

**Exploring the use of virtual worlds for the teaching and learning of
development education in primary schools.**

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

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Abstract

Educators face many challenges with the teaching and learning of development education in primary schools. The challenges include content and curriculum, resources and generic pedagogies and methodologies. This research explores the use of virtual worlds in the teaching and learning of development education in Irish primary schools.

The researcher proposes a process using experiential learning (Kolb, 1984), discovery based learning (Bruner, 1966) and peer teaching and learning (Mitra, 2003; Topping, 2005) aligned with the virtual world characteristics of immersion, interactivity simulation as described by Warburton (Warburton, 2009), to assist with the teaching and learning of development education in primary school.

A process was designed by the research to enable a participant group of 12 primary school students, to acquire necessary skills and information to design and build an interactive development education learning experience in a virtual world based on a chosen developing country. A 5th class group of 6 then engaged with the built learning experience under the instruction of the participant group.

A mixed-methods design was used in the collection and analysis of the data related to this single-case study. Chat logs, reflective participant journals, peer reflective journals, researcher observations, participant observations and semi-structured interviews were collected and analysed to ascertain whether the process designed by the researcher, assisted with the teaching and learning of development education in primary school.

Findings from the qualitative data analysis indicate that the process was very successful. Participants acquired knowledge of the chosen developing country, a development education issue, virtual world skills and technical skills through the building of the learning experience for the 5th class group. Key themes identified in the research were metacognition, ownership and motivation, increased confidence and pride and achievement. Peers acquired content knowledge from engagement with the process.

Contents

Acknowledgements.....	4
Abstract.....	5
2. Literature Review.....	13
Introduction.....	13
Background.....	13
Challenges Presented by Development Education.....	14
Content and Curriculum.....	14
Resources.....	14
Generic Pedagogies and Methodologies.....	15
Pedagogies Suited to Development Education.....	16
Experiential Learning Theory.....	16
Discovery Learning.....	17
Peer Teaching and Learning.....	18
Virtual Worlds for Learning.....	19
Virtual Worlds for Development Education.....	19
Immersion.....	20
Interactivity.....	20
Simulation.....	21
Literature Review Conclusion.....	22
3. Design.....	23
Introduction.....	23
Literature Informing the Design of the Process.....	23
Experiential Learning.....	23
Discovery Learning.....	23
Peer Teaching and Learning.....	23
Immersion.....	24
Interactivity.....	24
Simulation through Demonstration.....	24
The Process.....	25
Stage One – Entering.....	25
Stage Two – Preparing.....	25
Stage Three – Doing.....	25
Stage Four – Showing.....	26

Planned for Changing Roles Over Time.....	28
Entering Stage.....	28
Preparing Stage.....	28
Doing Stage.....	28
Showing Stage.....	29
Implementation of the Process.....	32
Tools and Infrastructure.....	32
Content Domain.....	32
4. Methodology.....	33
Research Method.....	33
Research Design.....	34
Case Study.....	34
Instruments.....	35
Direct Non-Participant Observations.....	35
Participant Observations.....	35
Interviews.....	35
Documentation.....	36
Testing.....	36
In-World Building.....	36
Implementation.....	36
Site and Duration.....	36
Ethics.....	36
Researcher Bias.....	37
5. Data Analysis.....	38
The Process in Action.....	39
Analytic Coding (Participant).....	43
Discovery Based Learning.....	44
Content Learning.....	45
Technical Learning.....	45
Peer Teaching and Learning.....	45
Immersion.....	46
Simulation.....	46
Engagement.....	46
Enjoyment.....	47

Self-regulation.....	47
Self-organisation.....	47
Satisfaction with the process	48
Decreasing teacher role	48
Analytic Coding (5 th Class Group)	49
Discovery Based Learning	49
Content Learning.....	50
Technical Learning.....	51
Peer Teaching and Learning	51
Immersion.....	51
Simulation.....	52
Engagement.....	52
Enjoyment:.....	52
Self-regulation.....	52
Self-organisation.....	52
Satisfaction.....	53
Decreasing teacher role	53
Open Emergent Coding (Participant).....	53
Metacognition.....	55
Ownership and Motivation	56
Pride and Achievement	57
Increased Confidence.....	57
Open Emergent Coding (5 th Class Group)	58
Motivation	58
Behaviour.....	59
Confidence	59
Findings in relation to the research questions posed	59
Conclusion.....	66
6. Discussion.....	67
Interesting Findings.....	67
Unexpected Outcomes.....	69
Limitations of the Research	70
Future Work.....	72
Bibliography	73

Appendix 1: Participant’s Parent / Guardian Information sheet.....	76
Appendix 2: Participants’ Parent / Guardian Consent Form.....	77
Appendix 3: Participant (Child) Information Sheet.....	78
Appendix 4: Participant (Child) Consent Form	79
Appendix 5: 5 th Class Group’s Parent / Guardian Information Sheet.....	80
Appendix 6: 5 th Class Group’s Parent / Guardian Consent Form.....	81
Appendix 7: 5 th Class Group (Child) Information Sheet	82
Appendix 8: 5 th Class Group (Child) Consent Form.....	83
Appendix 9: Principal and Board of Management Information Sheet.....	84
Appendix 10: Principal and Board of Management Consent Form	85
Appendix 11: Reflective Journal Used for Stages 1 and 2 of the Process.....	86
Appendix 12: Reflective Journal used for Stage 3 of the Process	87
Appendix 13: Reflective Journal used for Stage 4 of the Process	88
Appendix 14: Sample Coding of Reflective Journals.....	89
Appendix 15: Reflective Summary Document Questions	90
Appendix 16: Sample Coding of Reflective Summary Document Questions	91
Appendix 17: Sample Coding of Researcher Observations	92
Appendix 18: Participant Observation Template.....	94
Appendix 19: Sample Coding of Participant Observations.....	95
Appendix 20: Sample Coding of Group Interviews	96
Appendix 21: Irish Primary School Curriculum Objectives for the Traditional Classroom Content Learning - ‘Preparing’ Stage.....	98
Appendix 22: Development Education Objectives for the Traditional Classroom Learning taken from http://www.oxfam.org.uk/education/teachersupport/global_dimension/files/The%20Eight%20Key%20Concepts%20of%20the%20Global%20Dimension.pdf – ‘Preparing’ Stage.....	99
Appendix 23: Photographs of the Participant Planning in the ‘Doing’ Stage of the Process	100
Appendix 24: Screenshots of the Development Education Learning Experience Built by the Participants in the Virtual World. Screenshots show changes to the build over time.....	101
The school building and information.....	101
The village and information.....	102
The Coffee Plantation.....	103
Impenetrable Forest.....	104
The Fair Trade Coffee Shop.....	105
The Hospital.....	106

1. Introduction

Development education is being taught by educators under the Irish Primary School Curriculum (1999) areas of Geography and Social, Personal and Health Education. Typical pedagogies used to teach development education include active learning in various forms, peer or group activities and projects. This research suggests that these pedagogies, while good, are not conducive to achieving the aims of development education in general. This study argues that experiential learning (Kolb, 1984), discovery based learning (Bruner, 1966) and peer teaching and learning (Mitra, 2003; Topping, 2005) are better suited to the ever-evolving nature and content of development education.

Fast paced technological advances present “both innovative opportunities and intriguing challenges for educators” (Dickey, 2011). Minocha & Reeves (2010) note that virtual worlds are being used in education for a wide range of purposes including historical recreations, language acquisition, mathematics and science as educators have the opportunity to create learning experiences tailored to their own specific pedagogical needs (Minocha & Reeves, 2010). This research explores the use of virtual worlds in the teaching and learning of development education.

A four-stage process was designed aligning the virtual world characteristics of immersion, interactivity and simulation (Warburton, 2009) with the proposed pedagogies to assist with the teaching and learning of development education. Engagement with the process enabled participants to acquire necessary content knowledge, technical and virtual world skills to design and build a development education learning experience in a virtual world for a 5th class group to engage with.

This research is based upon the research purpose to explore the use of virtual world in the teaching and learning of development education in primary school. In dealing with the research purpose, three research questions were formulated and are as follows:

1. Did the participants gain a strong understanding of the chosen country and development education issues?
2. Which elements of the designed for virtual world development education process enabled the knowledge acquisition?
3. Which features of the pedagogies as implemented in the virtual world process emerge strongly in the process to bring about this knowledge acquisition?

To answer these research questions a literature review was carried out to identify pedagogies suited to development education and characteristics of the virtual world which

could be aligned with the proposed pedagogies. The literature review demonstrates the need for this research.

The literature review led to the design of a four-stage process based upon the appropriate pedagogies aligned with the characteristics of the virtual world identified as being appropriate for the teaching and learning of development education. The process saw participants designing and building a development education learning experience in a virtual world for a 5th class group to engage with.

In an attempt to answer the research questions, a mixed-methods research design was selected with both qualitative and quantitative data collected and analysed. Data sets included reflective participant and peer journals, chat logs, researcher and participant observations and semi-structured interviews. 12 participants engaged with the four-stage process and a further 6 peers engaged with the learning experience designed by the participants.

Data sets were analysed using analytic and open emergent analysis *looking at* and *looking for* information and theories within the data. These results are discussed in detail with reference to the research questions, interesting and unexpected outcomes as well as limitations to the research. This research concludes with suggestions for future work in this area.

2. Literature Review

Introduction

The aim of a literature review is to describe, through organising into topics, what is already known about an area of interest in order to document a need for a proposed study (Creswell, 2012; Pole & Lampard, 2002). This literature review looks at development education in Irish primary schools and the characteristics of virtual worlds. Specifically it identifies challenges presented by development education and current methodologies used in the teaching and learning of development education. It explores pedagogies appropriate for the teaching and learning of development education and examines how these pedagogies can be aligned with the characteristics of virtual worlds to create high quality learning experiences for development education in Irish primary schools.

Literature for this review was sourced from a variety of locations. Firstly, a search of Trinity College's library catalogue was conducted to obtain books on educational theory. A search of literature available on-line through Development and Intercultural Education's website was carried out to obtain information relating to the teaching and learning of development education in Irish primary schools. Finally, educational technology journals, such as *Computers & Education* and *British Journal of Educational Technology*, were searched using the key terms of 'virtual worlds', 'education' 'educational virtual worlds'.

Background

Development education can be defined as an "educational process aimed at increasing awareness and understanding of the rapidly changing, interdependent and unequal world in which we live." (Ireland, 2003). Development education is incorporated into the Primary School Curriculum under the curriculum areas of Geography and Social, Personal and Health Education. The geography curriculum states that children should be enabled to "study some aspects of the environments and lives of people in one location in the European Union and in another part of the world" (Education & Science, 1999a, p. 75). This is reiterated in the S.P.H.E. curriculum which states that children in senior classes should be enabled to "become aware of some of the cultures, life-styles and languages of the countries in the European Union and the wider world" (Education & Science, 1999c, p. 65).

Despite not being a subject in its own right, educators recognise the importance of development education and are making efforts to include development education in their teaching. Dillon & O'Shea (2009) conducted a survey to assess if and how development education was being taught in Irish primary schools and reported that development

education was being taught by 66% of respondents for the teaching year 2006/2007 (S. Dillon & Shea, 2009).

In their survey, Dillon & O' Shea (2009) noted that respondents were using generic teaching methods, such as collaborative learning, projects and inquiry learning to teach development education (S. Dillon & Shea, 2009). However, Jeffers (2008) argues that development education should be experiential and taught with Kolb's Experiential Learning Theory (Kolb, 1984) in mind (Jeffers, 2008). Additionally, development education deals with sensitive issues which require a different approach than one would take to teach other curricular areas.

Challenges Presented by Development Education

As it is not an independent subject, development education presents many challenges for Irish primary school teachers. Content is a problem as there are no concrete guidelines or manuals provided by the Department of Education and Skills. Methodologies currently being used by teachers are generic and arguably not best suited to development education. Additionally, resources are limited and can be hard to source.

Content and Curriculum

According to Dillon & O'Shea (2009), 23% of respondents noted curriculum as major limitation to the teaching of development education (S. Dillon & Shea, 2009). With very vague curriculum objectives, teachers are charged with selecting appropriate themes for children and integrating them with other curriculum areas. This requires a lot of planning and ultimately educators are relying heavily on their own personal motivation. Educators need to have up-to-date information in order to teach development education. The curriculum is already crowded and sourcing relevant and appropriate information for development education can be time-consuming.

Development education can be defined as an "educational process aimed at increasing awareness and understanding of the rapidly changing, interdependent and unequal world in which we live." (Ireland, 2003). The world changes rapidly and as a result so too does the content of development education. It can be said that development education is ever changing and ever evolving in line with developments in the world. Printed resources and materials can become dated very quickly. Educators need to think about approaches to development education that mirror the ever evolving nature of the content.

Resources

In their survey, Dillon & O'Shea (2009) documented that 80% of respondents identified lack of resources as the main limitation to the teaching of development education (S. Dillon &

Shea, 2009). Other respondents felt that there were enough resources but that access to and information about resources available was the problem (S. Dillon & Shea, 2009). It can be frustrating and time-consuming to research and locate resources for development education.

Irish Aid published a guide to development education resources in 2008 and listed 100 resources suited to primary schools (Aid & Trócaire). Of the 100 resources listed, 41 were available through British websites and only 29 were produced in Ireland. Of the 29 produced in Ireland, 20 were affiliated to religious charities (Aid & Trócaire). Some teachers, especially those working in non-denominational schools may be reluctant to use resources produced by religious charities and organisations because of their religious connotations.

The internet can be an invaluable resource when teaching development education however, some content can be inappropriate for use with young children as the very content of development education is sensitive and emotive. Video sharing sites such as YouTube, can provide an insight into different countries and cultures, but the content needs to be age-appropriate and often this is not the case. Additionally many schools have blocked access to YouTube, taking away any opportunity of it being used as a resource for the teaching and learning of development education.

