		
Text analyst Critical analysis of literacy activities and the text used to make informed decisions on texts. Understanding how texts potentially shape people's perception of the world, how they live, how they participate, how texts are constructed and produced. Resources This leads to an active and informed citizen.		

Appendix 2Ma: <u>**INFORMATION SHEET AND CONSENT FORM**</u>

ASKING PERMISSION TO CONDUCT RESEARCH IN YOUR SCHOOL

Dear Headmaster/headmistress,

My name is Stefania Savva and I am a researcher, primary school teacher as well as a practicing painter. At the present time I am doing my doctorate in Museum Studies, in the University of Leicester, UK. The focus of my dissertation research is in the nature of museum-based literacies. I aim to explore the ways in which literacies are undertaken in Cypriot Public Museums' educational programmes.

STUDY PURPOSE:

My preliminary research suggests that particular skills and competences are associated with museum learning, which may be broadly described as museum literacy. My intention is to examine the nature of museum-based literacies and the impact in learning through an investigation of pupils' engagement in a museum educational programme in Cyprus.

STUDY PROCEDURES:

Research will take place during the period of January 2012- May 2012, September 2012- December 2012. One or two school teachers will be asked to participate in one in-depth interview that will ask them to talk about aspects of their museum experience such as school visits, extra-curricular activities etc. They will be asked to provide a list of their pupils and may be asked to hand a questionnaire for them. Research will include direct observation of pupils on the visit to the museum/heritage site and collection of physical artefacts. Also schoolteachers will be asked to answer a short questionnaire after the visit. This will take 10 minutes to b completed. A follow-up visit to the school will seek to interview pupils (in groups) and explore the impact of the visit on teaching and learning through multiple literacies. This could include story completion test and will take approximately 40-45 minutes to be completed; this time will be allocated from the classroom teacher beforehand. Interviews with teachers will be arranged to be conducted during break time or after school hours.

STUDY BENEFITS:

The information I am seeking through your school's participation to this case study will provide me with some valuable insights on current practice surrounding literacies in the museums in Limassol district. Conclusions derived will aid to think about possible programme reforms and hopefully contribute to a better understanding and development of museum literacy and museum education in general. Benefits to you may include a better understanding of your own school's development, including your staff and pupils. It is my premise to send a summary of the research findings to the Educational Office in Limassol and to all schools who will participate in the research.

STUDY RISKS:

Your school's participation in this research involves no physical or psychological risk for the participants nor will in any way harm your school's reputation.

VOLUNTARY PARTICIPATION IN, AND WITHDRAWAL FROM, THE STUDY:

It should be stressed that participation to this research is voluntary; you have the right to non-participation and withdraw at any stage of the research.

CONFIDENTIALITY:

At this point I wish to clarify that the information derived from the participants through the fieldwork will remain confidential. Your school's name will not be mentioned in any reports, and it will be used only for the purposes of my PhD research. Permission to conduct the survey will be obtained by the authorized Research Centre of the Pedagogical Institute of Cyprus in January 2012.

      I do appreciate your cooperation,

Yours sincerely,

Stefania Savva

STATEMENT OF CONSENT:

I ACKNOWLEDGE THAT I HAVE READ THE ABOVE EXPLANATION OF THIS RESEARCH THAT ALL OF MY QUESTIONS HAVE BEEN SATISFACTORILY ANSWERED, AND I AGREE TO FOR MY SCHOOL TO PARTICIPATE IN THIS RESEARCH. SIGNING THIS FORM DOES NOT WAIVE ANY OF MY LEGAL RIGHTS.

By signing below, you are indicating that this form has been explained to you, and any questions you have about the research have been answered. You are indicating that you understand the ways the case study data may be used and how your privacy will be protected. If you agree please sign below.

I, _____, hereby grant permission to the main researcher to conduct research in my school for the following project: "A Museum-school Partnership Supporting Diversity and Multiliteracies-based Pedagogy For The 21st Century".

School name: _____

Signature of school's principal _____

Printed name of school's principal _____

Date _____

I CERTIFY THAT I HAVE EXPLAINED FULLY TO THE ABOVE SUBJECT THE NATURE AND PURPOSE, PROCEDURES AND THE POSSIBLE RISK AND POTENTIAL BENEFITS OF THIS RESEARCH.

Signature of principal investigator _____

Date _____

Appendix 2Mb: <u>INFORMATION SHEET AND CONSENT FORM</u>

INTERVIEW FOR CYPRIOT PRIMARY SCHOOL TEACHERS

Dear Colleagues,

My name is Stefania Savva and I am a researcher, a primary school teacher as well as a practicing painter. At the present time I am doing my doctorate in Museum Studies, in the University of Leicester, UK. The focus of my dissertation research is in the nature of literacies in the museum. I aim to explore the ways in which literacies are undertaken in Cypriot Public Museums' educational programmes.

STUDY PURPOSE:

My preliminary research suggests that particular skills and competences are associated with museum learning, which may be broadly described as museum literacy. My intention is to examine the nature of museum-based literacies and the impact in learning through an investigation of pupils' engagement in a museum educational programme in Cyprus.

STUDY BENEFITS:

The information I am seeking through your response to this interview will provide me with some valuable insights on current practice surrounding literacies in the museums in Limassol district. Benefits to you may include a better understanding of your own development as a professional. Your recommendations will aid to think about possible programme reforms and hopefully contribute to a better understanding and development of museum literacy. It is my premise to send a summary of the research findings to the Educational Office in Limassol and to all schools whose staff will participate in the research.

STUDY PROCEDURES:

Research will take place during the period of January 2012- May 2012, September 2012-December 2012. You will be asked to participate in two in-depth interviews that will ask you to talk about aspects of your museum experience such as school visits, extra-curricular activities etc. Interviews will be arranged to be conducted during break time or after school

hours. The interview is designed to take approximately 40 minutes to be completed. You will be asked to provide a list of your pupils and may be asked to hand a questionnaire for them. Research will include direct observation of pupils on the visit to the museum/heritage site and collection of physical artefacts. Also you will be asked to answer a short questionnaire immediately after the visit. This will take 10 minutes to b completed. A follow-up visit to the school will seek to interview pupils and explore the impact of the visit on teaching and learning through multiple literacies. This could include story completion test and will take approximately 40-45 minutes to be completed, time which will be allocated from you beforehand.

STUDY RISKS:

Your participation in this evaluation involves no physical or psychological risk nor will in any way harm your position at your school. Attention will be given during the interviews to avoid any sort of discomfort due to nosy questions or bias caused by leading questions/prompts. The same requirements are ensured for your pupils participating in the research.

VOLUNTARY PARTICIPATION IN, AND WITHDRAWAL FROM, THE STUDY:

It should be stressed that participation to this research is voluntary; you have the right to non-participation and withdraw at any stage of the research.

CONFIDENTIALITY:

At this point I wish to clarify that the information derived from you through the interview will remain confidential. Your name will not be mentioned in any reports, and it will be used only for the purposes of my PhD research. Permission to conduct the survey will be obtained by the authorized Research Centre of the Pedagogical Institute of Cyprus in January 2012.

I do appreciate your cooperation,

Yours sincerely,

Stefania Savva

STATEMENT OF CONSENT:

I ACKNOWLEDGE THAT I HAVE READ THE ABOVE EXPLANATION OF THIS RESEARCH THAT ALL OF MY QUESTIONS HAVE BEEN SATISFACTORILY ANSWERED, AND I AGREE TO PARTICIPATE IN THIS RESEARCH. SIGNING THIS FORM DOES NOT WAIVE ANY OF MY LEGAL RIGHTS.

By signing below, you are indicating that this form has been explained to you, and any questions you have about the research have been answered. You are indicating that you understand the ways the case study data may be used and how your privacy will be protected. By signing this form, you are agreeing to participate in the project called "A Museum-School Partnership Supporting Diversity and Multiliteracies-Based Pedagogy For The 21st Century".

Signature of study participant _____

Printed name of study participant _____

Date _____

I CERTIFY THAT I HAVE EXPLAINED FULLY TO THE ABOVE SUBJECT THE NATURE AND PURPOSE, PROCEDURES AND THE POSSIBLE RISK AND POTENTIAL BENEFITS OF THIS RESEARCH.

Signature of principal investigator _____

Date _____

Appendix 2Mc: <u>INFORMATION SHEET AND CONSENT FORM</u>
FOR PUPIL PARTICIPANTS (INDIVIDUAL AND GROUP INTERVIEWS)

Dear parents/legal guardians,

My name is Stefania Savva and I am a researcher, a primary school teacher as well as a practicing painter. At the present time I am doing my doctorate in Museum Studies, in the University of Leicester, UK. The focus of my dissertation research is in the nature of literacies in the museum. I aim to explore the ways in which literacies are undertaken in Cypriot Public Museums' educational programmes.

STUDY PURPOSE:

My preliminary research suggests that particular skills and competences are associated with museum learning, which may be broadly described as museum literacy. My intention is to examine the nature of museum-based literacies and the impact in learning through an investigation of pupils' engagement in a museum educational programme in Cyprus. Through this form I am requesting parental permission for your child to participate to this research.

STUDY BENEFITS:

The information I am seeking through your child's participation and response to this interview will provide me with some valuable insights on current practice surrounding literacies in the museums in Limassol district. The children's reactions, ideas and work (eg. drawings, worksheets, word clouds) produced before, during and after the museum visit will aid to think about possible programme reforms and hopefully contribute to a better understanding and development of museum literacy. It is my premise to send a summary of the research findings to the Educational Office in Limassol and to all schools whose staff will participate in the research. You may at any point of the research enquire about your concerns directly to me.

STUDY PROCEDURES:

Research will include initial visit to the school to conduct interviews with the school teachers and conduct a 40 minutes group interview with the pupils, which will be in the form of a story completion and worksheet. Then will follow direct observation of pupils on the visit to the museum/heritage site and collection of physical artefacts such as tools, videotapes, photographs and chidren's drawings, worksheets etc. Finally a follow-up visit will be conducted to the school to interview pupils in groups and explore the impact of the visit on teaching and learning through multiple literacies. This will include story completion test and will take 40-45 minutes to be completed. The plan is to conduct fieldwork between the periods of January 2012- May 2012, September 2012-December 2012.

VOLUNTARY PARTICIPATION IN, AND WITHDRAWAL FROM, THE STUDY:

It should be stressed that participation to this research is voluntary; your child has the right to non-participation and withdraw at any stage of the research; this research is irrelevant to the child's grades at school and will have no impact to his/her school performance nor will necessitate out of school activity/work.

CONFIDENTIALITY:

At this point I wish to clarify that the information derived from your child through the interview (individual or group) will remain confidential. At no point will the name of your child be mentioned in any reports, and it will be used only for the purposes of my PhD research.

STUDY RISKS:

Above all it is clear that our interest is to make sure that the research experience is a positive one for the child. I will ensure that your child's physical and mental safety is secured. I will recognize and accommodate the child's emotional and social vulnerabilities; attention will be given to during the interviews to avoid any sort of discomfort due to nosy questions or pressure from peers such as individual interviews, best friend pairs, or mini-groups with kids from different classes. Permission to conduct the survey will be obtained by the authorized

Research Centre of the Pedagogical Institute of Cyprus in January 2012. As a requirement I will have to ensure that I have a Criminal Records Bureau (CRB) check prior to fieldwork.

I do appreciate yours and your child's cooperation to my research,

<div align="center">

Yours sincerely,

Stefania Savva

</div>

STATEMENT OF CONSENT:

<u>I ACKNOWLEDGE THAT I HAVE READ THE ABOVE EXPLANATION OF THIS RESEARCH AND ALL OF MY QUESTIONS HAVE BEEN SATISFACTORILY ANSWERED. I AGREE THAT MY CHILD PARTICIPATES IN THIS RESEARCH. SIGNING THIS FORM DOES NOT WAIVE ANY OF MY CHILD'S LEGAL RIGHTS.</u>

By signing below, you are indicating that you understand the ways the evaluation data may be used and how your child's privacy will be protected. You hereby grant permission to the main researcher to create, copy, reproduce, exhibit, publish, or distribute the case study data from this research. To give your consent, please sign below.