Generic Pedagogies and Methodologies

The Irish primary school curriculum advocates the use of active and collaborative learning (Education&Science, 1999). In their research, Dillon & O' Shea (2009) found that the most common methodologies used in the classroom were; use of images, discussion, drama, role-play, games, interactive group / peer activities, projects and story (S. Dillon & Shea, 2009). Furthermore, Fitzgerald (2005) noted the use of comparable methodologies in her review of relevant literature (Fitzgerald, 2005). These pedagogies and methodologies, while good, are not aligned with either the principles or content of development education.

According to the curriculum, active learning requires children to actively participate in their learning (Education & Science, 1999d). Active learning as described in the curriculum also places an emphasis on the role of the teacher in the process stating: "The teacher also needs to continually encourage them to construct meaning and make connections for themselves. How the activities are organised, the depth of exploration and the level of questioning and critical reflection will all be determined by the classroom teacher (Education & Science, 1999d). This 'active learning' is teacher-led and doesn't help achieve the aim of development education. Irish Aid argues that development education is seeking to "engage people in analysis, reflection and action for local and global citizenship and participation"

Irish Aid (as cited in Regan, 2006). Development education hopes to develop 'global citizens' who actively participate in their world. In order to achieve this, learners need to be self-motivated which could in turn encourage life-long interest in development education issues. Despite actively involving the child in the learning process, teacher-led learning, does not promote self-motivated learning in the same ways as discovery learning, peer teaching and learning can.

Collaborative learning is difficult to achieve when teaching development education. Collaborative learning is described as a "coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (Rochelle & Teasley, 1995, p. 70). If educators are using produced resources to teach development education it is highly unlikely that true collaboration as defined by Rochelle & Teasley (1995) can be achieved as this needs to be designed, planned and matched to the children's needs and development.

Luis Hernandez comments: *"My major concern about the way Third World issues and countries are portrayed in the European media is that most often our people appear as victims of hunger, disease, poverty, corruption"* (as cited in Regan, 2006, p. 6). The use of images in the teaching and learning of development education is common, however problematic. Development education training was not part of initial teacher education until 2003. This becomes an issue when selecting images for development education. Images of developing countries are easily accessible on the internet however they may not be appropriate for use in the classroom. Teachers need to be trained to identify appropriate images so as not to reinforce negative stereotypes. Teachers also need to be aware that charities and media often have their own agenda when publishing images. Teachers need to be taught how to 'read' images before trying to 'read' images with children.

Pedagogies Suited to Development Education

This section explores alternative pedagogies for the teaching and learning of development education. It identifies the characteristics of these pedagogies that are suited to the nature and content of development education.

Experiential Learning Theory

Experiential learning theory states that the 'experience' of the learner is central to the learning process and is rooted in the work of Dewey and Piaget (Kolb, Boyatzis, & Mainemelis, 2001). This is different to inquiry or active based learning. Kolb (1984) states that experiential learning theory defines learning as "the process whereby knowledge is

created through the transformation of experience” (Kolb, 1984, p. 41). Emphasis is placed on the process and the learner’s engagement with the learning process experience.

Development education requires learners to deal with concepts, situations and realities. The content is often abstract and difficult to comprehend as it is far removed from the experiences of the children. Development education is largely concerned with the experiences of others in the world, and how interdependence affects the experiences of those in both the developing and developed world. It can be argued that if the learners were engaged in a process where they could ‘experience’ some of the issues associated with development education in a safe way, they could better understand them.

According to Kolb (1984), to successfully allow for experiential learning, learners must be guided through four stages: concrete experiences, reflective observations, abstract conceptualisation and active experimentation (Kolb, 1984). Experiential learning builds on the hands-on, learn-by-doing, active participation advocated by Piaget, Dewey and the Irish Primary School Curriculum (Dewey, 1999; Education & Science, 1999b; Piaget, 1990). The characteristics of experiential learning are suited to development education as children start with their own concrete experiences, reflect on them, explore countries and cultures different to their own and try to understand development education issues through engagement. This pedagogy could help them better understand development education issues. For example, interdependence could be looked at through ‘cause and effect’ type work in the classroom using the model of the experiential learning theory (Kolb, 1984).

Discovery Learning

Discovery learning, as developed by Bruner (1966), is closely linked to experiential learning and is highly suited to development education. Discovery learning is a feature of the Irish Primary School Curriculum and is defined by the curriculum as requiring “children to actively participate in their learning in a wide variety of ways, thereby increasing the possibility of internalising what they have explored” (Education & Science, 1999c, p. 54). This is linked to stage four (active experimentation) of Kolb’s experiential learning theory. Bruner’s theory argues that learner’s learn best when they discover facts and relationships for themselves (Bruner, 1967). This is done through exploration. Discovery learning requires active engagement and can increase motivation. As learners are engaged in their own learning, the learning experience becomes tailored as it is driven by the learner.

Discovery learning can help learners to analyse, synthesise and think critically which, according to Kolb, are necessary skills required for the acquisition of new knowledge, skills and concepts (Kolb, 1984). Discovery learning is appropriate for the teaching and learning of

development education as the themes and concepts being investigated are ever changing and evolving. There are no hard and fast answers and children need to understand that situations need to be constantly analysed and actively explored in order to try and find possible solutions.

Peer Teaching and Learning

Topping (2005) defines peer learning as the “acquisition of knowledge and skill through active helping and supporting among status equals or matched companions”(Topping, 2005, p. 631). Peer learning is more than simply placing children together and hoping for the best. Through the use of peer teaching and learning, individuals can become active participants in the learning process. Those being helped benefit from the support offered by the peers, while those helping learn the topic “better and deeper” (Topping, 2005, p. 643).

Sugata Mitra (2003) has carried out research on minimally invasive education which features peer learning and talks about new material being presented to learners in a three-part pedagogy. A teacher introduces the subject matter, then a more knowledgeable assistant assists the learner and finally the learner works with resources and a 5th class group (Mitra, 2003). In his research Mitra notes that “children formed impromptu classes to teach one another” (Mitra & Rana, 2001, p. 230). He also found that in a minimally invasive environment, when children self-instruct, the learners divide up into those who know and those who don't know. Those who know will help those who don't know (Mitra & Rana, 2001).

Peer teaching and learning is closely linked to Piaget and Vygotsky. Peer teaching and learning ultimately involves conflict and challenge, whilst also incorporating the use of support and scaffolding from a more knowledgeable other (Topping, 2005). Vygotsky (1978) believed that through the provision of sufficient scaffolding, children can achieve things beyond his or her independent efforts (Vygotsky, 1978). Scaffolding is the pairing of a weaker learner with a stronger learner. The stronger learner can teach the weaker learner and in doing so deepen their own understanding.

Vygotskyian theory argues that learners need to be paired with a ‘more able other’ in order to learn from them (Vygotsky, 1978). Mitra's research found this to be true noting that groups split into the “knows” and “know nots” and imparted their knowledge to help others(Mitra & Rana, 2001). This is in contrast to Piaget(Piaget, 1959) who argued that peers need to be paired simply with someone who has a different outlook or opinion, enough to cause the peers to question their own understanding. Piaget felt that having a pairing based on a knowledge base mismatch was enough to lead to dialogue and eventually cognitive change

in the pair as they explore, examine and explain their thoughts and understanding with a peer who has a different stance (Piaget, 1959). This is reflected in Toppings description of peer learning stating that it involves conflict and challenge (Topping, 2005).

Peer teaching and learning is appropriate for the teaching and learning of development education as often children have different life experiences and exposure thus immediately creating different knowledge bases in the classroom allowing for peers to interact and learn from each other. Different knowledge bases allow for conflict and challenge. Additionally peer learning is suited to development education as children may have travelled to a developing country, or are more exposed to current affairs than their peers making them the more knowledgeable others in a pairing. Furthermore development education is emotive and will naturally cause children to react differently to situations and concepts thus providing cognitive conflict as described by Piaget (1959), necessary for cognitive development (Piaget, 1959). Piaget, Vygotsky and Mitra place an emphasis on the role of peers in the learning process.

Virtual Worlds for Learning

Kirschner (2002) defines educational affordances of a technology as the “characteristics of an artefact that determine if and how a particular learning behaviour could be enacted within a given context” (Kirschner, 2002). Virtual worlds can be defined as three-dimensional online environments with many users represented on screen by avatars who have the ability to communicate with each other (Girvan & Savage, 2010). Burdea & Coiffet (2003) identified key characteristics of VWs as immersion, interactivity and imagination (Burdea & Coiffet, 2003). Similarly, Warburton (2009) identifies interactivity, immersion and simulation as key features of virtual worlds (Warburton, 2009). The educational affordances of virtual worlds are supported by the key characteristics of virtual worlds as outlined. The characteristics aligned with the pedagogies suited to development education discussed earlier, makes virtual worlds appropriate for the teaching and learning of development education.

Virtual Worlds for Development Education

Development education requires children to imagine places, cultures and situations often far removed from their own experiences. In an ideal world, it would be best if children could actually visit developing countries in order to learn about them. Kolb, Bruner and Piaget are all in agreement on the importance of experiential learning. The characteristics of virtual worlds provide opportunities for educators to create an experiential learning experience which places an emphasis on active, discovery-based learning as recommended by Kolb, Bruner, Piaget and the Irish Primary School Curriculum. It was discussed earlier that allowing the children to experience some of the development education issues could be the

best way of helping them to understand the abstract concepts and situations presented by development education. Virtual worlds, through the use of immersion, interactivity and simulation, could allow for the creation of such 'experiences' in a safe environment.

Immersion

Warburton (2009) describes immersion as an experience that "conveys a feeling of being there"(Warburton, 2009, p. 419). The use of an avatar, a virtual embodiment, enables users to feel like they are in the environment. Falloon (2010) found that personalisation of the avatars added to the user's sense of ownership and identity (Falloon, 2010). Immersion can be further achieved through the use of in-world communication tools such as text-chat, voice-chat and notecards. It is important, therefore, to allow users to personalise their avatar and promote the use of in-world communication tools to successfully achieve immersion.

Guadagno et al. (2007) argues that immersion is the level to which people believe they are in fact interacting with the virtual environment (Guadagno, Blascovich, Bailenson, & McCall, 2007). For Guadagno, immersion does not exist in isolation from interactivity. This is supported by Dalgarno & Lee (2010) who also acknowledge the connection between immersion and interactivity (Dalgarno & Lee, 2010).

Experiential learning can be achieved through immersion in the virtual world. Experiential learning theory states that the 'experience' of the learner is central to the learning process (Kolb, et al., 2001). Immersion is concerned with learners feeling like they are in the world and experiencing it. Immersive virtual world environments "modelled on real places and objects have the potential to provide an enhanced sense of realism and a greater sense of presence" (Dalgarno & Lee, 2010). A higher sense of realism and presence could help learners feel like they are actually in the environment and personally experiencing life in that environment. Learners could 'see' the landscape, homes and buildings, culture and life in an authentic setting thus helping their understanding of the development education issues being addressed. When it is not possible to visit the real environment, this could be an appropriate alternative to help the teaching and learning of development education.

Interactivity

Interactivity is a major characteristic of virtual worlds. Interactivity allows users to be active in their learning whilst also allowing for creativeness within the environment. According to Iqbal et al. (2010), interactivity in virtual worlds is two-fold, interaction with and through avatars (Iqbal, Kankaanranta, & Neittaanmaki, 2010). Avatars can communicate and work together on tasks. Avatars can also touch objects and create their own objects in the environment. Embedding interactivity into a virtual world environment ensures that learners are active

participants in their learning. Learners can construct their own knowledge through interacting with the environment and eventually convey their knowledge in-world by constructing within the environment in the same way as the participants of Girvan & Savage's (2010) study did.

Interactivity is suited to discovery based learning which requires children to actively participate in their learning in a wide variety of ways, thereby increasing the possibility of internalising what they have explored (Education & Science, 1999c, p. 54). Learners may interact with objects and other avatars to discover information and facts to help them understand development education issues. The very nature of virtual worlds is suited to discovery learning as learners learn to work in the world by doing. The ever-changing nature of a virtual world is also appropriate for discovery learning, there is always something new to be discovered.

Interactivity allows for the creation of peer teaching and learning opportunities for both development education and the virtual world itself. Through interaction with avatars using communication tools, learners could impart knowledge to others and assist them with their learning. Questions could be posed and answered by peers using communication tools. Avatars could drop notecards with information onto other avatars to share knowledge. Additionally, the interactive characteristic of building and creating within the virtual world is appropriate for peer learning situations. Through the use of avatars and communication tools, peers could help each other when building and scripting in-world. A more knowledgeable other could help with technical issues, while a peer with a different opinion could cause conflict and challenge in relation to the authenticity, practicality or appearance of a build.

Simulation

Warburton (2009) defines simulation as the "reproduction of contexts that can be too costly to reproduce in real life with the advantages that some physical constraints can be overcome" (Warburton, 2009). Simulation is closely linked to immersion. The impact of simulation is seen when participants feel like they are actually there. The use of virtual worlds can help educators to create a representation of a country or area that is authentic and beneficial to the learning. In the E-Junior project, an immersive and interactive virtual aquatic world was created to teach children about the Mediterranean Sea. Observations of the E-Junior project recorded that the children "frequently asked if the room was moving and screamed with excitement when the image changed rapidly" (Wrzesien & Alcaniz Raya, 2010, p. 183). Using the characteristic of simulation, educators have the ability to create an authentic environment for the children to learn in thus providing context to the content for the children.

Simulation is linked to experiential learning. An authentic developing country could be represented in the virtual world and used to promote experiential learning of development education issues. An authentic representation of a chosen country which using the characteristic of simulation, could add to the learner's sense of presence, immersion and engagement. This would lead to experiential learning where the experience itself is at the heart of the learning process.

Literature Review Conclusion

As we have seen from the literature, a major difficulty faced when teaching development education is the lack of resources and over reliance on generic methodologies. The literature has shown experiential learning, peer teaching and learning and discovery learning to be appropriate pedagogies for the teaching and learning of development education. The literature has also shown the appropriateness of virtual worlds for the teaching and learning of development education. Virtual worlds could be an excellent resource for teachers and is suited to the fast paced, ever-evolving nature of development education.

Technology is constantly evolving and with the development of new media comes opportunities and intriguing challenges for educators (Dickey, 2011). At a very basic level, Dillon & O'Rourke (2008), acknowledge the ability of interactive whiteboards to make "abstract ideas and global issues more tangible for students" (A. Dillon & O'Rourke, 2008, p. 28). The use of virtual worlds for the teaching and learning of development education takes this further. Educators could use the proposed pedagogies aligned with the characteristics of virtual worlds to teach children about development education issues in an alternative, appropriate and engaging manner which would appeal to digital natives.

3. Design

Introduction

The purpose of this chapter is to outline the rationale for the creation of a process to explore the use of virtual worlds for the teaching and learning of development education. This section describes in detail the process designed by the researcher. The previously reviewed literature informed the creation of the process which is constructed upon the pedagogies suited to development education namely, experiential learning (Kolb, 1984), discovery based learning (Bruner, 1966), peer teaching and learning (Mitra, 2003; Topping, 2005). The process leverages off the virtual world characteristics of immersion (Warburton, 2009), interactivity (Iqbal, et al., 2010) and simulation (Warburton, 2009). The process was designed to assimilate the outlined characteristics of the virtual world and pedagogies suited to development education. The process is a four stage model and allows for changes in the role of the teacher and participant over time.

Literature Informing the Design of the Process

Experiential Learning

Experiential learning places an emphasis on the 'experience' of the learner. A process was designed to enable participants to be hands-on, actively involved in their learning and reflect on their experiences. Participants' completion of a semi-structured reflective journal could encourage reflection on experiences and learning. Challenges and tasks requiring hands-on, active participation would be necessary to create opportunities for participants to enhance their learning experience. Allowing the participants to choose the content for the experience could create another avenue for the participants to be active in their learning.

Discovery Learning

Bruner (1967) argues that learners learn best when they discover facts and relationships for themselves (Bruner, 1967). It would be necessary to include free time to 'experiment' and the creation of discovery based challenges and tasks in the process, in an attempt to encourage participants to discover things about the chosen country or culture, the virtual world and other technical areas for themselves. According to Bruner (1967) participants should be encouraged to find solutions to problems themselves through experimenting (Bruner, 1967). This plays a crucial role in the process.

Peer Teaching and Learning

In order to facilitate peer teaching and learning, participants are required to work in small groups on tasks and challenges. Participants ought to work in open areas where it was

possible for them to view others work in the same way as Mitra's 'self-organised learning environments' (Mitra & Dangwal, 2010) . Additionally, participants should have the option to move around the room or communicate through in-world chat to ask peers for help, ideas and feedback. Participants are encouraged to use their peers when problem-solving.

Participants should be encouraged to teach others their technical skills and knowledge and then reflect upon it in their journal. It would be appropriate to allow participants to select content, choose appropriate presentation and activities to create a development education learning experience in a virtual world for their peers. Furthermore, participants ought to teach their peers how to use the virtual world before they engage with the learning experience created by the participants.

Immersion

Immersion is concerned with the extent to which people feel like they are there in the world (Warburton, 2009). The participants need to be introduced to the virtual world and allowed time to explore and experiment within a safe environment. The use of in-world communication tools should be encouraged to enhance immersion. It is vital for participants to name their avatars and have time to edit the appearance of their avatars before undertaking any in-world tasks to encourage connectedness and immersion. It would be essential for the participants to be taught basic technical skills necessary to function in a virtual world e.g. getting around, taking pictures, using the map and other virtual world specific tools.

Interactivity

Interactivity in virtual worlds refers to interaction with and through avatars (Iqbal, et al., 2010). It is vital for participants to interact with each other and a pre-existing environment to experience interactivity at work and the possibilities of interactivity in the virtual world. It would be crucial to show participants examples of interactivity in virtual worlds through demonstration. It would be necessary for participants to spend time engaging with, experimenting with and finally producing an interactive piece using the Scratch 4 Opensim (created by Rich White) application.

Simulation through Demonstration

In order to develop an understanding of simulation in virtual worlds, participants ought to be shown existing builds which demonstrate simulation in a variety of environments such as a planetarium and Irish Aid's Project Murias. This could provide the participants with excellent examples of being transported to another world whilst also enhancing their immersion and sense of 'being there' (Warburton, 2009).

The Process

A process was designed based upon the pedagogies and virtual world characteristics identified and discussed previously. The process was designed to enable participants to engage with the content and the virtual world in a meaningful way. This was done through the designing and building of a development education learning experience for engagement with by a 5th class group. There follows a detailed description of the four-stage process.

Stage One – Entering

In this opening stage of the process, the objective is to ensure that the participants develop the skills necessary to progress through the process both technically and academically. The participants will acquire the necessary initial technical skills through didactic teaching methods. Simple tasks and challenges will be designed for the participants to practice and develop their skills through discovery based learning methods (Bruner, 1966). More tasks and challenges will be created to facilitate and encourage peer teaching and learning within the participant group. Finally the participants will be enabled to engage in experiential learning (Kolb, 1984) through reflecting on their learning and experiences using a semi-structured reflective journal.

Stage Two – Preparing

During this stage of the process the objectives are that the participants learn through the various pedagogies suited to development education the information and knowledge relating to the chosen country. Using a mix of didactic teaching, discovery based learning (Bruner, 1966), peer teaching and learning (Mitra, 2003; Topping, 2005) and experiential learning (Kolb, 1984) participants learn about the chosen country focusing on specific topics.

Additionally during this stage in the process, participants will be familiarised with the virtual world platform in which they will work. This familiarisation ought to be done through the naming and editing of individual, personal avatars. Participants will be given ample free time to learn about the virtual world and how it works through discovery based learning (Bruner, 1966). Participants ought to be familiarised with the simulation possibilities of the virtual world through demonstration.

Stage Three – Doing

The objective at this stage in the process is that the participants design and build an interactive learning experience based on the chosen country for a 5th class group to engage with. Experiential learning (Kolb, 1984) will see the children drawing on their experiences and reflections from stages one and two to inform the design and build of the learning experience. Experiential learning (Kolb, 1984) plays a major role at this stage as the

participants will need to be hands-on and constantly engaging in reflection to refine their build.

Peer teaching and learning (Mitra, 2003; Topping, 2005) is encouraged within the group to help complete the task of designing and building the learning experience, especially relevant when faced with problem solving as often happens with building in virtual world.

Furthermore, discovery based learning (Bruner, 1966) is enabled through problem solving at this stage in the process.

Stage Four – Showing

The main objective in this final stage in the process is to show the learning experience created by the participants to a 5th class group. In order for the 5th class group to engage with the learning experience, the participants teach the peers the necessary virtual world skills in much the same way as they themselves learned the skills – didactic methods and discovery based learning (Bruner, 1966). In doing this the participants and 5th class group are engaging in peer teaching and learning (Mitra, 2003; Topping, 2005). Peer teaching and learning is also evident in the selecting of content for the experience by the participants. This content will teach the 5th class group about the chosen country.

Immersion for the 5th class group is enabled through the naming and editing of avatars and also their interaction through and with avatars and the learning experience built by the participants.

Discovery based learning (Bruner, 1966) is built into the acquiring of the virtual world skills by the 5th class group and also the information and knowledge they gain through interacting and engaging with the learning experience created by the 5th class group.

Experiential learning (Kolb, 1984) is connected to both the participants and 5th class group at this final stage in the process. As the 5th class group engage with the learning experience, they will be encouraged to be hands-on and active. The use of semi-structured reflection journals will encourage 5th class group to reflect on their learning and experiences. Participant observation of the 5th class group's engagement with the learning experience will encourage the participant group to reflect on their design and build of the experience, leading to possible future refinement.

The four-stage process is presented in table 3.1.

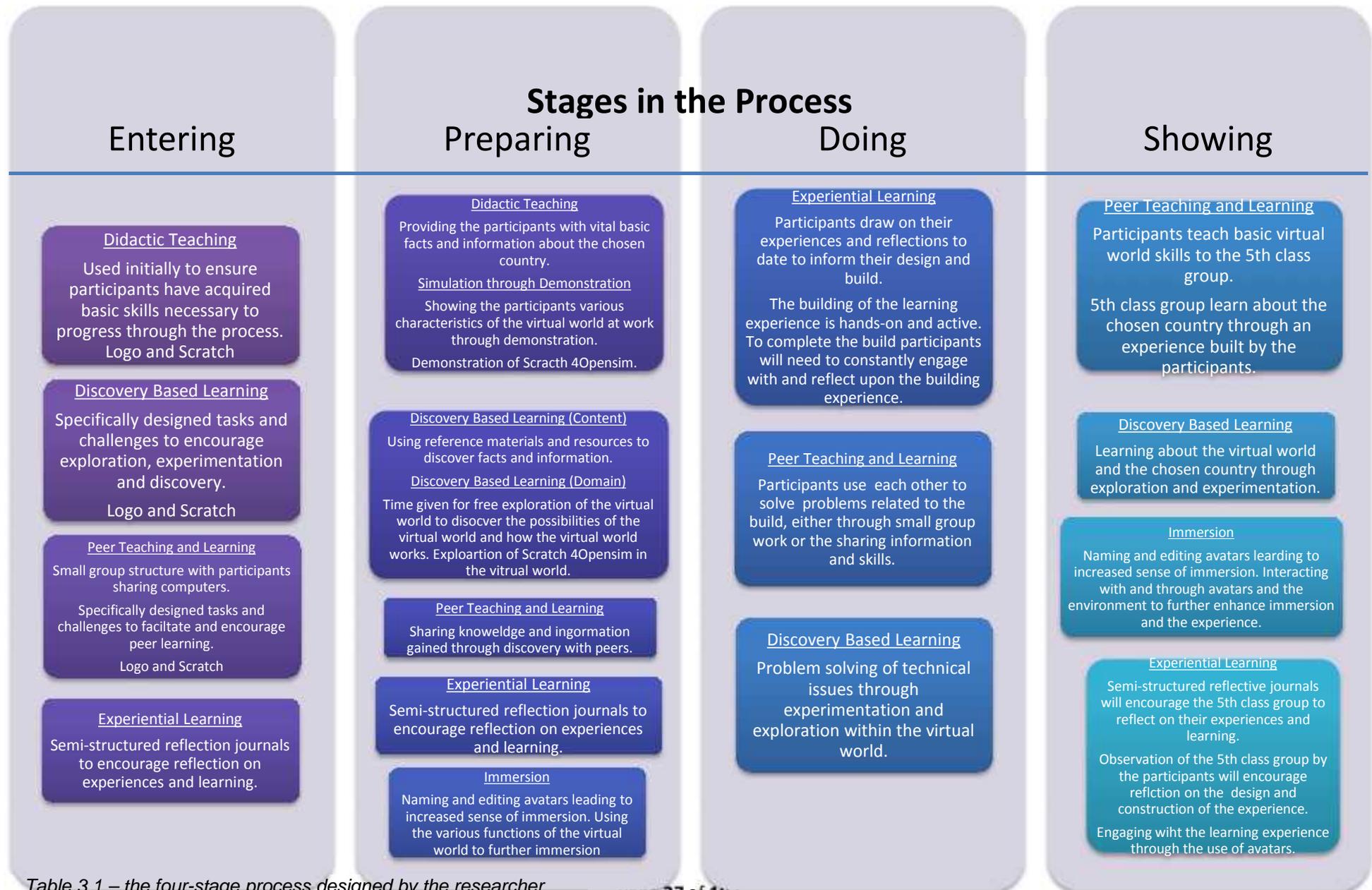


Table 3.1 – the four-stage process designed by the researcher

There exists another layer to this process which was designed for and demonstrates changes over the duration of the process. This layer is referred to as 'Founding Ideas' and can be directly mapped to the four stage process outlined previously. The 'Founding Ideas' are presented here.

Planned for Changing Roles Over Time

Entering Stage

During the 'Entering' stage of the process, the teacher needs to ensure that all participants acquire the technical and academic skills needed to progress through the process. These skills ought to be taught using didactic methods as without the skills participants would not be able to complete the designed process. The role of the teacher here at this initial stage is paramount to the success of the process. This stage will require participants to work through tasks and challenges specifically designed to develop the necessary skills. During this stage of the process, it is expected that participant engagement levels will be low as skills are taught using didactic teaching methods. At this stage in the process, self-motivation is lowest.

Preparing Stage

During the 'Preparing' stage in the process, the teacher again ought to use didactic teaching methods to ensure that participants have enough basic facts and information about the chosen country to enable them to progress to the next stage in the process. Additionally the teacher should provide a variety of reference and resource material for the participants to use in order to build upon the basic information and facts already gained about the chosen country. Furthermore, at this stage in the process, the teacher must assist the participants with the acquisition of basic virtual world skills. Participant role will be increasing at this stage as they engage with discovery based learning of the content using resources provided by the teacher (Bruner, 1966). This will also lead to an increase in participant engagement with the content. Naming and editing of avatars by the participants should lead to a rise in engagement levels.