I, _____, give my permission for my son/daughter, _____, to participate in the research called "A Museum-School Partnership Supporting Diversity and Multiliteracies-Based Pedagogy For The 21st Century".

Parent signature: _____

Date _____

<u>I CERTIFY THAT I HAVE EXPLAINED FULLY TO THE ABOVE SUBJECT THE NATURE AND PURPOSE, PROCEDURES AND THE POSSIBLE RISK AND POTENTIAL BENEFITS OF THIS RESEARCH.</u>

Signature of principal investigator: _____

Date _____

Appendix 4A: Examples of Research on Multimodal Learning Environments

Author	Title	References
Caroline M.L. Ho, Mark Evan Nelson and Wolfgang Müeller-Wittig	Design and implementation of a student-generated virtual museum in a language curriculum to enhance collaborative multimodal meaning-making	Computers & Education, 57(1), 1083-1097 Elsevier
Dominic Prosser Susan Eddisford	Virtual Museum Learning	Information Technology in Childhood Education Annual (2004), 281-297
Andrea Bandelli	Virtual Spaces and Museums	Published in the Journal of Museum Education, Volume 24, numbers 1 and 2, 1999, "The museum as a public space", pg. 20
Pierre Dillenbourg, Daniel Schneider, Paraskevi Synteta	Virtual Learning Environments	Dillenbourg, P., Schneider, D.K. and Synteta, P. (2002). Virtual Learning Environments. In A. Dimitracopoulou (Ed). Proceedings of the 3rd Hellenic Conference "Information & Communication Technologies in Education" (pp. 3-18). Kastaniotis Editions, Greece
Chris Dede, Jody Clarke, Diane Jass Ketelhut, Brian Nelson, and Cassie Bowman	"Students' Motivation and Learning of Science in a Multi-User Virtual Environment"	AERA, 2005
Maria Roussou	Immersive Interactive Virtual Reality and Informal Education	Published in Proceedings of i3 Spring Days 2000 - Workshop on Interactive Learning Environments for Children
Mark Christal Marty Kreipe de Montano Paul Resta Loriene Roy	Virtual Museums from Four Directions: An Emerging Model for School-Museum Collaboration	

Appendix 4B: Curriculum Examples Surveyed for the Teaching Strategy Design

Background information	Applying the four components of multiliteracies pedagogy
The multi-modal redesign of school texts *Christopher S. Walsh* *Deakin University, Australia* *Multiliteracies, 2009*	**Situated Practice:** Focus on Chinese immigration as students were first and second-generation Chinese immigrants in the United States. **Overt Instruction:** Development of, and teaching to students – a metalanguage – to describe and evaluate meanings created by the relationships between image and word, or between images themselves (Kress and van Leeuwen, 1996). **Critical Framing:** Students think about how people from diverse backgrounds might interpret images, video or Web pages in relation to accompanying text, narration or sound (Lemke, 2005). **Transformed Practice:** Students engage in multimodal design and redesign of school texts and knowledge practices in new ways and in different contexts. The multiliteracies curriculum created a space in the classroom that recognised the importance of students' creativity and ability to generate an infinite number of new meanings across various domestic and institutional contexts through multi-modal design.
Bamaga High School, near the coast of the York peninsula in Australia *Origin of student population ranges with some being aboriginals.* *Carrie Jones*	Visual design, working on transformation of physical patterns using animal pictures. The techniques used are from the traditional art of Torres Strait and New Quinea depicted from natural life. Students create their own designs, develop a metalanguage to discuss their processes and write stories, give their drawings depth and meaning, create following their own design printed sharogk (Malaysian dresses) and designs for their shoes
Fran Hodges teaches at William Ross Lyceum, TownSville, North Queensland, Australia	**Situated practice:** Presenting lyric parts of a song from Toni Childs. The students must find all the tricks and conventions of the poem and lyrical parts, for example refrain. The music plays and a discussion

	follows on what does the music adds to the lyrics and then following the video clip display (gestures, pictures) how does that add to the lyrics. Students bring their favourite songs to class. **Overt instruction:** students work to develop a grammar that analyses the linguistic, audio and visual design of the songs and clips. **Critical framing:** students compare the meanings and cultures each one represents-the song of the White female (Toni Childs), rap, techno, light, reggae, heavy metal or anything else. **Transformed practice:** students write, sing and shoot a video-clip for a song they have written
Annette Hodgen, Ryan School in the Catholic Community of Townsville, North Queensland, Australia	**Situated practice:** students construct a replica of a cyclone shelter –Townsville is in an area affected by tropical cyclones- and they are dealing with the question of how to survive without electricity. **Overt Instruction:** Students observe they different ways in which the concept of electricity is understood –the kinds of language which is appropriate for discussing for a shelter against cyclones, a scientific text that explains electricity, diagrams of electric circuits that electricians use. **Critical framing:** Students discuss about the different cultural frameworks of meaning making about electricity, how and why they differ. **Transformed practice:** Student construct an electrical alarm system. They write an explanation of the circuit in simple language so that they explain it to your parents or sell their product. They also explain in scientific terms how the alarm works. And they create a circuit diagram so that an electrician can copy their design.

Appendix 4C: Virtual Museum Making Project

Lesson Title: Virtual Museum Projects

Implementation Time: Two 80 minute class periods

Resource(s): Examples of Virtual Museums on the web,

Materials Needed: Virtual Museum Project outline, Rubric, Group Roles, Museum web site research sheet, WebQuest tasks

Lesson Focus

☒ **Content Knowledge:**
Endangeres species, ecosystems

☒ **Thinking Skill(s):**
Comparing/Contrasting

☒ **Habits of Mind:**
Creating, Imagining, Innovating, Thinking Flexibly

Procedure:

1. Share with students that over the next twelve weeks they will continue to investigate and to practice creative thought by working as a member of a team to construct a Virtual Museum Exhibit PowerPoint where they depict ecosystems and endangered species.

2. Show students examples of virtual museums, have them test the design of a virtual, 3D animated museum exhibition using two online tools: http://www.classtools.net/3D/ and http://www.artsteps.com/.

3. Ask students what they recall about the museum websites that were shown in class. What made an interesting and informative exhibit? Brainstorm characteristics with the students:
   - Clearly communicates information
   - Is aesthetically pleasing and interesting to view
   - May be interactive in some way
   - Is unique in its presentation
   - Visuals convey clear messages

4. Distribute the project outline and expose students to the WebQuest and Evaluation Rubric. Tell students they will be assigned to project teams and graded in part on their ability to work collaboratively. Discuss the Project Overview, the Required Specifications and the CBA Rubric.

5. Students will chose their topic for the project based on the choices above.

6. Remind students that they will want to practice flexible thinking in creating a unique design for their exhibit.

Closure/Assessment:

Use the Team Reflections to debrief the team building activity. Reinforce that students must demonstrate the skills of collaboration to be successful in completing their Virtual Museum Exhibit.

Appendix 4D: Building the rooms of the museum worksheets (Fasy et al., 2006)

Order ▾ ✕

TOOLS: from "AutoShapes" located on the Drawing toolbar at the bottom of your screen, select the Lines toolbar and tear it off.

From the Draw button in the lower left corner of the Drawing Toolbar, select Order and tear it off.

Creating a Virtual Museum Using One Point Linear Perspective

Keith Valley Middle School
Technology Integration Program
Fasy~Heitzenrater~Telthorster
© 2006

Step 1) Draw a horizon line at "eye level" (near the middle) and place a "vanishing point" on the horizon line

Step 2) Draw a rectangle. This becomes the front wall.

Step 3) Using the line tool, connect lines linking the vanishing point to the corners of the wall.

Note: if you double click on the line tool, that will "lock" the tool and allow you to draw multiple lines without having to select the line tool again.

Note for using the Freeform Tool: If you have never used the "Freeform Tool" before, it can be tricky. If you click and RELEASE, and then move your cursor, a straight line will be made. If you click and HOLD and move the cursor, a scribble line will be made.

Step 4) Select the "Freeform Tool", click on the top corner of the wall and release. Slide the cursor (without clicking) along the top guide line to where you want the wall to end (1). Click and release. Hold the "Shift" key down and side the cursor to the bottom guide line (2). Click and release. Slide cursor to the bottom corner of the wall (3). Click and release. Hold the Shift key down and return your cursor to the top corner (4). Click. A new wall should be formed.

Step 5) Select the "Rectangle Tool" and draw a wall that connects to the back edge of the previous wall. Select this new wall and send it to the back using the Order toolbar.

Step 6) Select the line tool and draw two guidelines starting at the Vanishing Point. Extend the guidelines to the edge of the slide making sure that the guidelines pass through the corners of the rear wall.

Step 7) Select the Freeform Tool and draw in the side wall. You have now completed the vertical walls of this simple room.

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Step 8) To make a floor, simply make a rectangle from the bottom of your slide to the horizon line. The rectangle should cover the bottom of your slide.

Step 9) Send the rectangle to the back using the Order toolbar. Repeat the same steps for creating a ceiling.

Step 10) Adjust the rectangular walls of the room to make the interior more interesting.

Step 11) Create a doorway on a side wall by drawing a guideline from the vanishing point forward. Using the Freeform tool click and re-draw the *entire* wall allowing for an opening. *Note: use the Shift key when drawing vertical lines!*.

Order ▼ ✕

Lines ▼ ✕

Rectangle wall →

Step 12) Delete the original wall leaving the wall with the doorway behind. Use the rectangle tool to finish the illusion of a hallway.

Order ▼ ✕

Lines ▼ ✕

Step 13) Add colors and/or textures to the walls, floor and ceiling. Use the fill tool (paint bucket icon) located on the drawing toolbar to accomplish this.

Order ▼ ✕

Lines ▼ ✕

Step 14) Hang paintings on the rectangular walls through Insert > Picture > From File. Locate the image, insert and resize to fit. To hang painting on walls that recede, draw two guidelines from the vanishing point. Using the Freeform Tool create a quadrilateral shape that will become the painting.

Order ▼ ✕

Lines ▼ ✕

Step 15) To fill the quadrilateral shape with a painting, select the shape. From the fill bucket (paint can icon) select Fill Effects. Select the Picture tab located at the top. Click on the Select Picture button and locate a saved picture. Click OK twice. Repeat steps for each painting.

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Step 16) Add people, clip art, etc. to make your museum more interesting. Create hyperlinks to take you throughout the museum. Enjoy!

Appendix 4E: Building a Room in Perspective

BUILDING A ROOM IN PERSPECTIVE

Before you begin you must get the following toolbars ....
>From AUTOSHAPES (located on the Draw toolbar) select Basic Shapes and tear off the toolbar.
>From the DRAW button select Rotate or Flip and tear off the toolbar
>From the DRAW button select Order and tear off the toolbar

Now, let's begin ....
1. Make a new, blank slide (Insert>New Slide)
2. From the Basic Shapes toolbar, select the rectangle tool (▢) and draw a large-sized rectangle on the left side of the slide. This is the left wall of the museum. (see picture below)
3. Locate the Trapezoid tool (▽) on the basic shapes toolbar and draw a trapezoid on your slide. The trapezoid will not be facing the correct way. You will fix that in the next step.
4. Highlight the trapezoid and click on the Rotate Left button (Rotate or Flip Toolbar) if you are doing a wall located to your left, or the Rotate Right button if you are drawing a wall located to your right
5. Stretch the trapezoid so that it touches the top and bottom corners of the rectangle (first wall)
6. By moving the yellow diamond, you can change the height of the wall.
7. Follow directions in diagram below to complete your room.

First wall, make a rectangle

Second wall, make a trapezoid and rotate it to the left

Third wall, make a rectangle that meets the corners of the trapezoid

Fourth wall, make a trapezoid and rotate to the right. Use the yellow diamond to change size.

Fifth wall, make it meet the corners of the trapezoid

To make a floor, make a rectangle that covers the bottom half of your slide and then send it to the back (order toolbar). It is that easy. Do the same for the ceiling . . Make a rectangle and send it to the back.