Doing Stage

At the 'Doing' stage in the process, the onus is placed with the participants. Participants are responsible for the designing and building of a learning experience to include information about the chosen country. Participants must plan, design, choose content and build their learning experience resulting in an anticipated increase in participant engagement level. The increase in the role of the participant at this stage is central to the success of the process. During this stage in the process, the role of the teacher has faded and changed to facilitator. Here the teacher ought to exist merely as a helper when participants have exhausted all

other avenues including discovery learning (Bruner, 1966), peer teaching and learning (Mitra, 2003; Topping, 2005). The change in the role of the teacher can be accredited to increased motivation, ownership and engagement of the participants during the stage. In the 'Doing' stage of the process is quite high. Here participants' level of engagement, ownership and motivation are high and crucial to the success of this stage in the process and cause a decrease in the teacher role.

Showing Stage

Throughout the final 'Showing' stage in the process, the role of teacher ought to be facilitator and observer, there for the participants and 5th class group only if needed. As there is an emphasis on peer teaching and learning (Mitra, 2003; Topping, 2005), experiential learning (Kolb, 1984) and discover learning (Bruner, 1966) at this final stage in the process, it is now participants' increased motivation, ownership and activeness that plays a crucial role to the success of the process. Participants ought to be responsible for teaching necessary skills to the 5th class group whilst also managing peer engagement with the learning experience which they have created. It is hoped that during this stage, participant levels of ownership, engagement, participation and motivation will be at their peak.

The following figures summarise the 'Founding Ideas' discussed above as planned for in conjunction with the designed process.

Decreasing Teacher Role

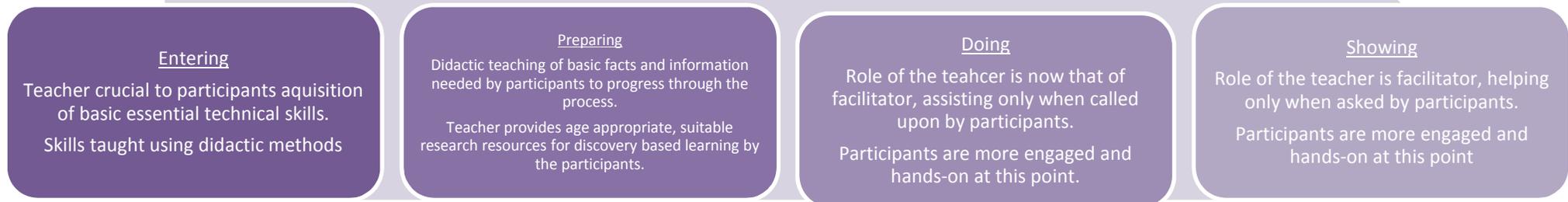


Figure 3.1 – Decreasing teacher role changing over time during the stages of the process

Increasing Participant Role

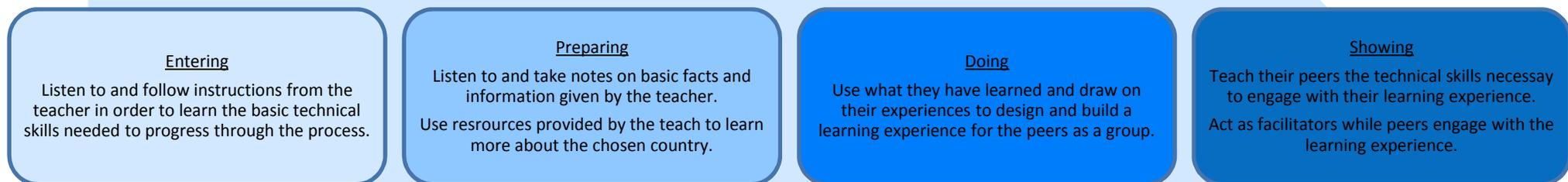


Figure 3.2 – Increasing participant role changing over time during stages of the process

Increasing Participant Engagement with the Process

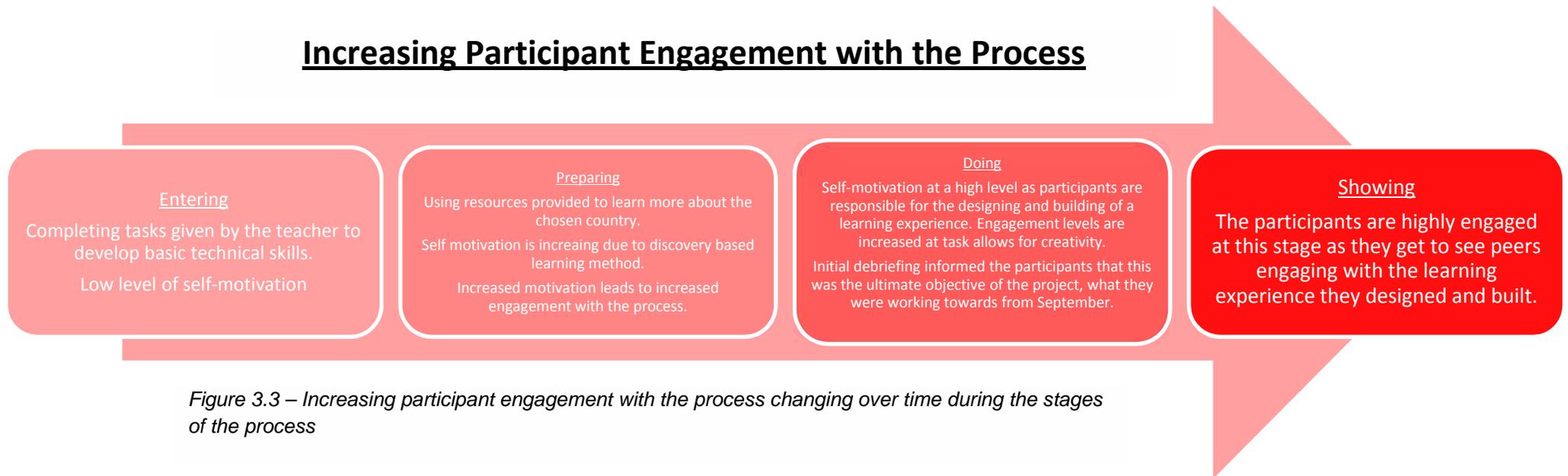


Figure 3.3 – Increasing participant engagement with the process changing over time during the stages of the process

Implementation of the Process

As seen in the previous sections, a four stage process informed by the literature was designed for the participants to progress through. The four stage process was designed to combine the pedagogies, virtual world characteristics and design principles previously outlined. The previously discussed 'Founding Ideas', were planned for and carefully mapped to each stage of the process.

Tools and Infrastructure

JokaydiaGrid was chosen as the virtual world platform as it is a virtual world designed for educational use with primary school aged children. JokaydiaGrid has PG status, which means that the virtual world is suitable for younger learners under the direction of an adult, in this case the researcher.

Another influencing factor in choosing JokaydiGrid was that it is constantly monitored by the owner and anything she deems inappropriate for younger users is removed. A final reason for choosing JokaydiaGrid was that it supports Scratch 4 Opensim (created by Rich White). Scratch 4 Opensim (created by Rich White) is seen as a 'low-floor, high ceiling' application allowing the children to achieve a high level of scripting success in a relatively short design time-frame.

Content Domain

Uganda was chosen as the country of focus as the participants did not have a lot of prior knowledge of the country making the learning experience more beneficial to them. Additionally, learning about Uganda is suited to the objectives of the Irish Geography and Social, Personal and Health Education Primary School Curriculum as outlined in the literature review. A final reason for choosing Uganda as the country of focus was the possibilities it provided for problem solving. Uganda has had a difficult past and is still quite volatile. Decisions made now will impact upon its future and children need to explore this.

4. Methodology

The purpose of this chapter is to identify the research methodologies employed by the researcher in this study. According to Creswell (2012), a purpose statement is a statement that “advances the overall direction or focus for the study” (Creswell, 2012, p. 110). Arising from the literature, the purpose of this research is to explore the use of virtual worlds for the teaching and learning of development education in primary school. The following research questions arise from the purpose statement:

1. Did the participants gain a strong understanding of the chosen country and development education issues?
2. Which elements of the designed for virtual world development education process enabled the knowledge acquisition?
3. Which features of the pedagogies as implemented in the virtual world process emerge strongly in the process to bring about this knowledge acquisition?

Research Method

In an attempt to answer the above research questions, a mixed-methods research design was selected with both qualitative and quantitative data collected and analysed. It is argued that a mixed methods design is appropriate when the combination of both forms of data provides a better understanding of a research problem than they would in isolation (Cohen, Manion, & Morrison, 2011). Specifically, this research uses the embedded design which is described by Creswell (2012) as collecting qualitative and quantitative data simultaneously but having one data form playing a supporting role to the other (Creswell, 2012).

Qualitative research is centred on the participants, their views and experiences. In conducting qualitative research, the researcher must ask broad, general questions and record answers using self-designed protocols. Analysis of the data looks for descriptions and themes and is reported using emerging structures and evaluative criteria (Creswell, 2012). For the purpose of this study, qualitative data was given priority while quantitative data was secondary, playing a supportive role.

Action research would be suited to this type of study. Hopkins, defines action research as “a form of disciplined, rigorous enquiry, in which a personal attempt is made to understand, improve and reform practice” (Hopkins in Cohen, et al., 2011, p. 345). However due to the

small scale of this research and the time constraints, a case study approach was more applicable.

Research Design

Case Study

A single-case study approach was chosen for this research as it has been used successfully to study virtual world in education previously by projects such as the E-Junior Project (Wrzesien & Alcaniz Raya, 2010), Murias (Girvan & Savage, 2010) and MARVIN (Falloon, 2010).

Case studies are described by Yin (2009) as an in depth investigation of a contemporary phenomenon within its real-life context (Yin, 2009). Furthermore, case studies “cope with the technically distinctive situation in which there will be many more variables of interest than data points” (Yin, 2009, p. 18) and therefore require multiple sources of evidence used in triangulation (Yin, 2009). Cohen et al. (2011) offer a similar definition of a case study arguing that it provides a unique example of real people in real situations, accepting that there are many variables at play in any one single case (Cohen, et al., 2011). In using case studies, researchers can “catch the complexity and situatedness of behaviour” (Cohen, Manion, & Morrison, 2007, p. 85). The case study approach is appropriate for use in this study, as the research is focused on how a process can enable teaching and learning of content using a virtual world.

Yin (2009) proposes that the type of research question posed defines the type of case study method a research study will use (Yin, 2009). As a result, this research uses an exploratory case study with elements of a descriptive case study. An exploratory approach to a case study, allows the researcher to look for patterns in the data to answer the research questions posed (Yin, 2009). Data will be collected and analysed throughout the process and will be referred to as *'looking at'* in data analysis. Trochim (1989) defines this as ‘pattern matching’ which compares an empirically based pattern with a predicted one” (Trochim in Yin, 2009, p. 136). The descriptive elements of the case study allow the researcher describe what is happening in relation to the different stages of the process.

Instruments

Direct Non-Participant Observations

Observation was a main data collection instrument used in this research. A feature of observation is that it allows the researcher to gather real-time data from naturally occurring social situations and can be used to record non-verbal behaviour (Cohen, et al., 2011). This study uses both participant and non-participant observation. According to Yin (2009) participant observation can mean the researcher assumes a “variety of roles within a case study situation and may actually participate in the events being studied” (Yin, 2009, p. 111). Participant observation allowed the researcher to perceive reality from the participant’s point of view inside the case study rather than externally to it.

Non-participant observation means the researcher is “aloof from the group” (Cohen, et al., 2011, p. 296). Observations “can range from formal to casual data collection activities” (Yin, 2009, p. 109). This research uses an unstructured approach observation to allow for emergent data collection. Non-participant observation allowed the researcher to record observations as an ‘outsider’ removed from the working group and activity.

Participant Observations

During the ‘Showing’ stage, participants engaged in observations of the 5th class group. Using a template designed by the researcher, the participants observed what was being done and said by the peers during their engagement with the experience. Additionally, the participants were encouraged to think about the meaning behind what the peers were doing and saying. Participants were encouraged to engage with observation in order to validate the learning experience they designed and built.

Interviews

Interviews are one of the most important sources of information for case studies (Yin, 2009). Interviews can also allow for clarification or in-depth discussion of something arising from an earlier observation. According to Yin (2009), interviews for case studies should be “guided conversations rather than structured queries” (Yin, 2009, p. 106). Therefore, this study used semi-structured group interviews upon completion of the process. Group interviews are used when time is limited which was the case with this research (Creswell, 2012). The interviews were audio-recorded and transcribed. Following data analysis, anonymity was applied.

Documentation

Documents can be used to support and augment evidence gathered from other sources. Analysis of documents also allows the researcher to make inferences which can then be explored through the semi-structured interviews. The documents analysed in this research were semi-structured journals which participants completed through-out the process. Specific questions focused the participants on areas of interest to the study, once these questions had been addressed; there were opportunities for the participants to reflect freely on their experiences. Following data analysis, anonymity was applied.

Testing

A closed test was constructed and administered prior to and post engagement with the process. This closed test was used as part of the quantitative research supporting the qualitative findings. The test was summative in nature and designed to measure factual information learned through the process based on the chosen country. The test used closed questions and as such allowed for graphing of results.

In-World Building

The environment and artefacts created by the participants and 5th class group were analysed to demonstrate evidence of learning and engagement.

Implementation

Participants and 5th class group were chosen using both homogeneous and opportunistic sampling methods. Homogeneous sampling is defined as choosing people because they possess a similar trait (Creswell, 2012). In this study the similar trait was class level. Opportunistic sampling refers to the participants being readily available to the researcher. In the case of this research, the participants and 5th class group attend the school where the researcher is employed (Creswell, 2012).

Site and Duration

The process was carried out through an after-school computer club which took place in the computer room of the participants and peers own school. The process began in September and ended in April. Initially the club ran for one hour per week. From January the club ran for two hours a week and in the final stages for three hours per week. Group interviews were conducted upon completion of the process and lasted 10 minutes.

Ethics

Prior to participation in the study, informed consent was required and collected from participants and their guardians as well as the school's Board of Management. All parties

involved in the process received a written document outlining the purpose of the research and their right to withdraw. Following data collection and analysis, avatar names and other potential identifiers were removed through an anonymisation process. Ethical approval was obtained from Dublin University College prior to commencement of the process.

Researcher Bias

Bias exists as the researcher teaches in the school that the participants attend. In an attempt to address this bias, the researcher decided to work with participants who have never been taught by the researcher. However, the researcher believes that this bias does not affect the findings yielded by this study.

5. Data Analysis

Analysis of the data was centred on the research questions below.

1. Did the participants gain a strong understanding of the chosen country and development education issues?
2. Which elements of the designed for virtual world development education process enabled the knowledge acquisition?
3. Which features of the pedagogies as implemented in the virtual world process emerge strongly in the process to bring about this knowledge acquisition?

To assist with answering the research questions, this research uses both qualitative and quantitative data with quantitative data playing a supporting role. Data was gathered throughout the implementation of the research which spanned seven months. The data sets collected and analysed included observations, reflective journals, chat logs, reflective summary documents and interviews. The long period of implementation of the process resulted in the accumulation of a large amount of data sets to be analysed by the researcher. Table 5.1 demonstrates the amount of data collected and analysed in this research.

Data Set	Number Analysed
Researcher Observations	20
Participant Observations	7
Participant Reflective Journals	130
Peer Reflective Journals	7
Chat Logs	3
Group Interviews	5
The Virtual World Learning Areas	5
Reflective Summary Documents	17

Table 5.1 - Record of the number of data sets collected and analysed for the research.

Qualitative data analysis is concerned with the organising, accounting for and explaining of the data, that is to say making sense of the data (Cohen, et al., 2011). Data sets collected were divided into two groups – participant data and 5th class group data. Data groups were treated separately in analysis however the same methods of analysis were applied to both. The researcher used two methods for analysing the data collected in this research. Firstly analytic coding, which is described as an interpretive way of coding, was undertaken. The content was analysed leading to a summarization and the formation of speculative inferences (Cohen, et al., 2011). Secondly the data was coded and themed in an open and

emergent manner based on Creswell's (2012) "Visual Model of the Coding Process in Qualitative Research" (Creswell, 2012, p. 244). Additionally, the participant data was analysed separately to the data pertaining to the implementation with the 5th class group referred to as the "Showing" stage in the process.

The Process in Action

Participants engaged with the Logo programme and learned basic turtle commands through didactic teaching methods. Researcher observations noted that participants seemed uninterested in the Logo programme and were engaging with it simply because they were asked to. Logo finished with participants completing an individual task to create a picture using the turtle commands.

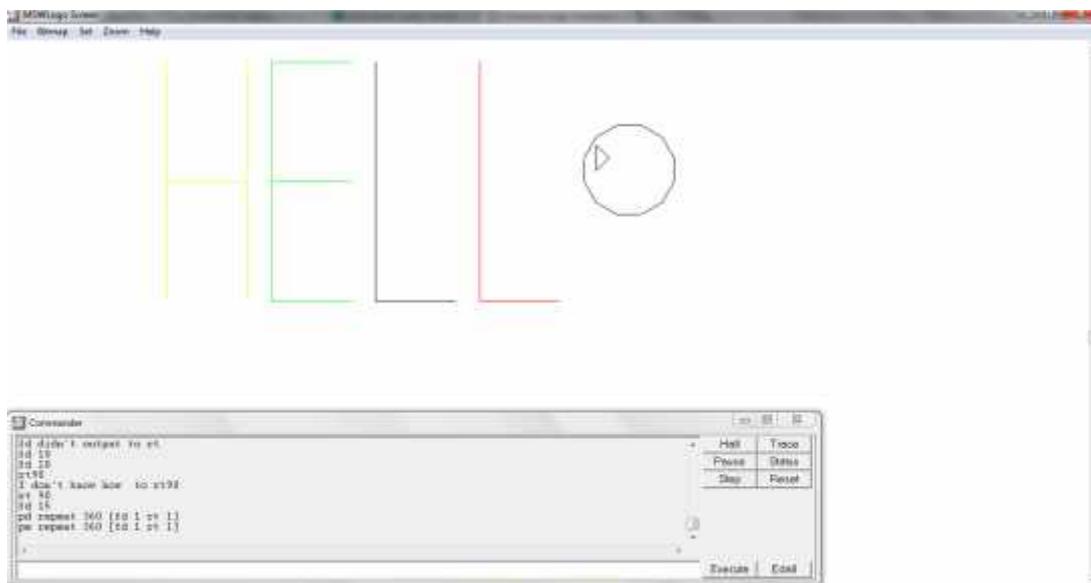


Figure 5.1 – Example of work done by a participant in Logo programme

Following on from Logo, participants learned about the Scratch programme. Basic skills associated with Scratch were taught using didactic methods. Participants then had time to explore Scratch. Finally, participants were set the challenge of making an interactive game using Scratch. Most participant completed this task individually, however some chose to work with a partner. Research observations noted that participants enjoyed working with Scratch, possibly because it was new and a challenge for them.

After Scratch, participants learned content in the traditional classroom using a mix of didactic teaching methods and discovery based learning. At the same time in computer club, participants were learning basic virtual world skills again through didactic methods and discovery based learning. Participants were given free time to edit avatars and explore the possibilities of building in the virtual world. Participants were encouraged to practice and

develop their scripting skills through free experimentation using the virtual world and Scratch 4 Opensim (created by Rich White).

Participants went on to plan the design and build of the development education learning experience for the 5th class group. They discussed the inclusion of content and the general design. Participants discussed the need for a project manager and chose one through a vote.

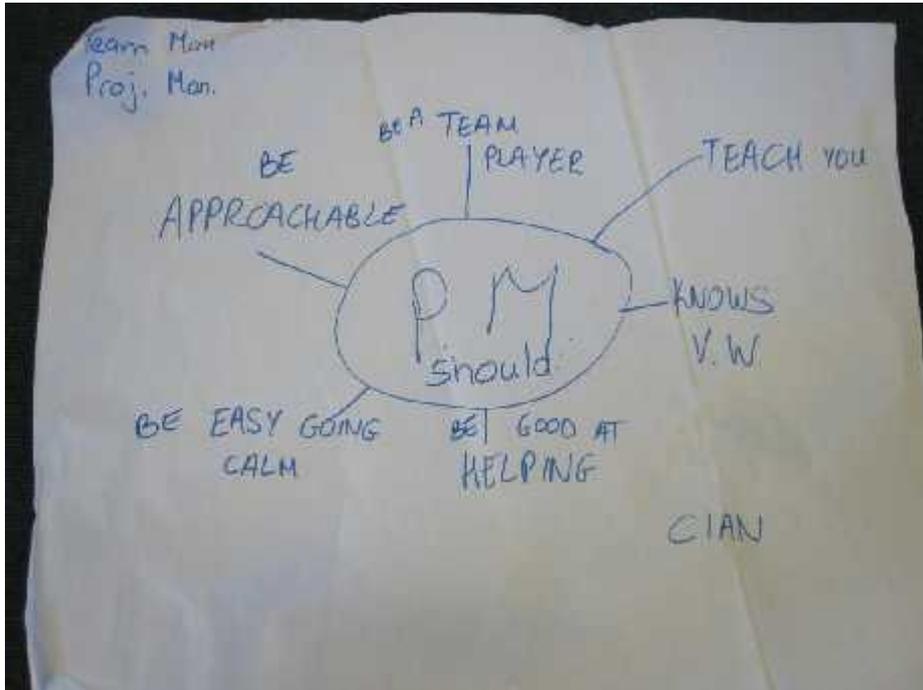


Figure 5.2 – Photograph of the participants idea of the traits needed by project manager



Figure 5.3 – Photograph of the initial content plans for the development education learning experience (identifiers covered)

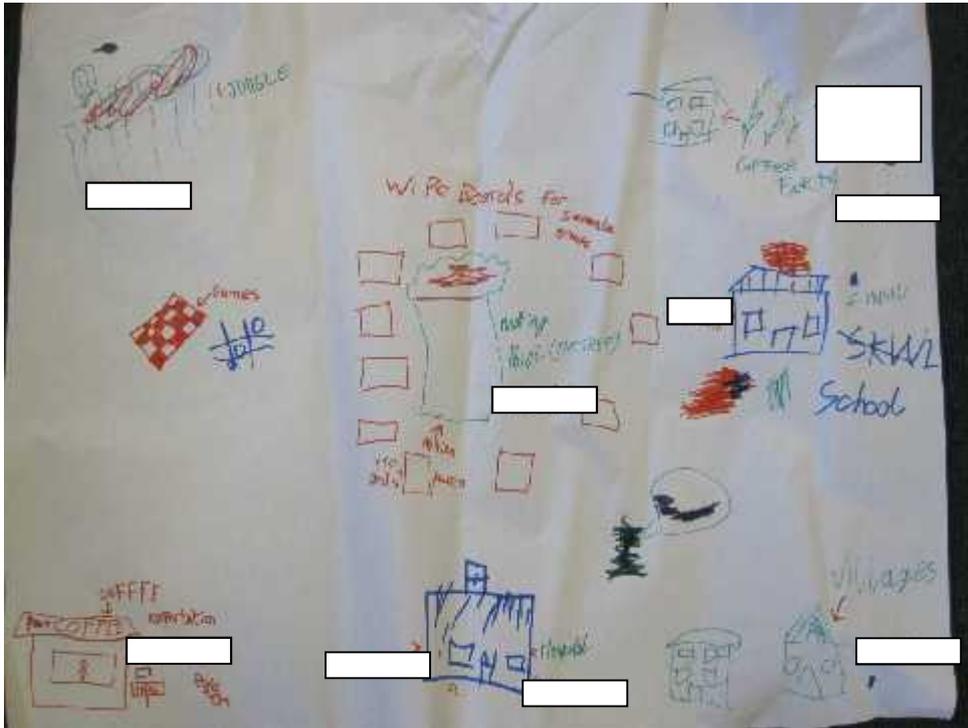


Figure 5.4 – Photograph of the content and design as agreed upon by the participants (identifiers covered)

Once the plan was agreed upon, building of the representation of Uganda in the virtual world started. The participants included a forest, school, village, fair trade coffee shop, coffee plantation, hospital and meeting point in the learning experience (see appendix 25 for screenshots of the building process). The following images show what the participants built.



Figure 5.5 – screenshot of the finished coffee shop built by participants. Information used as textures for the walls of the coffee shop.



Figure 5.6 – screenshot of the finished hospital built by participants. Information is presented on an interactive infoboard.



Figure 5.7 – screenshot from inside classroom 2 built by the participants. Information is provided on an interactive infoboard



Figure 5.8 – screenshot of the finished village built by participants. Information is presented on an interactive infoboard and through interaction with the various dummies who gave users a recording of information



Figure 5.9 – screenshot of the Impenetrable Forest built by the participants. Information was presented through interaction with the gorilla and mud hut which offered users notecards full of information



Figure 5.10 – screenshot of the finished coffee plantation built by the participants. Information was presented on an interactive infoboard

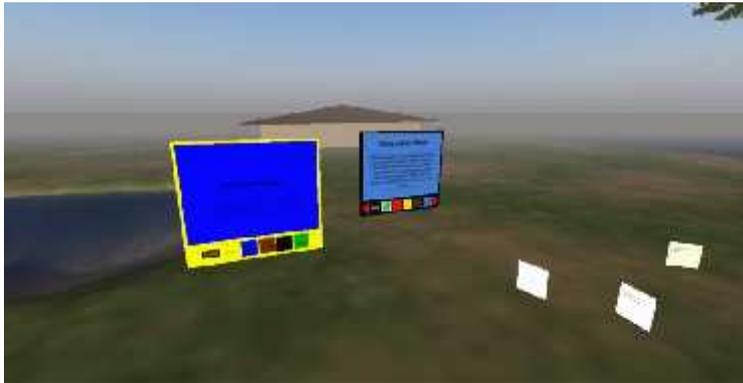


Figure 5.11 – screenshot of the meeting point. This is where the 5th class group met in-world for induction training and again for the sharing of learning at the end of the engagement

When the building of the learning experience was complete, the participants planned an induction to virtual world for the 5th class group. This induction saw participants teaching the 5th class group basic virtual world skills such as how to edit avatars, how to get around and interact with the environment, how to take notes and snapshots. After the induction session, the 5th class group engaged with the development education learning experience built by the participants. This engagement session was conducted by the participants who were helping and encouraging the 5th class group while also engaging with their own observations using a template drawn up by the researcher.

Analytic Coding (Participant)

A rubric was constructed based on the key ideas and concepts planned for and expected outcomes embedded into the process. These key ideas were informed by the previously reviewed literature. Additionally, some key ideas which would help to answer the research questions were included in the rubric such as engagement, enjoyment, self-regulation and self-organisation. The data sets were analysed for evidence of the ideas. Table 5.2 shows the frequency of the key ideas being referenced in the various data sets.