8. Using the Fill Color tool (paint bucket) fill the walls with color. Try using "one color gradients". They usually work well
9. Fill the floor with a texture, like a rug texture or wood texture (fill tool>fill effects>Textures).
10. If you complete one room, try making another. You can get pretty complex as seen in the next example .... (flip paper over)

Keith Valley Technology Integration Program
~ Fasy, Heitzenrater, Teshorster ~
www.hatboro-horsham.org

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Appendix 4F: Hanging Paintings in Your Museum

HANGING PAINTINGS IN YOUR MUSEUM

STEP ONE: get the right tools for the job
1. From the "Draw" button, tear off the "Flip or Rotate" toolbar
2. From "AutoShapes" tear off the "Basic Shapes" toolbar

STEP TWO: inserting paintings on to **RECTANGULAR WALLS**
1. From "Insert" select "Picture from File" and insert one of your paintings
2. Place this painting on a "rectangular" wall and, using the corner handle only, shrink the painting so that it fits the wall
3. Repeat this step for paintings going onto rectangular walls

STEP THREE: Placing paintings onto **TRAPEZOID WALLS**
1. Draw a trapezoid and place it onto a trapezoid-shaped wall
2. Rotate the trapezoid so that it fits the wall
3. Using the handles and the yellow diamond, resize the trapezoid so that it looks like it would fit onto the wall
4. Locate the "Fill tool" (paint bucket) on the drawing toolbar
5. Select "Fill Effects" and then choose the "Picture" tab
6. Locate the painting you wish to include in your museum and fill the trapezoid with the painting (See diagrams below)
7. Make sure you UNCHECK the "Rotate fill effect with shape" box. See diagrams below.
8. Click OK and repeat steps for each "Trapezoid" wall

Select "Fill effects" and fill your trapezoid with a picture

Click on the "Select Picture" button and choose a painting from your Virtual Museum folder

Uncheck the Rotate fill effect box!! Click OK
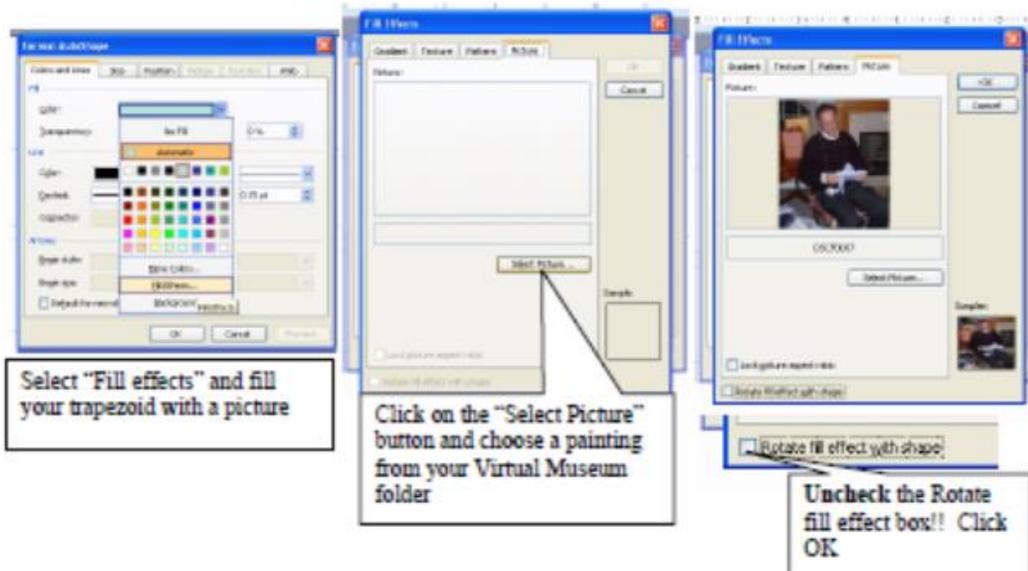
Appendix 4G: Proposed Schedule of the LMP

Week	Learning Objectives for sessions	Curriculum Materials / Resources / References	Activities
Week 1+2 *Induction stage* *"Making sense of the world"*	Session 1: Students reflect upon their everyday literacy practices and have a first discussion about multiliteracies Session 2: To introduce the students to the nature and workings of a virtual museum and to initial multimodal meaning-making emphasizing creative play and experimentation. Develop thinking and presentation skills Confirm theme/topic for virtual museum	Teacher's Resources: WebQuest platform Links to virtual museums (Smithsonian and the Natural History Museum, National Gallery Art) Projector Laptop Students' Resources: Handouts on Group Think Gallery Proposal Sheet, Desktop computers	Prezi presentation Placemat activity or Round Robin P-O-E Orientation workshops, 'Playshops' on online virtual museums Introduce students to the problem (On webquest) Debate activity in groups to propose an idea for the theme of the museum
Week 3+4 *Immersion stage* *"Resource Collection"*	Session 3+4: Students use and select from all the available semiotic resources for representation to explore themes for the environmental problem identified and prepare the content of the virtual museum. The intention is to: Develop a metalanguage – to describe and evaluate meanings on the chosen topic. Understand the causes of the problem and what people in their community are doing to prevent this situation To critically reflect about how people from diverse backgrounds might deal with such environmental problems. This includes	Teacher's Resources: Webquest platform Online sources Projector Laptop Students' Resources: Youth resources ref list (given in October 4) Worksheets	What is needed to create the virtual museum (on the webquest) Role play in groups scientists (worksheets) Looking for resources Online search, library books, email to local environmental groups, ask parents and relatives for information Web of life (worksheet) Map activity

| | thinking about their own cultures and suggest solutions of what needs to be done,

Based on the knowledge learnt from various text forms and activities, students plan their course of action for the multimodal design and redesign of the virtual museum. | Online resources

A3 sheets

You tube clips

Desktop computers | Flow chart : Students create a plan of action for the construction of the virtual museum |
|---|---|---|---|
| *Week 5*

Prior to museum visit

Immersion stage

"A world full of museums" | Session 5: To inform students of the content of the museum so that they have an idea of what is expected by them and motivate them to go by creating an authentic situation-problem. | Teachers' Resources:

Newspaper article

WebQuest (website platform)

PowerPoint slides

Projector

Laptop

Real objects from the museum

Caption Label samples

Students' Resources:

Handouts on Topic wheel

worksheet summary

Desktop computers

Powerpoint slides | *Y-chart-Naming (Activity 1)*
Analysing the obvious features of something. Students answer questions:
What does a museum look like?
What does it sound like?
What does it feel like?

Storytelling and discussion (Activity 2)

Two characters introduce the story behind the creation of museums (timeline) and provoke a discussion on what kind of museums exist, and talk on terms like collections, objects, types of museums

Museum announcement
Students go online to read a museum announcement. The museum calls for young volunteers to help with the setting up of the only Theatre museum in Cyprus.

Museum box (10-15')
The educator presents to the class a mystery box which contains real objects and photos from the museum. Students must generate questions that relate to the discovery of what is in the box. The questions may only receive a yes or a no answer and some of the |

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			objects may not be revealed until the day of the visit. What wiil you see at the museum? What will you hear? What will you touch or smell? Who decides what to include in the collections? Topic wheel Students in groups draw from a topic wheel to record in a flow chart one of the following questions: What do we know about setting up a museum exhibition? What do we need to know? How are we going to find out?
Week 6 Museum Visit *Immersion stage* *1 and a half hour*	Session 6: For technological literacy: the intention was to understand the ways that technology facilitates, alters, challenges, or redefines visitors' encounter with the museum object In regards to verbal literacy: students understand the ways in which the museum makes arguments through and about the objects it displays. With regards to visual literacy the intention was for pupils to analyze how objects interact with their physical setting to form persuasive arguments that are primarily visual. In social literacy the focus is on calling students' attention at the exhibitors' agency in producing the exhibit's meaning. It ponders their goal in mounting the exhibit.	*Activity 1* <u>Teachers' Resources:</u> Museum holdings (images, videos, written text, touch screens, real objects) Bag and note <u>Students' Resources</u>: A5 cards senses *Activity 2* <u>Teachers' Resources:</u> Projector 3D Animation clip created using online animation creator software	*Senses card (15')* Note from the director Students are given 10 minutes to familiarize themselves with the museum. However they are given 5 cards illustrating the 5 senses as guidelines for what to look for at the museum. Upon return to the educator, students are asked to demonstrate their findings, i.e which senses were used the most to navigate around the museum space. *Film Animation (5')* Students watch a short film (created by the researcher) where the two characters who they met at school welcome the visitors to the museum and explain the purpose of the visit.

| | For critical literacy the purpose is to help students to recognize and consider ideological stances and power structures implicit in museum displays. It encourages students to share the results of their investigation with museum officials. | *Activity 3*
Teachers' Resources:
Bag, cards

Students' Resources:
A5 Caption label templates | *Labels at the museum (15')*

Students discuss the use of labels in museums. Upon exit from the studio where the film was shown, students find three bags with a card inside (the card is the same for all groups). The messenger from each group (a student assigned from school) read their part (different coloured text) in the form of a dialogue.

Questions raised from discussion include:
How are labels important in a museum?
Are the labels at the museum easy to understand by all, both adults and children?
Do you have to know specific vocabulary to understand the language of the written texts?
Is the design and formatting appropriate to read the labels?
What if the labels are not written in the language that the visitor can understand?
What else facilitates understanding? |
| | | *Activity 4*
Teachers' Resources:
Website,

Students' Resources:
Postcard template | *Labels writing(10')*
Postcard
Students in groups create postcards using large carton paper on the concepts being discussed and record them on the postcard in the Postcard Problem section. They then provide an alternative solution to the problem. Postcards are then 'mailed' to another group who discuss the problem posed and then record an answer to the |

			problem with an explanation or justification.
			The postcards are collected again and delivered to another pair or group for an alternative response. At this point the museum director arrives and collects the postcards to read them (arranged from before) and provide feedback when students return to school.
		Activity 5 Teachers' Resources: Designer's portfolio 3D maquettes at the museum 3D design clip Bag, cards Students' Resources: paper, scissors, glue, pictures of objects from the museum, foam paper	*Collections and objects storyboards(10')* If the objects had voice, what would they tell you? Brainstorming activity Are they pleased with how they are arranged in space? What other ways can you think to arrange the collections/objects? Students find another bag containing a card with a question alongside some paper, scissors, glue, pictures of objects from the museum, foam paper etc. They gather in their teams and try to recreate three different rooms from the exhibits using the resources in the bag. They then present their collage scene to the rest and justify their decisions.
		Activity 6 Students' Resources: Costumes Accessories stage	Dressing room (20') The final activity includes role play. Students discover a dressing room and choose from it costumes to wear. They are now on their own and must decide the clothes and accessories carefully. Their intention is to create a character and a

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			story for the costumes to present to the rest. Key questions to answer include: Where? When? Who? Why? What? How did it end? They have 5 minutes to prepare their role and present it on a real stage at the museum. Goodbye (10')
Week 7 *After the museum visit* *Immersion stage*	Session 7: Students conceptualize and design with a focus. This involves setting priorities to succeed the goal of creating the museum, justifying potential plan and course of action and reaching fulfillment of requirements for each task.	Teachers' Resources: WebQuest Online multimodal story-tool Students' Resources: Worksheet	Reflection on experience of museum visit
Week 8+9 *After the museum visit* *Creative stage*	Session 8+9 The intention was to have students engage in constructing the museum gallery exhibitions and displays, artifacts and interpretation for their virtual museum using worksheets provided. Development of the museum floor plan by translating ideas in spoken or written into another medium, sourcing, selecting, adapting and creating design layout, artifacts, exhibits. Gather and compile relevant resources Reflect on individual creation and process	Teachers' Resources: WebQuest Virtual Museum Creation Tool Power Point slides Students' Resources:	Modeling/construction work with guidance from NTU staff. (Artifacts, e.g. 3D models, animation, etc requiring more time/work to be identified and directed to NTU staff asap after lesson) Confirm museum floor plan/layout. T monitors S construction of multi-modal features chosen for their galleries and gives advice where necessary.
Week 10+11 *Creative stage*	Session 10+11: Students would: Gather and compile relevant resources Classify, catalogue and analyze museum artifacts and products according to specific, agreed criteria.	Teachers' Resources: Caption Label samples Students' Resources: Caption Label Task Sheet	S upload resources collection into the MUSE portal according to their modes (3D, images, videos, text or audio). S complete Caption Label Task Sheet. T monitors S construction of multi-modal features chosen for their

	Select, sort, sequence, organize and classify information or data related to stance/perspective taken. Write descriptive captions for artifacts that integrate image-text relations.		galleries and gives advice where necessary. Modeling/construction work with guidance from NTU staff
Week 12+13 *Transformation stage* *Resource Collection*	Session 12+13: Modeling/Construction work where relevant Elicit peer feedback and T for revision Present group report on Gallery Proposal	Students' Resources: Reflection Task Sheet	Carry out a mini presentation on contents of proposal S and T offer feedback.
Museum day	Reach out to other students and adults "outside" the group (including teachers and school administrators) better insights into their language and literacy capabilities including those of culturally and linguistically diverse students. Students acknowledge their common experiences, therefore solidifying group identities and memberships. Students could be recognised as museum creators in a 'hybrid' ground where the physical is mixed with the virtual.	Teachers' Resources: Caption Label samples Students' Resources: Final product: The Alive Museum	Museum Day Presentation of final product: The Alive Museum Self-evaluation sheet Reflection on project Focused group Interviews

Appendix 4H: List of online sources for the intervention

List of sources for the webquest
http://webquest.org/index-resources.php
http://questgarden.com/search/
http://forest.mtu.edu/kidscorner/ecosystems/definition.html
http://www.junglewalk.com/classroom/Endangered-Species-Lesson-Plan-8.htm
http://dim-rizou.pel.sch.gr/ergasies/zoa/page09.html
http://www.kidsplanet.org/factsheets/map.html
http://worldwildlife.org/species/directory?direction=desc&page=2&sort=extinction_status
http://www.mnh.si.edu/vtp/1-desktop/
http://olc.spsd.sk.ca/de/webquests/animal/index.html

Research project 'Alive Museum':

Endangered species

This WebQuest is part of a student-generated virtual museum project. Through the WebQuest students will inquiry into endangered species; which species are endangered, their characteristics, where they live, what are the possible reasons that they are endangered and what are some actions that could be taken to help these species.

> **Grade Level:** 3-5
>
> **Curriculum:** Science
>
> **Keywords:** Life cycles, Habitats, Ecosystems, Extinction, Endangered species
>
> **Author(s):** Stefania Savva

A. Introduction

CYPRIOT MOUFFLON
(Ovisorientalis ophion)

"The visitor may count himself lucky if he sees a moufflon - a symbol of Cyprus. The Cypriot moufflon, Ovisorientalis ophion, a protected subspecies endemic to Cyprus, is threatened by poaching. The reclusive Cypriot Moufflon, an indigenous wild mountain sheep that was hunted to the verge of extinction and now survives with an estimated 200 breeding pairs in the protected reserve of the Paphos Forest Station, in the South Cyprus. In the village of Panayia, Paphos."

MARLEN
(Russian, 9 years old)
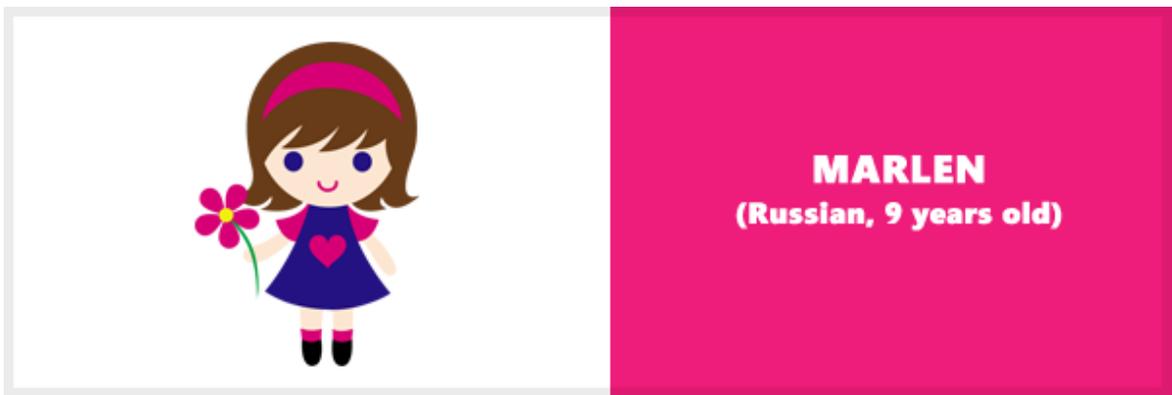
Hi you guys! My name is Marlen. I come from Russia and I am nine years old but have been staying in the island of Cyprus most of my life.

DIMITRIS
(Cypriot, 10 years old)
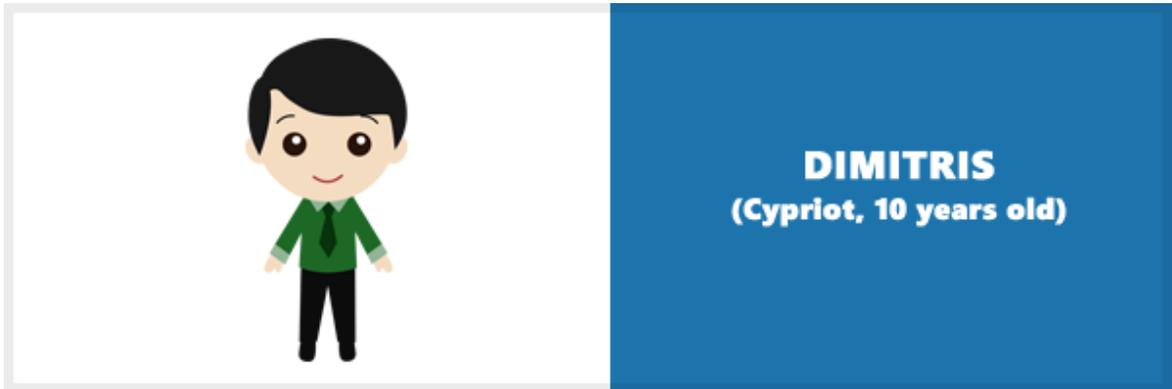
And I am Dimitris. I am 10 years old and was born in Cyprus.

Like many of you, we love animals and that is why we are concerned about them, especially the endangered ones like the Cypriot moufflon.

A moufflon, Oh MY!
Have you seen one before? Do you know where they live?

What if there were no more?
Could you imagine a world without fish, birds, or frogs?

How is it possible for them to disappear?
Could you imagine coming home one day and it had vanished? Everyday many species habitats are destroyed and they face the possibility of becoming endangered or extinct if they cannot find a way to survive.

Is there any way to stop them from disappearing?
Time is running out for the animals on the endangered species list! If even one of these animals becomes extinct, there may be a huge impact on the whole environment! From the smallest snail to the biggest bear, every animal plays an important role on our planet.

There's no time to waste; let's start saving the world **RIGHT NOW!**

NATURAL MUSEUM OF
AMERICAN HISTORY

Do you know what is a Natural History Museum?

As you can imagine, Natural History Museums can be fun and exciting places and you can find information on almost every species the world!

Have you ever been to a Natural History Museum?

Do not worry, if you haven't been to a museum of this sort, today is your chance!

How? Just click on this link

(http://www.mnh.si.edu/vtp/1-desktop)

I hope you enjoyed your free visit to this great museum! However, if you would like to know more about species coming from Cyprus there is one place you can visit, The

[Cyprus Museum of Natural History,](#) the first museum of its kind in Cyprus. The Museum's collection includes more than 2.500 exhibits. The majority of the collection consists of stuffed mammals, birds, fish, reptiles and insects as well as rocks, minerals, semiprecious stones, shells, fossils and more.

Would you like to help the Cyprus Museum of Natural History find out more about them so we can save life on Earth as we know it?

We are volunteers at the museum. This means we visit the museum and offer our support in any way we can.

Stephania, our friend from the museum, works together with other scientists to learn about endangered species in Cyprus and abroad. Actually, she is currently working on an exhibition about endangered species from all over the world and was wondering if your class could help her with her research.

So, here is your chance to educate the public and bring awareness about extinct and endangered species!

Are you interested?

B. Process Stage 1

Ready? Let's start.

---

1. What is an ecosystem?

You might want to know what an ecosystem is first! Click on the link below to watch a video about ecosystems.

Link

While watching the video see if you can define the words found in the card provided for you named key words for ecosystems.

2. **How do ecosystems work?**

Click on the link below to watch a video about the how ecosystems work.

While watching the video record the trophic levels present in an ecosystem and an example for each trophic level in the worksheet provided named Ecosystem Organisation Pyramid.

[Link](#)

I hope the video helped you understand how ecosystems work. However there is more to know about ecosystems!

3. **What are the different types of ecosystems?**

Visit the link below to list the six types of ecosystems.

1.

2.

3.

4.

5.

6.

[Link](#)

Now that you know what an ecosystem is see how it relates with the different species!

CHALLENGE #2

SPECIES INVESTIGATION
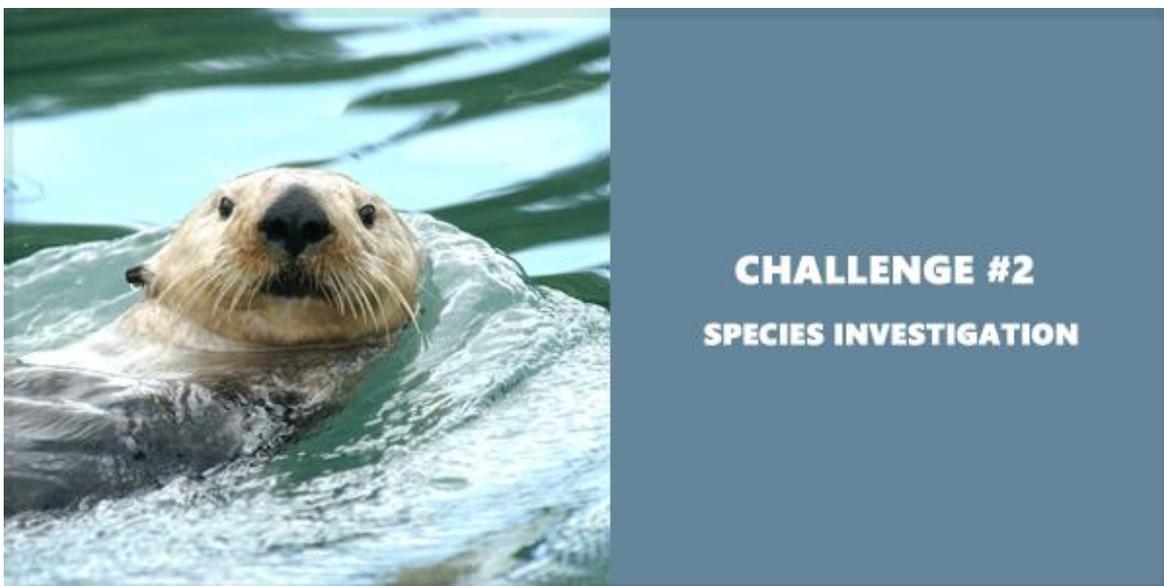
Different professionals work to create a museum exhibit. Today you are all researchers for the museum. A researcher is a scientist who gathers information on a particular topic from various sources.

---

1. What are the names of the six classes of species?

Visit the link below to list the six classes.

For each class provide three example creatures, and the characteristics of that class.

Class name: _____

Class characteristics: _____

Example animals: 1.) _____ 2.) _____ 3.) _____

Link

2. Visit the link below to investigate one of the example animals you listed from each class to find out more information.

Animal Name: _____

Class Name: _____

Characteristics: _____

Diet: _____

Locations: _____

Habitat: _____

Reproduction/Life Cycle: _____

Behaviour: _____

Other interesting facts: _____

Link

Once you are finished move further down to **Process 2**.