<u>Key Idea</u>	<u>Chat Log</u>	<u>Researcher Observations</u>	<u>Reflective Journal</u>	<u>Interview</u>	<u>Reflective Summary Documents</u>	<u>Totals</u>
Experiential learning	*	*	*	*	*	*
Interactivity	*	*	*	*	*	*
Discovery based learning	3	7	7	7	0	<u>24</u>
Content learning	0	18	13	11	11	<u>53</u>
Technical learning	6	3	35	11	12	<u>67</u>
Peer teaching and learning	7	13	42	14	6	<u>82</u>
Immersion	4	10	38	0	6	<u>58</u>
Simulation	0	4	0	9	11	<u>24</u>
Engagement	0	30	30	18	16	<u>94</u>
Enjoyment	10	15	58	47	13	<u>143</u>
Self-regulation	3	7	0	0	0	<u>10</u>
Self-organisation	2	13	0	0	0	<u>15</u>
Satisfaction with progress	0	15	8	4	0	<u>27</u>
Decreasing teacher role	0	11	1	0	0	<u>12</u>

Table 5.2 – Frequency of the key ideas in the various participant data sets. *Experiential learning and interactivity were key ideas in the design of the process however they weren't counted for the rubric as they were embedded into the process and occurred too frequently to be counted.

Discovery Based Learning

Discovery based learning refers to the participants acquiring new information or skills through exploration and other discovery methods. For coding purposes, discovery based learning was counted when participants described learning information or skills through exploration or by themselves in their reflective writing, when researcher observations noted

participants using skills not taught by the researcher, and when participants referenced learning through exploration in interviews. Analysis of the rubric shows that discovery based learning was an important feature in the process designed by the researcher and was recorded at 18 points. The following extracts from researcher observations demonstrate how discovery based learning was coded:

Researcher Observations: "Participant 12 approached me and showed me how he planned on recording information for his area of the virtual world. I hadn't shown him this; he figured it out over the weekend"

Researcher Observations: "Participants are trying different things in order to solve building problems they are facing"

Content Learning

Content learning is concerned with participants retaining facts and information about Uganda and development education issues. Content learning was counted in the data sets when participants were able to recall with accuracy facts and information. The rubric highlights that learning about Uganda and development education occurred through engagement with the process as it was recorded in the rubric a total of 49 times. The following extract from participant reflective summary document is an example of how the researcher recorded content learning in the data sets:

P2 "I learned that coffee beans are Uganda's largest export and that they are involved in the fair trade programme"

Technical Learning

Technical learning relates to learning general computer skills as well as specific virtual world skills. From analysis of the rubric it is evident that the participants developed their technical skills through engagement with the process. Technical learning appeared at 62 points in the data sets. The following quotation from a participant reflective journal elaborates how the researcher identified technical learning the data sets:

P3: "I went on to powerpoint and I clicked on title and I write fair trade for my title then I write about fair trade then I saved it to jpeg".

Peer Teaching and Learning

Peer teaching and learning was a major feature of the process and is evident in the frequency with which it is referred to in the various data sets. When coding, peer teaching and learning was recorded when participants mentioned helping each other, asking each other questions, teaching others and when this was observed by the researcher and was

recorded 72 times in the rubric. The following quotations from participant reflective journals illustrate evidence of peer teaching and learning:

P6: "It was enjoyable to have someone to help me with things I was not sure about"

P7: "I helped P4 and P1 get their commands into their inventory by showing them control + v"

Immersion

Immersion in the virtual world is evident when participants use avatar names when communicating with each other, when communicating through channels in the virtual world and when using virtual world language. Immersion was counted 58 times in the rubric. The following extracts from reflective journals indicate immersion:

P7: "We went into our inventory and clicked on create new notecard"

P6: "I had to log in using a different avatar but I had forgot to make everyone able to edit things so I had to (use) my original instead. I then finished rotating things."

P5: "I rebuilt my lake by going into "bulldozer" in build and clicked on lower and made the ground go lower so the water was visible."

Simulation

For the purpose of coding, simulation refers to the virtual world's ability to transport to another world and convey a sense of 'being there' (Warburton, 2009). Simulation was counted in the rubric when participants mentioned their build looking like Uganda or being a place different to the school environment. Simulation was recorded at 17 points in the rubric. The following is an example of how simulation was identified when coding:

P4: "I designed my area like that because that's what a Ugandan village looks like in my opinion."

P11: "If we didn't know how like eh the hospital or coffee shop or a house in Uganda looked like we'd look it up and then we'd sorta like try and see and try copy it as much as we can."

Engagement

Engagement refers to the participant's level of involvement and connection with the project, the content and development education. It was demonstrated in the extra work conducted by the participants and their expressing wishes to learn or do more. Analysis of the rubric indicates that engagement levels were high in the participants throughout the process as it

was recorded 84 times in the rubric. The following extract from a participant's reflective summary documents highlights their engagement:

P10: "I kept coming (to computer club) every week because I thought it was fun and I could learn more things about Uganda."

P12: "I got my information from the internet."

P2: "I chose to work on that are of the project because I wanted to know where the coffee beans came from and more about fair trade."

Enjoyment

It is obvious from the rubric that enjoyment featured greatly in the process. Enjoyment was recorded in four ways – enjoyment of the content, the virtual world, peer teaching and learning and working with friends. Enjoyment was recorded 143 times in the data sets and proves that enjoyment was an important feature of the process. The following examples from interviews demonstrate how the researcher identified enjoyment in the data:

P5: "I liked doing it (the process) because I got to be there with my friends."

P4: "I really enjoyed it because not only is it like em learning about Uganda, but we're learning like new things on the computer."

P3: "It's fun to learn about Uganda and like build loads of things."

Self-regulation

Self-regulation refers to the participants controlling behaviour and work during the process i.e. management of themselves. Only 10 references to self-regulation were noted in analysis of the various data sets. An example of the coding of self-regulation is taken from researcher observation of the 'Showing' stage of the process:

P1: "P10, will you listen to P5!"

P4: "P10, how do you not know how to do that? We've been doing it for ages and you're supposed to be teaching it."

Self-organisation

For the purpose of coding, self-organisation refers to any time data sets noted the participants organising themselves in such a way as to fill the void created by the decreasing teacher role and included formation of working groups, planning and co-ordinating the project and 'Showing' experience with the 5th class group. Despite being an integral part of

the process, self-organisation was only referenced 15 times in the rubric. The following researcher observations highlight occurrences of self-organisation:

The participants are working together to decide upon content for their build and layout design. Through group discussion, participants have decided to choose a project manager who will be responsible for keeping everyone on track and helping with technical problems. Additionally through discussion, participants have decided that it will be best to work in small groups when working on their build as they feel this will speed up the process whilst also helping with inevitable problem solving.

Researcher Observation: P5 and P6 haven taken charge of conducting both of the 5th class group experiences despite neither of them being the project manager. They are keeping track of time and ensuring that everyone (both participants and 5th class group) is on task and focused.

Satisfaction with the process

Satisfaction with the process was counted when participants mentioned being happy with the club in general (the process), their individual work and the collective work of the group. It was recorded at 26 points in the rubric. The following extracts from reflective journals indicate how satisfaction with the process was identified in analysis:

P10: "I think the group is working well because we are getting loads of work done."

P6: "I think the project is working well and we are working well together"

P7: "I am happy with the work I've been doing. I think the hospital is looking great."

Decreasing teacher role

For the purpose of the rubric, decreasing teacher role appears 12 times in the rubric and was counted when a reference was made to participants being the 'teacher' and when observations noted participants acting like teachers. The decreasing teacher role is closely linked to self-organisation and engagement of the participants. Decreasing teacher role is also evident in the detail of the observations of the researcher, as the role of the teacher faded the observations of the researcher became more detailed as they were increasingly removed from the situation. The following quotes are example of how decreasing teacher role was identified in the data:

P6: "I think that P1 is doing great with being the teacher."

P10: "I thought it was very good (teaching the 5th class group). You were the boss and you were teaching them and they're learning new things like we did."

Researcher Observation: Participants are asking each other for help with the virtual world, they are choosing not to ask me. Participants are naturally offering each other feedback on their builds and suggestions for improvement. It is clear that they have taken control of the project and its direction.

Analytic Coding (5th Class Group)

The rubric applied to the participant data sets was also used for analytic analysis of the 5th class group data however sets were smaller in scale. A new data set used in analysis of the 5th class group data was participant observations taken by participants during the 'Showing' stage of the process.

In the 'Showing' stage, the participants planned and carried out a virtual world skills induction session for the 5th class group. Following this induction, the participants planned and conducted the 5th class engagement with the development education learning experience. The participants were responsible for deciding how the session would be conducted – what the 5th class would be expected to do and when. While doing this, participants also completed observations using templates designed by the researcher. Table 5.3 on the following page shows the frequencies in the data sets.

Discovery Based Learning

Discovery based learning appears at 5 points in the rubric. Discovery based learning was embedded into the learning experience built by the participants as information was often hidden and required interactivity. However, the style of instruction used by the participants during the 'Showing' was not conducive to discovery based learning. Researcher observations notes that the participants were unwilling to 'let go' of the experience and were very didactic and authoritarian in their interactions with the 5th class group. The following excerpts from interviews and reflective journals demonstrate instances where discovery based learning were referenced:

P16: "I liked the way you had to like find information on it."

P13: "I liked trying to find the information in the different objects."

<u>Key Idea</u>	<u>Chat Log</u> <u>(1)</u>	<u>Researcher</u> <u>Observations</u> <u>(2)</u>	<u>Reflective</u> <u>Journal</u> <u>(7)</u>	<u>Interview</u> <u>(2)</u>	<u>Participant</u> <u>Observations</u> <u>(7)</u>	<u>Totals</u> <u>(19)</u>
Experiential learning	*	*	*	*	*	*
Interactivity	*	*	*	*	*	*
Discovery based learning	0	0	1	4	0	<u>5</u>
Content learning	0	4	4	10	8	<u>26</u>
Technical learning	0	3	3	10	14	<u>30</u>
Peer teaching and learning	4	6	7	5	2	<u>24</u>
Immersion	0	3	6	13	10	<u>32</u>
Simulation	0	0	0	1	0	<u>1</u>
Engagement	0	4	9	25	24	<u>62</u>
Enjoyment	6	6	17	30	15	<u>74</u>
Self-regulation	0	0	0	0	0	<u>0</u>
Self-organisation	0	0	0	0	0	<u>0</u>
Satisfaction with progress	0	1	0	0	5	<u>6</u>
Decreasing teacher role	<u>0</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>

Table 5.3 – Frequency of the key ideas in the various peer data sets. *Experiential learning and interactivity were key ideas in the design of the process however they weren't counted for the rubric as they were embedded into the process and occurred too frequently to be counted.

Content Learning

Analysis of the data sets clearly shows that peers learned about Uganda and development education issues through interaction with the learning experience. Evidence of content

learning was recorded 26 times in the rubric which is high for the data sets collected. The following examples indicate how content learning was identified in analysis:

P13: "I learned how to say hello is Swahili. It's hujambo."

P18: "Fair trade means like when they make something and like get a fair amount of wages."

Technical Learning

Analytic analysis of the data notes that technical learning was reference a total of 30 times. Again, this number is quite large. In engaging with the learning experience, peers were enabled to develop their technical abilities.

P4 Observation: "P16 is flying around the world looking at information. She is writing the info she finds down in a notecard."

P14: "To run you double click the top arrow. To build you click build and choose a shape, you can change the shape in edit."

Peer Teaching and Learning

The 'Showing' stage of the process was based upon peer teaching and learning with the participants teaching the 5th class group. Peer teaching and learning was noted at 24 points in the rubric. Both the participants and 5th class group expressed enjoyment of the peer teaching and learning experience. No negative feedback was recorded. The following examples highlight the enjoyment of the peer teaching and learning evident in the data sets:

P15: "I liked being taught by 6th class, they were really good at explaining stuff."

P17: "The enjoyable thing is that the teacher isn't teaching you."

Immersion

The rubric records immersion 32 times, this is high in relation to the amount of data sets analysed. As with the participant data, immersion was recorded when 5th class members used language associated with the virtual world or the communication features of the virtual world. The following example illustrates how immersion was identified in the data:

P14: "It was really fun cause you got to fly around, chat and buy clothes and build. I loved building cause you could create your own things."

Simulation

Simulation refers to the users feeling a 'sense of being there' in Uganda in this case. Only one 5th class member made 3 references to simulation during interview, however what they said was extremely important and worth quoting here:

P13: "It was an experience of what it is like in Uganda."

P13: "Cause like if you don't want to bother going all the way over to Uganda you could use this virtual world and see what it might look like in real life."

Engagement

Engagement was recorded in the rubric at 62 points and relates to both engagement with the experience and the content. This was the second highest frequency recorded in the rubric and demonstrates that the 5th class group engaged with the learning experience to a high level. The follow extracts highlight how engagement was recorded for the rubric:

P13: "I would like to learn more about Uganda and like about their food and what they like to eat."

P6 Observation: "They are very interested and reading lots of infoboards."

P4 Observation: "I think she is enjoying it because when she learns something new she says 'Oh I didn't know that' and writes it down in a notecard."

Enjoyment:

Analysis of the rubric clearly demonstrates that enjoyment was a key feature of the learning experience for the 5th class group. Enjoyment of the content and the experience was recorded 74 times in the rubric, the highest frequency in the 5th class group rubric. The following extracts are examples of enjoyment from the data sets:

P2 Observation: "So far he is liking the world, out of ten he rated it ten."

P13: "I liked learning about Uganda and getting information on it."

Self-regulation

Self-regulation was not recorded in the 5th class group rubric as the experience was regulated by the participants.

Self-organisation

Again, self-organisation was not evident in the data sets as the experience was controlled and organised by the participant group.

Satisfaction

Satisfaction with progress was recorded 6 times in the rubric, 5th class were happy with the progress of the experience and their work however all of the peers expressed during interview that they would have liked more time in-world to collect information and possibly to build also.

Decreasing teacher role

The decreasing teacher role was evident in researcher observations only and was recorded 3 times in the rubric. Decreasing teacher role was recorded when it was noted that participants were assuming the role of the teacher, especially evident in the 'Showing' stage. The following quote from researcher observation illustrates this point:

Researcher Observation: "Participants are moving from peer to peer ensuring that they are on task and doing okay. I stood outside the room listening to what was happening inside and noted no change in the behaviour of either the participants or the peers."