Keywords- ecosystem
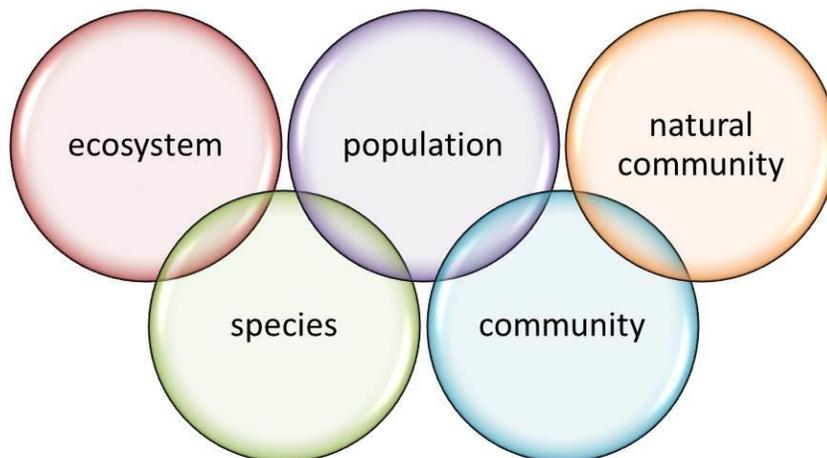
Ecosystem Organization Pyramid
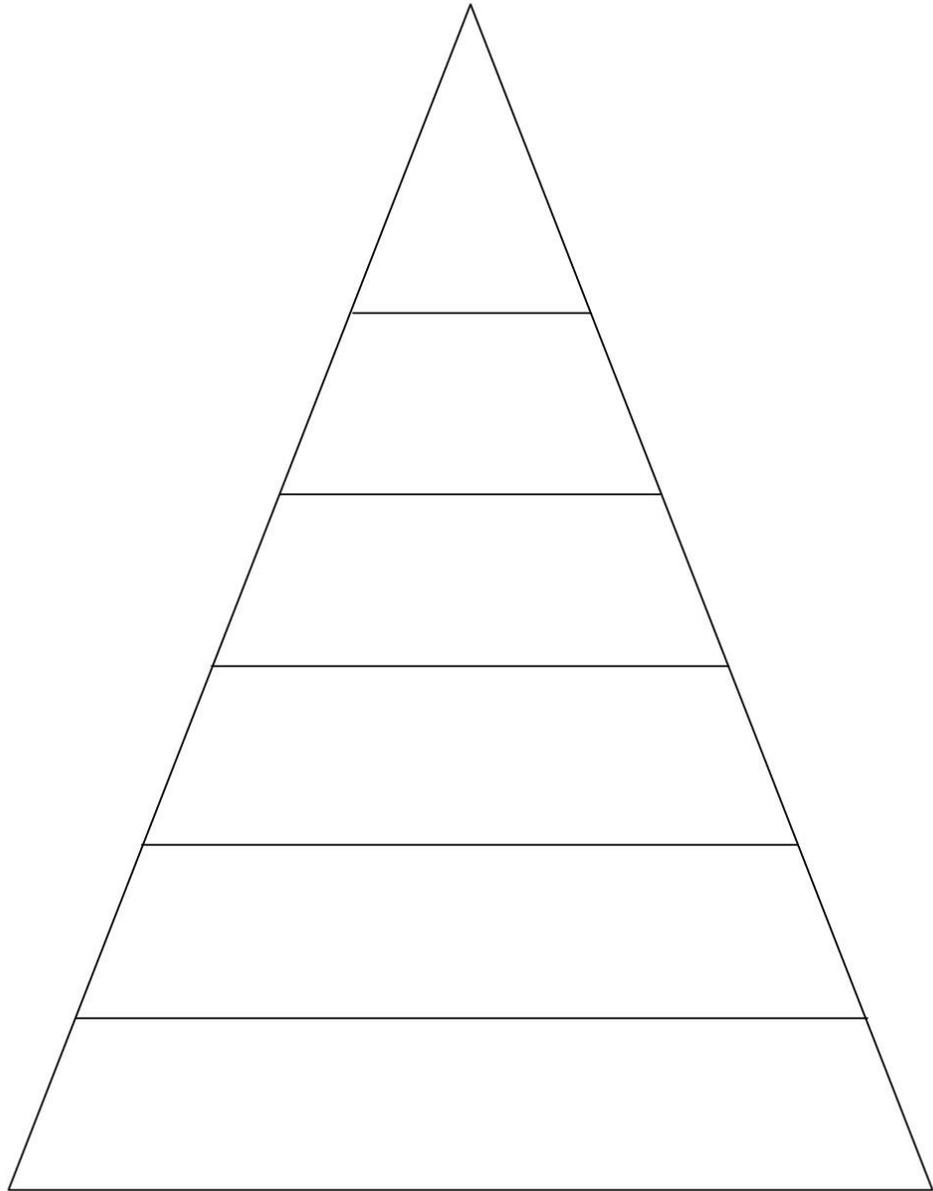
C. Process Stage 2

---

1. **What is an endangered species?**

    a. In your notebook, fill out a KWL chart about endangered species. (One column for what you already know, one column for what you want to know. For now, leave the learned column blank.)

    b. Now watch the following videos: <u>Video 1</u> and <u>Video 2</u> about endangered species! Now you can complete your KWL chart and fill out the "what I learned" column.

    2. What are the characteristics of different endangered species?

    a. The Museum Director (your teacher) will assign you to three groups. Each group represents the role of a scientist. The groups are:

    First group: ORNITHOLOGISTS

    Second group: AQUATIC BIOLOGISTS

    Third group: ZOOLOGISTS

In order to find out more about what the scientist assigned to you does, read the card provided for you in your group.

b. Now that you're in a group let's get started with your research. You can start collecting information and most of all, have fun while learning!

Each group member must research at least two species and can only choose from the list under your assigned group number. You can find a list of species here: List 1 and List 2. Follow the links to these websites and choose your endangered species. Be careful! In your group you should locate which species belong to your responsibility based on your profession. Once identified you should decide among your group members which species to gather information about and then go to the links below to find more information about your endangered animal.

Link 1   Link 2   Link 3

You should look for things such as:

* name of the endangered animal

* an image of the animal (a student drawing or an image downloaded from the Web)

* a description of the animal that includes information about its size, color, habits, and habitat

* a statement explaining why the animal is endangered

* a "fast fact" telling the most interesting thing you learned about the animal - something many people might not know

To better organize your ideas you can create a file inside the AM folder which is found on the desktop of your computer. There you can save pictures you find online. To record the information you find you will fill in a **Web of Life** provided in the AM folder.

c. When you have completed reading the pages, in a Microsoft Word document, put the information you have gathered in your Web of life in complete sentences. You should have at least 3 paragraphs about your endangered species. This will be your page in our Endangered Species ABC book. Remember, your page will be teaching the rest of our class, so be sure to do a good job! Please also include a colorful picture of your animal and the letter of the alphabet that your animal begins with at the top of the page.

More activities to do:

6.) Play the Endangered Animals Game!

7.) Endangered Animal Posters

- Visit this website and pick out five animals.

- Click on their names in blue and print out the picture.

- Color the picture exactly as described in the directions.

- Glue the picture onto your colored construction paper.

Web of life

Name _____

Web of Life

DIRECTIONS: Choose an endangered species and complete the web below to prove to members of We Love Wildlife that you understand the interdependence of creatures on Earth.

What are the characteristics of this animal?
Class:……………………………………………
Weight:…………………………………………
Size:………………………………………………
Life span:………………………………………
Diet:…………………………………………….
Physical
description:……………………………………
……………………………………………………

Describe the animal's habitat.
……………………………………………….
……………………………………………….
……………………………………………….
……………………………………………….

Animal:
……………………………….
……………………………….
……………………………….

Give an interesting fact about this animal.
………………………………………
………………………………………
………………………………………
………………………………………
………………………………………

Why is this animal endangered?
…………………………………………………
…………………………………………………
…………………………………………………
…………………………………………………
…………………………………………………
…………………………………………………

What is being done to save this endangered animal?
……………………………………………….
……………………………………………….
……………………………………………….
……………………………………………….
……………………………………………….
……………………………………………….

How does this animal impact it's environment and fit into the "web of life"? Why is it important?
……
……
……
……

D. Process Stage 3

CHALLENGE #4

MAPPING THE WORLD OF ENDANGERED SPECIES

Based on the information you have gathered you are ready to create a small world map to indicate where the species is known to be endangered (use small outline maps: Map 1 or Map 2 given by your teacher to the group). Each continent should be allocated a different color.

Be ready to share the information with the class with a brief presentation (2 minutes) highlighting the results of your research.

What is threatening the species?

You will watch two videos: [Video 1] and [Video 2] on how does a species become endangered.

Could you identify more reasons that these species are endangered? Why are these species being threatened? How are human actions affecting these species? Use the Internet information linked below to answer these questions in the form of a newspaper or online article:

Causes of endangerment: [Link 1] [Link 2] [Link 3] [Link 4] [Link 5]

Why should we protect endangered species?

a. As a human being, how do you think or feel about this ongoing global and potentially disastrous problem? Could you think of a creative way to share your emotions and ideas with the class?

b. You will work with your group to jog down some ideas on why we should protect endangered species using the **Placemat** worksheet provided to you. You must be prepared to give a brief presentation about the reasons you provide in the class.

More activities to do:

Take a look at this link on how development can affect the growth or endangerment of a species: [Link](#)

What can you do to help keep these creatures alive and protect them?

Think about ways that you can help the environment locally and globally.

What can the local government of that species change to save them?

What can you do?

Here are some sites with helpful ideas on how you can help.

[Site 1](#) [Site 2](#) [Site 3](#)

Present your ideas to the class in the form of a poster online or print (http://www.glogster.com) or a comic strip (http://www.pixton.com/uk) using your classroom's account.

Can you think of other ways to share your findings and raise awareness on endangered animals?

Discuss your ideas in your group and propose some actions for the upcoming student board meeting!

More activities to do:

Link 1 Link 2

Placemat activity

Activity: Placemat/Round Robin

This activity was designed to allow for each individual's thinking, perspective and voice to be heard, recognised and explored. Each group was allocated one piece of A3 or butcher's paper. One student in the group drew the diagram on the paper (Image 6.4). The outer spaces are for each participant to write their thoughts about the topic.

The circle in the middle of the paper was used to note down (by the nominated scribe) the common points made by each participant. Students were asked to work in their group and using their allocated space to jog down 2-3 ideas regarding the questions: 'Why are these species being threatened? How are human actions affecting these species?'

Image 1 Placemat template
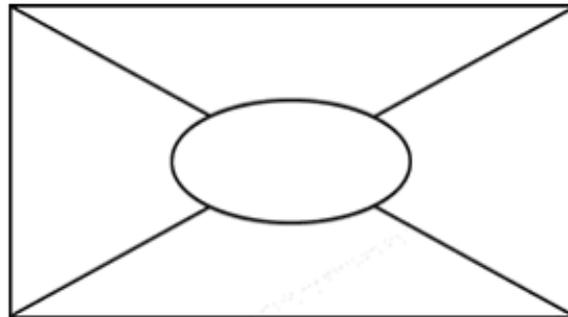
All students became scribes with the paper being passed around the group and students support each other with ideas and spelling. At a signal from the researcher the groups passed their pieces of paper to the table group on their left. After reading the responses from the previous table

the group continued to generate and record more ideas on the new piece of paper. This process was repeated up to three more times, at which point the groups were asked to further explore the ideas by ranking or classifying them. Each group then reported the common points to the whole class.
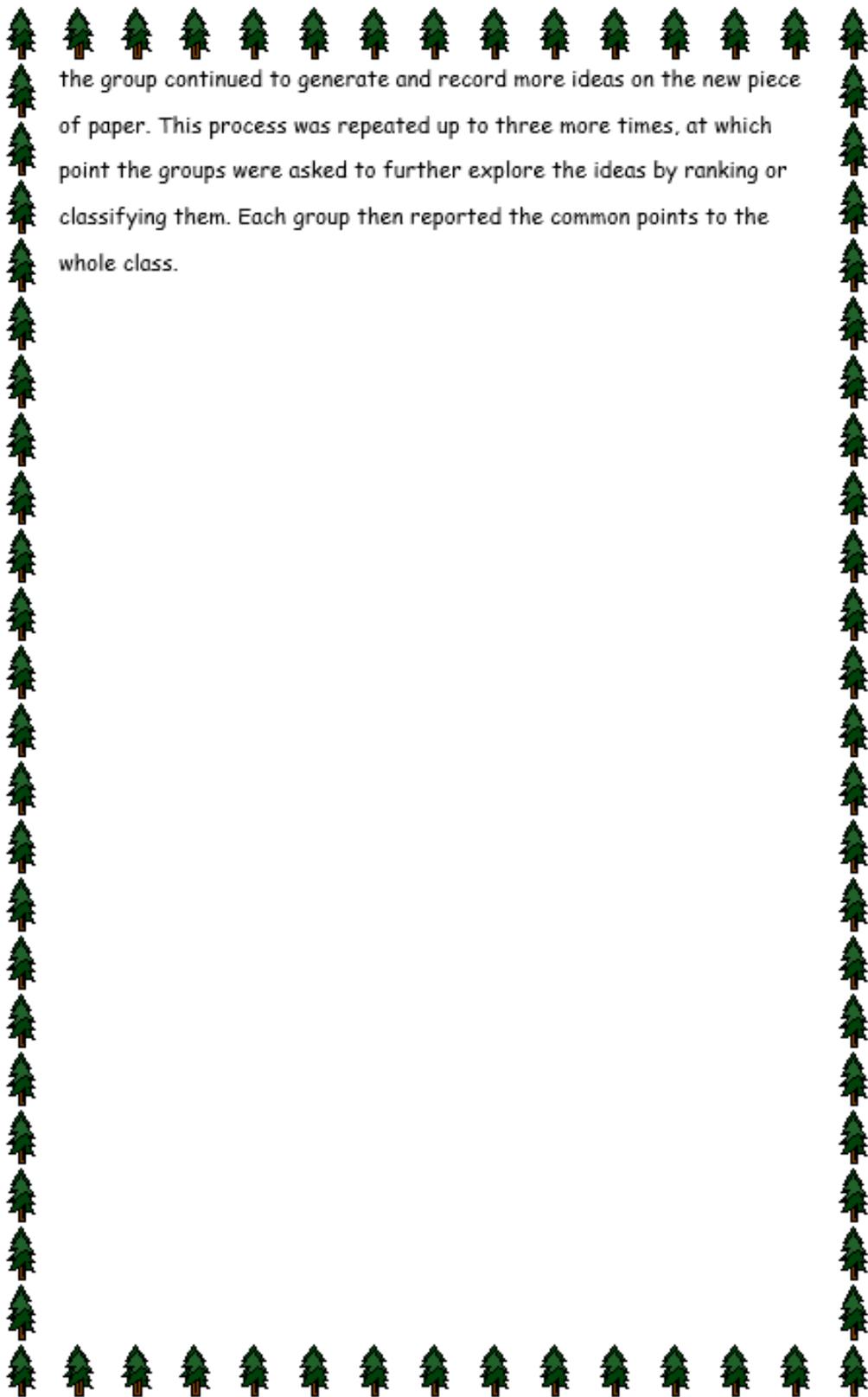
Appendix 4J: Other Worksheets created for the WebQuest

List of endangered species

Category 1 Zoologists

AFRICAN LION

GIANT PANDA

SUMATRAN RHINO

KOALA

CHIMPANZEE

GRAY WOLF

PENGUIN

Category 2 Ornithologists

MONARCH BUTTERFLY

BATS

PYGMY OWL

CROWNED EAGLE

CALIFORNIA CONDOR

RED COCKADED WOODPECKER

YELLOW EARED PARROT

Category 3 Aquatic zoologists

BLUE WHALE

TUNA

PACIFIC SALMON

GREAT WHITE SHARK

SEA OTTER

NASSAU GROUPER

SMALLTOOTH SAWFISH
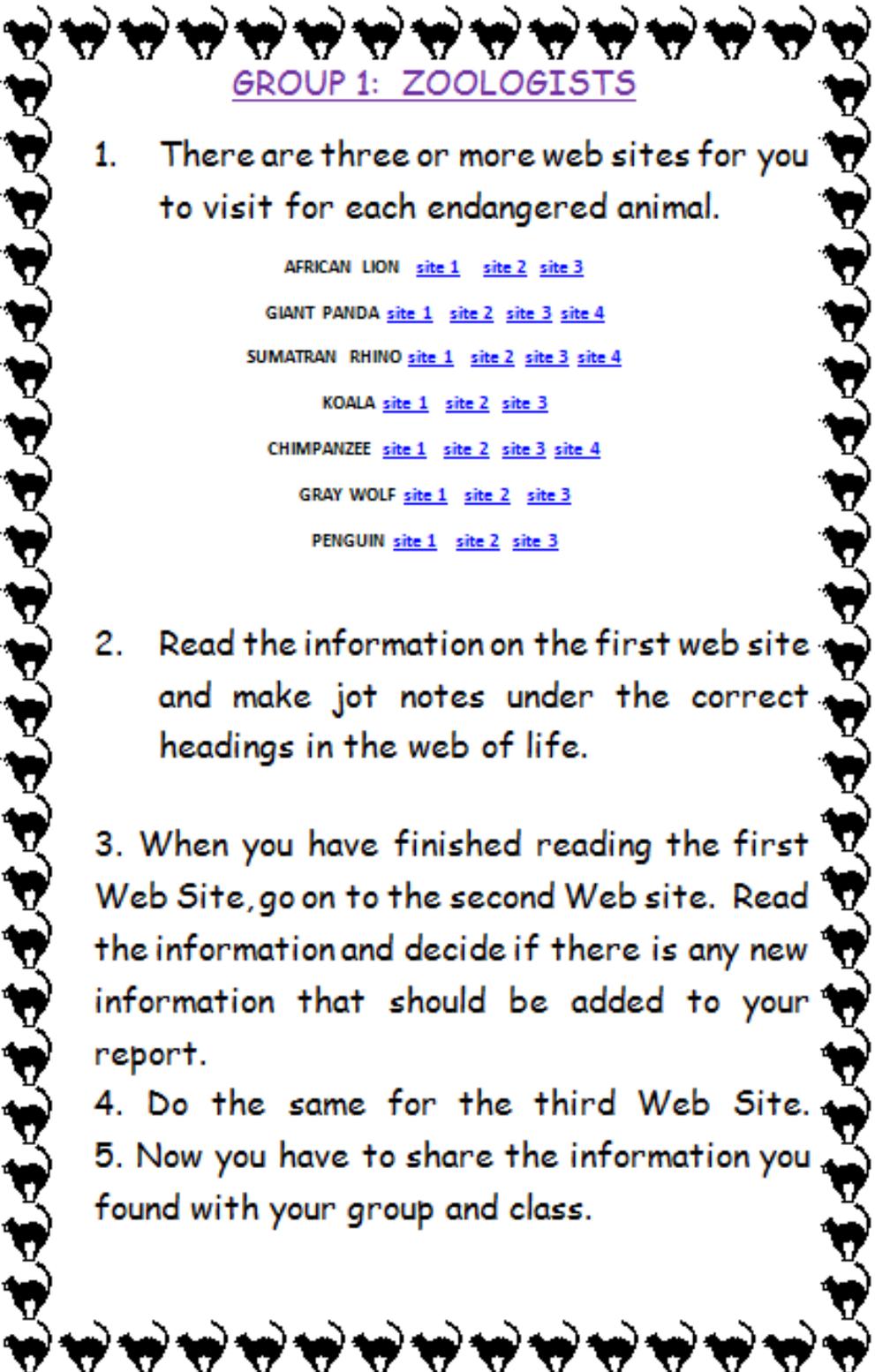
GROUP 1: ZOOLOGISTS

1.   There are three or more web sites for you to visit for each endangered animal.

AFRICAN LION   site 1   site 2   site 3

GIANT PANDA site 1   site 2   site 3 site 4

SUMATRAN RHINO site 1   site 2   site 3 site 4

KOALA site 1   site 2   site 3

CHIMPANZEE site 1   site 2   site 3 site 4

GRAY WOLF site 1   site 2   site 3

PENGUIN site 1   site 2   site 3

2.   Read the information on the first web site and make jot notes under the correct headings in the web of life.

3. When you have finished reading the first Web Site, go on to the second Web site. Read the information and decide if there is any new information that should be added to your report.

4. Do the same for the third Web Site.

5. Now you have to share the information you found with your group and class.

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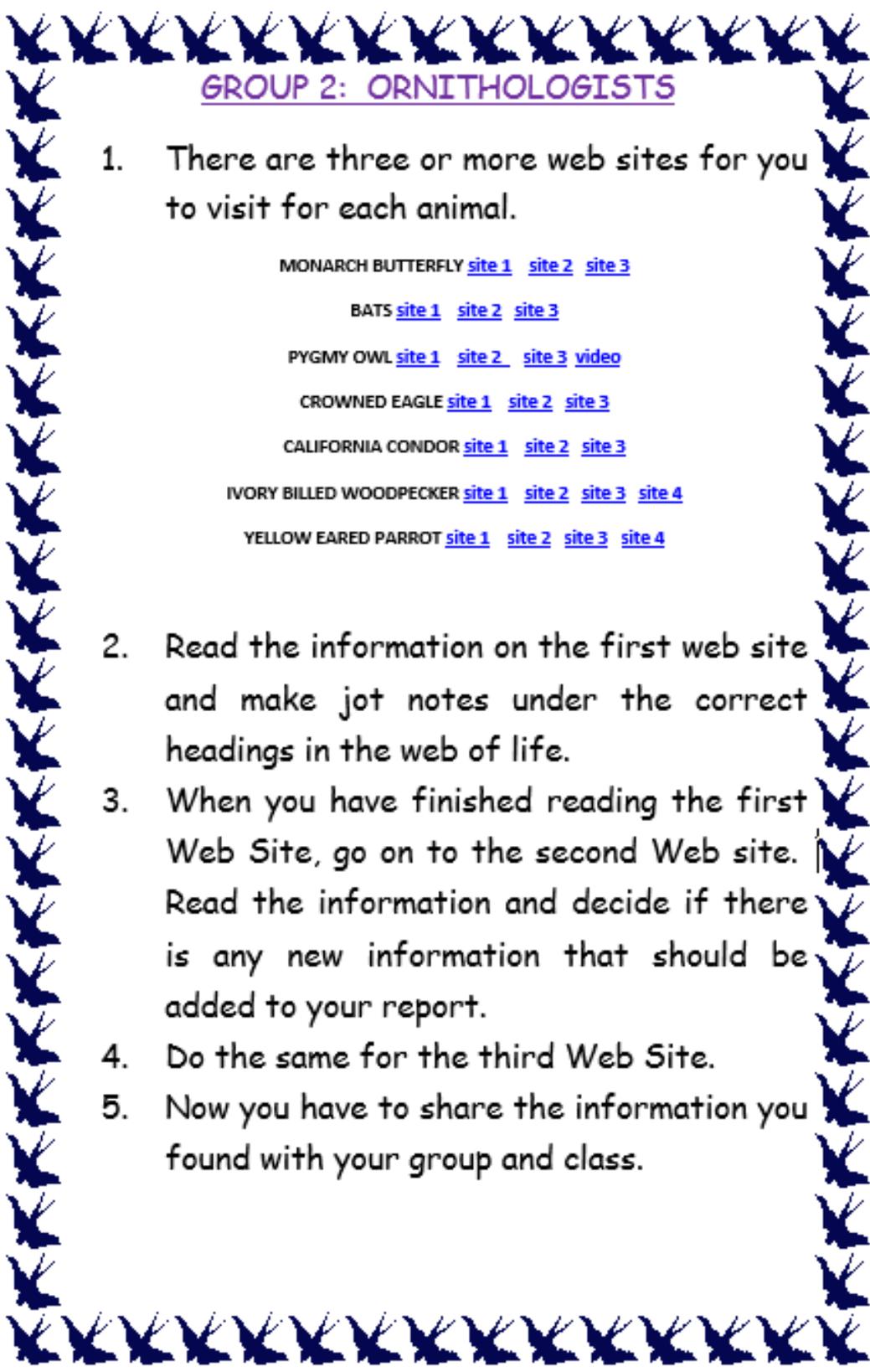
GROUP 2: ORNITHOLOGISTS

1. There are three or more web sites for you to visit for each animal.

MONARCH BUTTERFLY site 1   site 2   site 3

BATS site 1   site 2   site 3

PYGMY OWL site 1   site 2   site 3 video

CROWNED EAGLE site 1   site 2   site 3

CALIFORNIA CONDOR site 1   site 2   site 3

IVORY BILLED WOODPECKER site 1   site 2   site 3   site 4

YELLOW EARED PARROT site 1   site 2   site 3   site 4

2. Read the information on the first web site and make jot notes under the correct headings in the web of life.

3. When you have finished reading the first Web Site, go on to the second Web site. Read the information and decide if there is any new information that should be added to your report.