Open Emergent Coding (Participant)

Following on from analytic data analysis, the data relating to the participant group was analysed in an emergent and open manner. As the data sets were so numerous, a system of coding was employed again. 16 prominent codes were identified and organised into four important themes. Table 5.4 on the following page shows the open emergent coding and themes.

These themes are interlinked and worked simultaneously to impact the effectiveness of the process. Each of the themes plays a role in the fostering of the other themes. Figure 5.12 demonstrates how the researcher sees the themes to be interlinked and interdependent.

Theme	Code
Metacognition	Thinking about what they learned Thinking about how they learned Planning how they will learn (approach learning) Thinking about how others learn
Ownership and Motivation	Decreasing teacher role Peer teaching and leaching Self-regulation Self-organisation Engagement Enjoyment Discovery based learning Satisfaction with progress 'Not quitting' – <i>in vivo</i> 'Not letting others down' – <i>in vivo</i> 'Showing off' – <i>in vivo</i>
Pride and Achievement	Enjoyment Discovery based learning Satisfaction 'Showing off' – <i>in vivo</i> Peer teaching and leaching
Increased Confidence	Teaching Discovery based learning Peer teaching and learning 'Showing off' – <i>in vivo</i>

Table 5.4 showing open emergent coding and the respective themes.

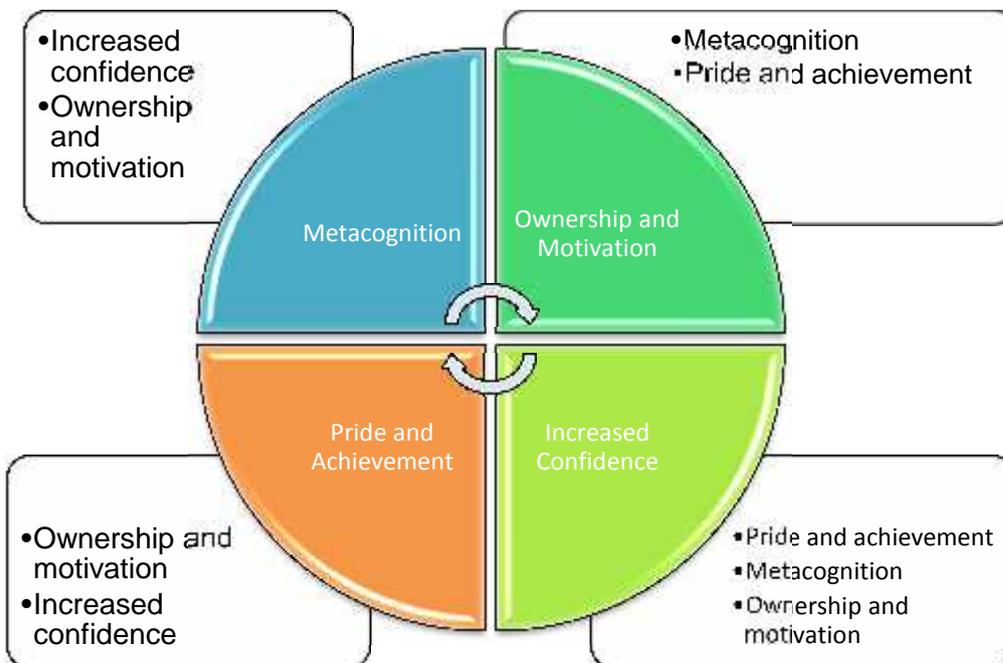


Figure 5.12 – illustration of the interlinking of the themes as reported by the researcher

Metacognition

Metacognition is often referred to as 'thinking about thinking'. Flavell (1979) defines four components of metacognition:

1. Metacognitive knowledge: a person's knowledge of their diverse cognitive tasks, goals, actions and experiences.
2. Metacognitive experiences: conscious cognitive experiences related to any intellectual endeavours.
3. Goals: learning objectives connected to intellectual endeavours.
4. Actions: actions or strategies used to achieve identified learning objectives. (Flavell, 1979)

These four components deal with learner's knowledge of themselves as learners, their ability to set goals and plan to achieve those goals through being aware and reflecting.

Additionally, metacognition can be categorised as content specific and general metacognition. In planning this research, a degree of metacognition was expected however not to the extent which is evident in analysis of the data. Participants engaged with all of the definitions and domains of metacognition explained previously. From detailed analysis, it is obvious that the participants became aware of how they learn and work best, they became very good at planning their learning activities to focus on areas of interest and weakness. On-going reflection enabled the participants to achieve higher levels of metacognition than initially anticipated. The following examples illustrate the occurrence of metacognition in the various data sets:

P8: "I didn't work with a partner today and I would not have liked to have one because I know I do a lot of work but when I do have a partner I never really get anything done."

P8: "I chose recordings because no one else was doing it and rather than someone reading page after page of information it was better for them to listen to stuff."

P1: "We got better at using teamwork and communication."

P9: "I liked that it was a challenge, you didn't give us the answers we had to find out for ourselves and that was good. Cause like if you give us all the answers, it's like you're doing nothing."

P12: "I learned that I get frustrated and that I need to slow down and think."

Metacognition played an integral part of the participants' planning for the 'Showing' stage of the process in which participants taught a 5th class group virtual world skills and co-

ordinated the 5th class group experience. When planning for this, research observations noted that the participants drew heavily on their learning experiences throughout the process and used these experiences to inform both the build and their 5th class group experience. The build used virtual world characteristics which the participants had identified with through previous simulation and interaction e.g. using hidden triggers, having interactive noticeboards. The participants used the interactive whiteboard for demonstration in the same way as they had learned some initial virtual world skills. They tried to make the experience a 'challenge' for the 5th class group as they enjoyed the challenge aspect of the process they engaged with.

It is possible that high levels of metacognition displayed by the participants lead to an increase in participant confidence levels as they became more aware of their learning and achievements. Being encouraged to choose the area they worked on and content they selected for the build through reflection and metacognition could also have increased the participants' levels of ownership and motivation.

Ownership and Motivation

Analysis of the various data sets shows high levels of ownership and motivation increasing over the implementation of the process. The participants increasingly felt in charge of the project, its content and direction as well as the whole 5th class group experience. This was connected to the decreasing teacher role as expected, however again it was on a much higher level than anticipated by the researcher. Analysis shows that as ownership increased so too did motivation and vice-versa. The following examples from the data sets highlight how ownership and motivation was identified in the numerous data sets:

P4: "I designed my area like that because that's what a Ugandan village looks like in my opinion."

Researcher Observation: "Participants are discussing showing their virtual world to other people and are clearly excited about doing so. Showing their work to others is a huge motivational factor."

Researcher Observation: "Participant group seem unwilling to let go completely of their build with the 5th class group. They appear possessive of it and reluctant to allow peers deviate from their planned experience. There is an air of "this is ours" about the participant group"

P1: "If we weren't showing off our work then I would not have put in the same amount of effort."

P1: "It's great because you can use your own initiative more."

P5: "I didn't wanna let anyone down by quitting."

Another motivational factor of the process was the participants' sense of pride and achievement, the more they achieved the more motivated they were. Additionally, ownership and motivation is linked to metacognition as discussed earlier.

Pride and Achievement

Pride and achievement is related to the participants' sense of accomplishment and satisfaction. Pride and achievement was primarily achieved in the process through the use of discovery based learning. Enabling the participants to acquire new information and skills through exploration and trial and error, led to a greater sense of achievement in the participants. Furthermore, a lot of the pride and achievement centred on the 'Showing' stage of the process. Most participants mentioned being excited about or enjoying 'showing off' their work to others outside of the computer club. The following examples illustrate how pride and achievement were recorded in the data sets:

P9: "The highlight was at the end getting to see all the work."

P6: "My highlight was finishing off my area because I was very proud of myself."

P10: "P3 made that, look at that and now look at his coffee shop. Some difference."

P8: "You look at it and you think we did not do this in that space of time. So we really have improved."

P12: "I think people are going to be impressed because of all the work that we've done."

P7: "It's good to show off your work."

P9: "It feels good because like you're just after building like a whole village."

It is clear from data analysis that ownership and motivation are affected by participants' sense of pride and achievement. Along with this, pride and achievement is closely linked also to increased confidence in the participants.

Increased Confidence

Increased confidence of the participants was not anticipated by the researcher and therefore completely unexpected. Analysis of the data sets shows that participants felt their confidence increased through engagement with the process and in particular with the final stage of the process 'Showing' their experience to others. The following examples demonstrate how increased motivation was identified in analysis of the data:

P1: "When I had done it like they didn't have any complaints about it so then that felt like my confidence multiplied."

P11: "Showing it off to other people gave me confidence."

It is important to note here that a number of the participants would not be high achievers in the traditional classroom and seldom experience high levels of pride and achievement which would naturally have a negative effect on their confidence. This was not the case in the computer club. Academically weaker children became knowledgeable about some aspect of the virtual world and were a 'go to' person for anyone in the group who needed specific help. This certainly led to an increase in participant confidence as they had a chance to shine.

Increased confidence naturally helped further participants' sense of pride and achievement, metacognition and ownership and motivation.

Open Emergent Coding (5th Class Group)

Open emergent coding of the data relating to the 5th class group and 'Showing' experience was coded and organised into three themes of motivation, behaviour and confidence.

Motivation

Open emergent analysis of the data sets, identified three key motivational factors for the 5th class group. It was clear from the levels of engagement noted in the rubric, that the 5th class were motivated to learn about Uganda and the virtual world. Researcher observations noted that the peers were extremely excited and interested when using the virtual world.

Additionally, 5th class members were overheard talking about new content they were learning thought engagement with the experience.

A second motivational factor for the 5th class group was their sense of pride for the 6th class participants and the work they had done in creating the learning experience. Open emergent analysis of interviews and reflective journals showed that the 5th class were proud of the achievement of the participants and aspired to these achievements, saying that they would have loved to build Uganda themselves and would appreciate the opportunity if it were there for them next year.

P15: "It's hard to think that like our friends made this."

A final factor in the motivation of the 5th class group is related to peer teaching and learning. The 5th class didn't want to 'let down' the participants. During interviews, all of the 5th class members stated that they behaved so well during the experience because they didn't want to disappoint the participants. Some of the 5th class members even expressed that their

behaviour would have been different if a teacher was in charge of the experience. The following quotes demonstrate this motivational factor:

P16: "I wanted to impress them and everything. They were trying to teach you and you have to take it all in and everything."

P14: "If it was a teacher you wouldn't take much notice of it."

Behaviour

Another theme identified through open emergent analysis, was peer behaviour. Having previously observed the 5th class in the traditional classroom and in the learning experience, the researcher can say with conviction that student behaviour changed as a result of being taught by the participants. 5th class were more attentive, respectful and diligent. The following quote exemplifies this:

P14: "If it was a teacher you wouldn't take much notice of it."

P17: "I was definitely better behaved than I am in class cause like it was their first time doing it and I didn't want to make it harder for them by messing."

Confidence

The final theme evident in open emergent coding of the 5th class group data is confidence again related to the peer teaching and learning experience. 5th class members mentioned having more confidence with the participants because they were young, they used language familiar to them and were approachable as they were friends with the participants. Researcher observations and interviews found this to be true as the following quote demonstrates:

P17: "You feel more confident around 6th class."

P13: "Cause they're just kids like us so it's not like a teacher."

Findings in relation to the research questions posed

This section seeks to identify links between the data sets collected and analysed and the research questions driving this research. Each of the data sets played an important role in the answering of the research questions however interviews were key to clarifying theories suggested in the other data sets. In this way, observations and journals helped form the questions for the interviews. Figure 5.13 attempts to convey how the data sets answered the research questions posed.

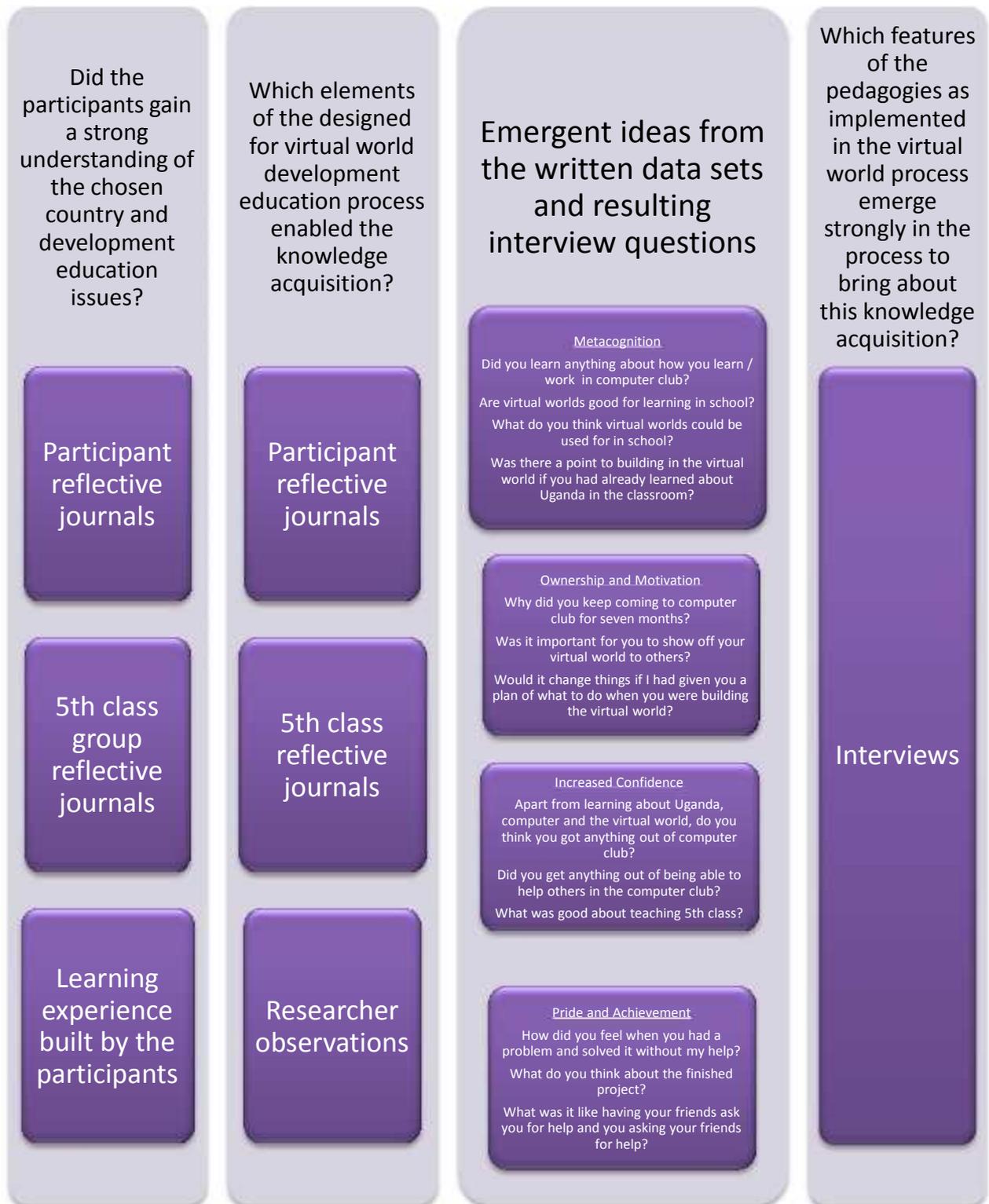


Figure 5.13 – data sets in relation to the research questions posed.