4. Do the same for the third Web Site.

5. Now you have to share the information you found with your group and class.
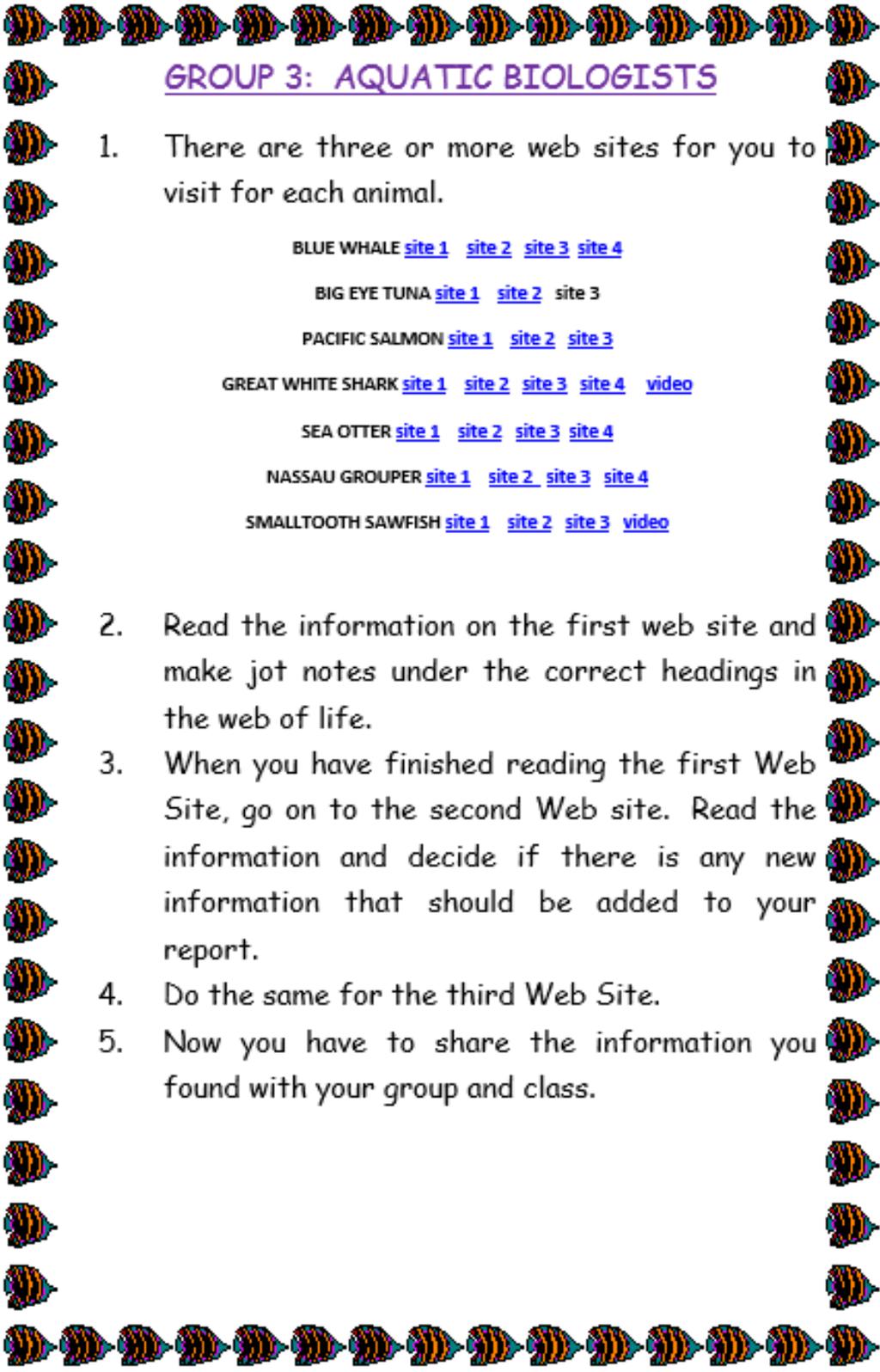
GROUP 3: AQUATIC BIOLOGISTS

1. There are three or more web sites for you to visit for each animal.

BLUE WHALE site 1   site 2   site 3   site 4

BIG EYE TUNA site 1   site 2   site 3

PACIFIC SALMON site 1   site 2   site 3

GREAT WHITE SHARK site 1   site 2   site 3   site 4   video

SEA OTTER site 1   site 2   site 3   site 4

NASSAU GROUPER site 1   site 2   site 3   site 4

SMALLTOOTH SAWFISH site 1   site 2   site 3   video

2. Read the information on the first web site and make jot notes under the correct headings in the web of life.

3. When you have finished reading the first Web Site, go on to the second Web site. Read the information and decide if there is any new information that should be added to your report.

4. Do the same for the third Web Site.

5. Now you have to share the information you found with your group and class.

Appendix 4K: Proposed Topics and Activities before the Museum Visit

Computer Lab Session	Learning Objectives	Curriculum Materials / Resources / References	Activity and Questions for the session	Knowledge Processes Learning by Design
Before the museum visit two hours session	To inform students of the content of the museum so that they have an idea of what is expected by them and motivate them to go by creating an authentic situation-problem.	Activity 1 Teachers' Resources: Website, Projector PC Real objects from the museum Caption Label samples Students' Resources: Handouts on Group Think Sheet, Youth resources ref list (given in Jan 10), Report on Gallery Proposal task sheet	*Y-chart-Naming(Activity 1)* Analysing the obvious features of something. Students answer questions: What does a museum look like? What does it sound like? What does it feel like?	Experiencing the known
		Activity 2 Teachers' Resources: Website,	*Storytelling and discussion (Activity 2)* Two characters introduce the story behind the creation of museums (timeline) and	Experiencing the new

		Students' Resources: Handouts on Group Think Sheet, Youth resources ref list (given in Jan 10),	provoke a discussion on what kind of museums exist, and talk on terms like collections, objects, types of museums	
		Activity 3	*Museum announcement*	
		Teachers' Resources: Website,	Students go online to read a museum announcement. The museum calls for young volunteers to help with the setting up of the only Theatre museum in Cyprus.	
		Activity 4 Teachers' Resources: Website, Students' Resources:	*Museum box (10-15')* The educator presents to the class a mystery box which contains real objects and photos from the museum. Students must generate questions to discover what is in the box. The questions may only receive a yes or a no answer and some of the objects may not be revealed until the day of the visit. What wiil you see at the museum? What will you hear? What will you touch or smell? Who decides what to include in the collections?	

Appendix 4L: Proposed Topics and Activities during the Museum Visit

Theatre Museum Session	Learning Objectives	Curriculum Materials / Resources / References	Activity and Questions for the session	Knowledge Processes Learning by Design
During the visit 1 and a half hour		*Activity 1* Teachers' Resources: Museum holdings (images, videos, written text, touch screens, real objects) Bag and note Students' Resources: A5 cards senses	*Senses (15')* Note from the director Students are given 10 minutes to familiarize themselves with the museum. However they are given 5 cards illustrating the 5 senses as guidelines for what to look for at the museum. Upon return to the educator, students are asked to demonstrate their findings, i.e which senses were used the most to navigate around the museum space. Questions raised:	Experiencing the new Conceptualising by Naming
		Activity 2 Teachers' Resources: Projector 3D Animation clip created using online animation creator software	*Film Animation (5')* Students watch a short film (created by the researcher) where the two characters who they met at school welcome the visitors to the museum and explain the purpose of the visit.	Conceptualising with Theory

| | | Activity 3
Teachers'
Resources:
Bag, cards

Students'
Resources:
A5 Caption
label templates | *Labels at the museum (15')*
Students discuss the use of labels in museums. Upon exit from the studio where the film was shown, students find three bags with a card inside (the card is the same for all groups). The messenger from each group (a student assigned from school) read their part (different coloured text) in the form of a dialogue. Questions raised from discussion include:
How are labels important in a museum?
Are the labels at the museum easy to understand by all, both adults and children?
Do you have to know specific vocabulary to understand the language of the written texts?
Is the design and formatting appropriate to read the labels?
What if the labels are not written in the language that the visitor can understand?
What else facilitates understanding? | Analysing
Functionally |
| | | Activity 4
Teachers'
Resources:
Website, | *Labels writing(10')*

Postcard
Students in groups create postcards using large carton | Analysing
Critically |

		Students' Resources: Postcard template	paper on the concepts being discussed and record them on the postcard in the Postcard Problem section. They then provide an alternative solution to the problem. Postcards are then 'mailed' to another group who discuss the problem posed and then record an answer to the problem with an explanation or justification. The postcards are collected again and delivered to another pair or group for an alternative response. At this point the museum director arrives and collects the postcards to read them (arranged from before) and provide feedback when students return to school.	
		Activity 5 Teachers' Resources: Curator's Day 3D maquettes at the museum 3D design clip Bag, cards Students' Resources: paper, scissors, glue, pictures of objects from the	*Curators' day (10')* If the objects had voice, what would they tell you? Brainstorming activity Are they pleased with how they are arranged in space? What other ways can you think to arrange the collections/objects? Students find another bag containing a card with a question alongside some paper, scissors, glue, pictures of objects from the	Applying Appropriately

		museum, foam paper	museum, foam paper etc. They gather in their teams and try to recreate three different rooms from the exhibits using the resources in the bag. They then present their collage scene to the rest and justify their decisions.	
		Activity 6 Students' Resources: Costumes Accessories stage	Dressing room (20') The final activity includes role play. Students discover a dressing room and choose from it costumes to wear. They are now on their own and must decide the clothes and accessories carefully. Their intention is to create a character and a story for the costumes to present to the rest. Key questions to answer include: Where? When? Who? Why? What? How did it end? They have 5 minutes to prepare their role and present it on a real stage at the museum. Goodbye (10')	Applying Creatively

Appendix 4M: Evaluation Rubric

Evaluation Rubric

	Beginning	Developing	Very Good	Examplary	Score
Knowledge & Understanding (Characteristics of the species and its status)	Student demonstrates a limited understanding about the negative impacts of human interaction on their species. Student report has little or no clairty of ideas that focus on the species and its habitat.	Student demonstrates some understanding about the negative impacts of human interaction on their species. Student report has some clarity of ideas that focus on the species and its habitat.	Student demonstrates considerable understanding about the negative impacts of human interaction on their species. Student report has a general level of clarity of ideas that focus on the species and its habitat.	Student demonstrates thorough understanding about the negative impacts of human their species. Student report communicates strong clarity of ideas that focus on the species and its habitat.	%25
Thinking and Inquiry	Inquiry Student rarely uses appropriate scientific vocabulary and conepts. Facts are inaccurate, misleading or incomplete.	Student occasionally uses appropriate scientific vocabulary and concepts. Some facts are accurate and relevant information.	Student often uses appropriate scientific vocabulary and concepts. Most facts are accurate and relevant information.	Student consistently uses appropriate scientific vocabulary and concepts. Facts are completely accurate and relevant.	%25
Communication (Expression and Organization of Ideas)	Student provides limited detail about the elements of their species. (Appearance, Habitat, Adaptations, Range, Food, Predators, Life Cycle, Human Impact, Current Status and Conservation Efforts). The length of the research report is inconsistent with the message. Student does not communicate the information in their own words.	Student provides some detail about the elements of their species. (Appearance, Habitat, Adaptations, Range, Food, Predators, Life Cycle, Human Impact, Current Status and Conservation Efforts). The length of the research report is somewhat appropriate to the message. Student communicates some of the information in their own words.	Student provides considerable detail about the elements of their species. (Appearance, Habitat, Adaptations, Range, Food, Predators, Life Cycle, Human Impact, Current Status and Conservation Efforts). The length of the research report is appropriate to the message. Student communicates most information in their own words.	Student provides thorough detail about the elements of their species. (Appearance, Habitat, Adaptations, Range, Food, Predators, Life Cycle, Human Impact, Current Status and Conservation Efforts). The length of the research report is very appropriate appropriate to the message. Student effectively communicates all information in their own words.	%25
Application	Student research is limited and not complete. Research was not done independently.	Student research is somewhat complete. Research was done independently.	Student research is complete. Research was done independently.	Student research is complete with great detail. Research was done independently.	%25

Total Score: %100

Appendix 4N: Auditing Instrument for the Evaluation (Anstey and Bull, 2006)

Social and intellectual resources accessed	A. Curriculum	B. Pedagogy used	C. Student assessment and teacher validation
Students	*1. When producing and consuming texts, do students draw on their lifewords experiences?* *2. Do students see texts as part of their social and cultural practices?*	*1. Are students gaining access to a range of texts and semiotic systems?* *2. Do students use the codes and conventions and the metalanguages of various semiotic systems?*	*1. Do the assessment tasks address real audiences and incorporate authentic tasks?* *2. Are assessment tasks related to both the school-based worlds and the lifeworlds (literacy identities) of students?*
Museum educators	*3. Does teacher planning draw on the lifeworlds of students as well as their school-based worlds?* *4. Does teacher planning include experience with semiotic systems: print, live and electronic texts; and a range of multimodal texts?*	*3. Are all the teachers familiar with a range of texts and semiotic systems?* *4. Are all the teachers familiar with the codes and conventions and the metalanguages of various semiotic systems?*	*3. Do the teacher-constructed assessment tools incorporate a range of auditing instruments that are design to measure student progress in new literacies and with the new texts?* *4. Are the teachers developing instruments that will measure and validate change in teacher practice?* *5. Is there a balance between student assessment and teacher validation?*
Museums	*5. Does whole-museum learning related planning address the consumption and production of a wide range of oral, print, multimodal, and electronic texts?* *6. Does whole-museum learning planning take account of the lifeworlds, as well as the school-based worlds, of students?*	*5. Does whole-museum learning planning identify the various texts, semiotic systems and metalanguages and suggest strategies for teaching and learning them throughout the museum programme?*	*6. Does whole-museum learning planning incorporate regular monitoring of the curriculum and pedagogies used throughout the museum programme?* *7. Does whole-museum learning planning incorporate validation of teacher practice in order to provide an overview of museum-wide pedagogy?*

Appendix 5A: Experts' Appraisal Guiding Questions

Dear Prof /Dr _____

You are requested to look through the attached prototypes that have been developed with an aim of improving museum multiliteracies teaching and learning methods in Cypriot Primary Schools. Your opinions and suggestions are highly valuable for improvement of the validity and the initial practicality of the prototypes. Specifically, this appraisal seeks answers, and explanation of the following questions:

1) Are the prototypes useful for the intended users to implement the developed intervention?

2) Can the prototypes improve the users' professional knowledge?

3) Can the components and the Learning by Design instructional sequence in the supporting materials provide an easy way for teachers to implement the museum multiliteracies-based approach?

4) Can the components and activities of the professional development programme enhance primary teachers' learning and practising implementation of the museum multiliteracies-based approach?

5) Do you perceive the museum multiliteracies-based approach and the Learning by Design instructional sequence as useful in improving literacy teaching and learning in Cypriot primary schools?

6) How can the materials and components of the museum-school partnership be further improved?

Thanks very much for participating in this study

Appendix 5B: Teachers' Evaluation Questionnaire (Users' Appraisal)

The following questions aim to elicit your opinion on the supporting materials utilised. Please write your opinions/comments in the provided space for each question. The information you provide will be regarded as confidential and only be used for this research.

Preliminary information
School _____

Classes/Forms taught_____

Teaching experience _____years:

Questions:
1. Briefly indicates your general impression about the curriculum materials by explaining the following.
    i)   Relevance of the lesson materials

    _____
    _____

    ii)   Lesson content

    _____
    _____

    iii) Design and structure

    _____
    _____

    iv)   Lessons presentation/ sequence

    _____
    _____

2. What did you like most about the supporting materials? Please provide reasons.

3. What you dislike about the materials? Please provide reasons.

4. What do you suggest to be added to the materials? Please provide reasons.

5. What things would you like to be taken out of these materials? Please provide reasons.

    _____
    _____

6. What do you think about using this kind of instructional approaches in the lesson preparation and teaching?

    _____
    _____

7. What problems do you foresee?

    _____
    _____

8. Will you be able to get all the materials and resources for the lessons you have examined? If not, what will you do?

    _____
    _____

9. What are your comments/suggestions on the materials?

    _____
    _____

Thanks for your time and cooperation

Appendix 5C: Group A and B Micro-Teaching Profile Practice Scores

(i.e.100% = all items for each stage were met in full)

Author	T1	T2
Situated practice *The teacher introduces a lesson by taking inspiration from students' funds of knowledge*	85	73
The teacher explicitly identifies and facilitates students' ideas and suggestions	82	71
The teacher encourages students to ask questions to generate their curiosity	84	71
The teacher makes use of print and multimodal modes to elicit students' interest	82	72
The teacher guides students to make connections between what they know and the new lesson ideas	82	73
Total Situated practice scores in percentage	**83**	**72**
Overt Instruction *The teacher introduces students to new knowledge by connecting with previous lessons*	85	83
The teacher facilitates students'conceptualizations and categorizing of the taught concepts	84	84
The teacher promotes use of diagrams and flow charts to organise students' thought	85	82
Students seem to have an increased understanding of what they are expected to do and start in a focused way	85	82
Students show lesson interest and seem motivated to produce practical work and ask questions	86	85
Total Overt Instruction scores in percentage	**85**	**83**
Critical framing *The teacher encourages students to participate in the lesson activities/practical work with minimum support*	42	47
The teacher encourages students' critical engagement with print and multimodal texts	42	47
The teacher assigns each group with tasks that enable critical thinking and higher order skills	41	46
Students are challenged to critically reflect on the reasons' behind respective decisions	43	48
The teacher probes students to analyse their actions and redirects their investigations accordingly	43	47
Students try alternative ideas and visualize them to choose the best option for their virtual museum	41	47
The teacher allows sufficient time for completion of the activities	41	47

The teacher asks for clarifications and justifications for students' actions	43	47
Total Critical framing scores in percentage	**42**	**47**
Transformed practice *The teacher encourages students to redesign texts and use multimodal modes of communication*	53	68
The teacher encourages students to apply and extend the concepts learned in new situations	54	69
The teacher guide students to understand discrepancies in their design of the virtual museum	53	67
Students present and elaborate on their decisions and actions while explain the lessons concepts in their own words	54	68
Students reflect on their practice and reach a higher level of understanding and conclusions for respective tasks and the LMP overall	52	70
Students are able to transfer their knowledge in other contexts	52	66
Students demonstrate their knowledge and skills taught from the LMP	53	68
Total Transformed practice scores in percentage	**53**	**68**
Average scores	**66**	**67**

Appendix 5D: Senses Worksheet

Imagery Tree

Directions: Record your observations for each of the five senses.

something intresting

we can see Pictour's clothes, Masks and different places they do theatre Caracter and Skripts

differen Coracters that talk in the tv.

What the Museum Sees/Hears/Smells/Feels.

Appendix 5E: What the Museum Sees/Hears/Smells/Feels/Tastes

Name_____

During our recent trip to the museum we were able to use our senses to discover many things. Write a short text for each of the five senses you experienced during your visit.

My Five Senses

See	
Hear	
Touch	
Smell	
Taste	

Appendix 5F: Virtual Museum Making Worksheet

a) Your task is to design a virtual, **3D-Animated** museum exhibition on a topic or theme of your choice.
b) Choose your **images** and **videos** carefully: you have space for THREE exhibits.
c) You can give each exhibit a **title** and a **description** for maximum educational effect.
d) When you have finished you can **save** your work for future editing, and **embed** your work
   into your own website.
e) Use this template to help you plan your project: your teacher may insist that you complete
   this sheet before you access the 3D Gallery Generator at http://www.classtools.net/3D.

A screenshot giving an impression of the 'walk-through' effect

Exhibits to be Displayed		
Image / Video Link	**Caption**	**Description**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

TIP: Aim for a logical **order** and a **mix** of different exhibits (e.g. videos, photographs of objects / scenes / individuals, cartoons, maps etc).

Suggested Reflective Evaluation

		Available Marks
Title	The title of the exhibition makes the focus of the gallery clear to the viewer.	1
Breadth	The gallery contains a variety of appropriate media types (e.g. paintings, video, photos, maps, cartoons)	3
Depth	Each gallery exhibit has a clear caption and a detailed description to accompany it.	3
Linkage	There is a logical, methodical order to the way that the exhibits are arranged (e.g. the description for each exhibit clearly picks up from where the last one left off).	3

Appendix 6A: DIARY NOTES

(Prior to visit pupils' group interview in the form of story completion, worksheet completion)
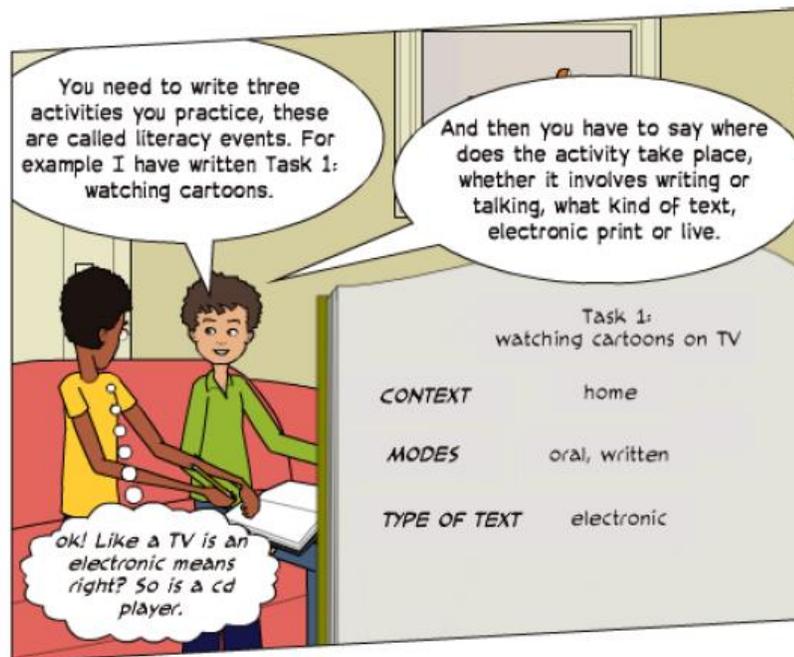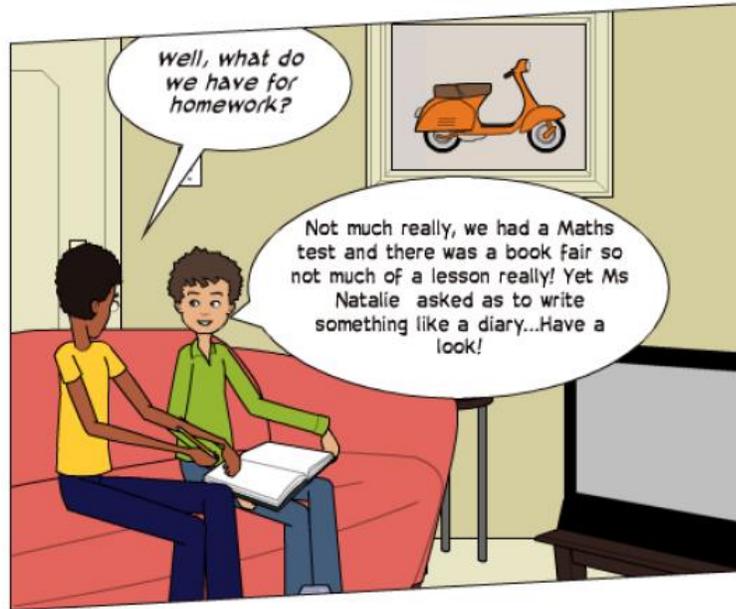
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