Did the participants gain a strong understanding of the chosen country and development education issues?

It is clear from analysis of the data and the experience built by the participants that the process designed by the researcher to facilitate the teaching and learning of development education in a primary school worked very well. On a basic level, the participants could not have built the experience without the process working. Data analysis both analytic and open emergent, clearly illustrates that the participants learned about both the virtual world and the chosen country as well as the development education issue of fair trade in undertaking and completing the building of the learning experience for the 5th class group.

Participants learned a lot about the chosen country through building the learning experience. This acquisition is evident in analysis of the actual experience build by the participants. Figure 5.14 is an image of the content included in the Impenetrable Forest in the virtual world. Figure 5.15 shows the information learned about schools in Uganda. Figure 5.16 is an example of the learning that took place around fair trade and coffee growing in Uganda.

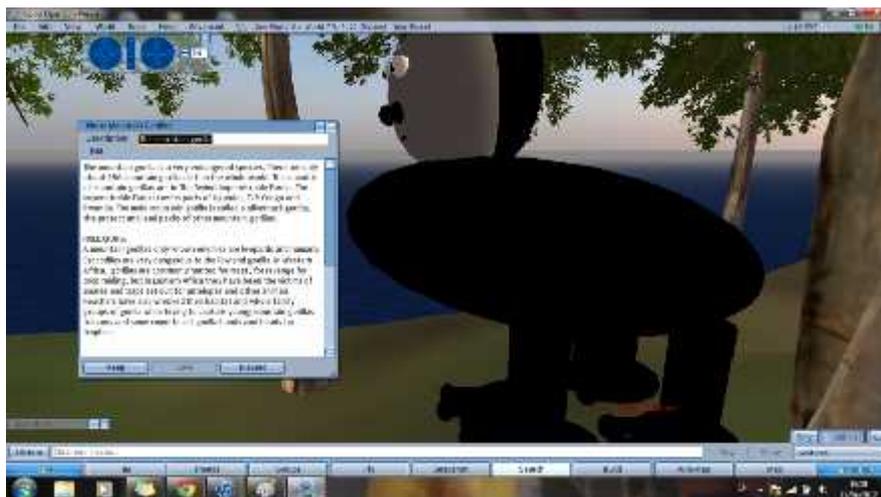


Figure 5.14 – notepad created by one of the participants containing information about mountain gorillas.



Figure 5.15 – Screen shot of two of the slides contained in the infoboard at the school presenting information about education in Uganda.



Figure 5.16 – Screen shot of two of the slides contained in the infoboard at the coffee plantation to teach people about the coffee trade in Uganda.

Data analysis demonstrated that the structure of the process ensured that the participants acquired the necessary skills to progress through the process. They felt that the process prepared them for the work they did in the virtual world. Without the ‘Entering’ and ‘Preparing’ stages of the process, the building of the learning experience would not have been so successful and possibly participant engagement and motivation would have been lower. During interviews, the participants acknowledged that it was good for them to start with Logo and move on to Scratch and finally the virtual world. The following interview extract highlights a participant’s satisfaction with the process:

P1: “You learn more with Logo. Like it’s just basic and then when you go on to Scratch it would be like you know how to do it and then when you go into the virtual world you know most of the stuff to do.”

Data analysis demonstrates that the structure of the process facilitated a decreasing teacher role, an increasing participant role and increasing participant engagement with the process. During the ‘Doing’ stage, the researcher handed over control and responsibility to the participants and they assumed this control and responsibility completely, excitedly and without hesitation. In taking control and responsibility for doing the project and showing it to others, the participants’ role was naturally increased as was their engagement with the process. They became more active in the project and as a result their levels of ownership and motivation increased leading to higher engagement with the project as they felt it was theirs. This in turn added to the success of the process.

Which elements of the designed for virtual world development education process enabled the knowledge acquisition?

The process was designed to didactically teach the skills required to progress through the process. Once these had been acquired, participants had the confidence in their abilities to

move through the process increasingly engaging with it. Spending time acquiring skills in the beginning of the process allowed for changing roles over time. Furthermore, the 'Preparing' stage of the process ensured that the participants had the information and facts needed to move into the 'Doing' stage. The first two stages of the process enabled the participants to develop necessary skills both technical and social to help with progression through the process. Taking out these two stages would radically change the success of the process.

Key to the success of the process was the facilitating of changing roles over time. Data analysis shows that having first acquired the necessary skills, the participants had the confidence in their abilities and interest to move from relying on the teacher to working independently. This change is clear in open emergent analysis of the researcher observations, detailed in the following passage:

Researcher Observation (Week 2): Participants are very dependent on me. They seek my help a lot and appear unwilling to attempt things on their own or experiment. This is especially true of the girls; is it possible that they are afraid of making mistakes?

Researcher Observation(Week 5): Participants are using each other more with each session and I am merely observing what is happening. They look to each other for support and guidance.

Researcher Observation (Week 22): Participants are completely in charge of the 'Showing'. I stood listening outside the door for a few minutes and noticed no change in either the behaviour of the participants or the 5th class group. At this point in the process I have no role other than providing supervision, this is in stark contrast to the initial stages of the process where I was constantly being asked for help, guidance and support.

The changes in roles over time helped keep the participants interested in the process and motivated to continue engaging with the process. Data analysis shows that these changes took place at the points in the process they were planned for. As the teacher's role decreased, the participants increased and along with it their engagement. With an increasingly active role and engagement levels, motivation and ownership also flourished. All of these changes helped with the success of the process as without motivation and engagement, the process would have failed long before stage four was reached.

Open emergent analysis also reveals that the 'Showing' stage of the process was paramount to the success of the process. This final stage was an incentive for the participants to keep working and provided them with an end goal to which they could strive to achieve. Interviews highlight that if there was no clear end goal the outcomes of the process would be different.

Participants expressed that they would not have been as interested in the building of the learning experience and certainly would not have put in as much time and effort. The following interview extract illustrates the importance of the 'Showing' stage:

Researcher: If I didn't tell you that you would be showing it at the end, would you have behaved differently?

P4: I probably would not have put in much effort, I would not have went onto the internet and got the textures."

P1: "My effort would lack a lot, I would not really care. I would not be real interested in it but I'd still do it just to be in school like after time and just messing around like with my friends and stuff."

P9: "My highlight for computer club is teaching 5th class about Uganda."

P4: "We were building up to the day when we were going to be teaching everyone else."

Data Analysis shows that the peer teaching and learning element of the process helped increase participants' confidence. With increased confidence the participants had the belief, interest and motivation to finish off their build and then show it to others. It was important for the participant's to feel needed in the process and to be able to seek support and advice from their friends. Additionally, peer teaching and learning benefited the process in that participants felt increased ownership and engagement with the process through teaching others. The following quotes demonstrate this:

P2: "It was good because you do not need to be afraid to ask for help like you would be with teachers sometimes."

P4: "We sort of understand our friend's language better."

Which features of the pedagogies as implemented in the virtual world process emerge strongly in the process to bring about this knowledge acquisition?

Ownership and Motivation

The levels of ownership and motivation displayed by the participants and evident in the various data sets, was crucial to the success of the process. Such high levels of ownership and motivation as recorded through open emergent data analysis were not anticipated in the planning of the process. A surge of ownership and motivation was noted during the final two stages of the process, the 'Doing' and 'Showing' stages. During these stages control of the building of the learning experience and ultimately its engagement with by a 5th class group was offered up to the participants. The participants relished this opportunity and

responsibility and rose to the occasion. Having complete control over the content, the design and the peer engagement with the built virtual world experience added to the participants' sense of ownership. When asked by the researcher to justify their decisions regarding content and design the participants were able to do so with conviction with most of them stating for example that it was what they wanted to do, it was how they imagined it to be in reality. Having ownership over the work and project lead to an increase in motivation in the participants. During interviews, all of the participants agreed that they would have lost interest in the project had they been given a detailed plan to follow.

Challenge

Analysis of the group interviews illustrates that participants enjoyed the discovery based learning feature of the process. There were many references to enjoying the 'challenge' provided by the process. The 'challenge' of the process could possibly have impacted positively upon the participants levels of motivation and engagement with the process. The participants use of the word 'challenge' in the data sets also refers to the degree of difficulty associated with the process. The following interview excerpts highlight the participants' satisfaction with the discovery based learning feature of the process:

P4: "I kept coming because it was a challenge and I was having fun and learning aswell."

P6: "I thought it was great. I thought it was very fun but a lot of it was hard to get the hang of but once you got the hang of it it was great."

P2: "Building was probably the best bit for me. It's like sort of hard when you had to get the shapes properly cause sometimes they would not go into the right place but it was good building."

Initiative

During interviews, some participants argued that engagement with the process enabled them to use their initiative more so than in the traditional classroom. This could have added to ownership and motivation levels as well as interest. The following quotes from interviews explain this:

P1: "You could use your initiative more like and you could just do it, you could have it the way you want it."

P6: "Yeah it was good because instead of having the teachers there telling you how to do everything"

P1: "We learned more and we didn't just keep going on with what they telly shows us and the ads about the little kids dying. We were able to show others what the actual country is like not by stereotypes and what you hear."

Creativity

Analysis of the interviews also highlighted satisfaction with the process encouraging creativity within the participants. The freedom to choose content and design for the building of the virtual world learning experience was important to some of the participants. Again they all agreed in interview that the process would not have been successful if they had been told what to do and how to do it.

Conclusion

It is clear from the analytic and open emergent analysis of the two data groups that the process designed for the teaching and learning of development education through the use of virtual world in a primary school was very successful. Initial skills acquisition played an important role in the success of the process as did the levels of ownership and motivation displayed by the participants. It is evident that participants learned about the chosen country and a development education issues as well as developing their technical skills through building in the virtual world. Building in the virtual world helped keep the participants motivated and interested and in turn helped them to learn more about the chosen country.

6. Discussion

Looking back to the literature review, we see that experiential learning (Kolb, 1984), discovery based learning (Bruner, 1966) and peer teaching and learning (Mitra, 2003; Topping, 2005) were argued as suitable pedagogies for the teaching and learning of development education in primary schools. Along with these pedagogies, the researcher identified three characteristics of virtual worlds suited to the teaching and learning of development education – immersion, interactivity and simulation (Warburton, 2009). It was argued by the researcher that the pedagogies and characteristics could be aligned and used for the teaching and learning of development education in primary schools. Analytic and open emergent analysis of the data sets demonstrates that the research was successful at achieving this. Participants engaged with and successfully completed a process based upon the pedagogies and characteristics mentioned previously to learn and teach others about a chosen developing country and a development education issue. Data analysis reveals that participants were active in the learning experience; they were reflective and learned through discovery. Discovery based learning is defined in the Irish Primary School Curriculum as requiring “children to actively participate in their learning in a wide variety of ways, thereby increasing the possibility of internalising what they have explored” (Education & Science, 1999c, p. 54). Participants’ experience of the process was fundamental to their learning. Immersion, interactivity and simulation (Warburton, 2009) featured heavily in the building of the learning experience which some participants feel helped them to internalise what they had learned in the traditional classroom as the following quote proves:

P12: “It helped us like do you ever think you know something in your mind but when you go to write it down you actually do not know it? I think the building helped to actually get it into your mind properly instead of just thinking oh I know this.”

Interesting Findings

Many of the outcomes and results seen in the analytic and open emergent data analysis had been planned for and built into the designed process, however they exceeded researcher expectations. Despite my experiences as a practicing primary school teacher, I was taken aback by the extent to which the process worked and also by the final outcomes reported by the research. I believed that the participants might have become bored with the process due to the long implementation period (7 months), yet the opposite was true. From the moment we started working in the virtual world, the participants requested extra computer club sessions. We increased computer club from one day a week to two which were Monday and Friday from 2.30 – 3.30. This meant that participants were choosing to spend an extra hour in school on a Friday evening; this is not common behaviour of either teachers or children in

schools. This upsurge in participation is seen then as an example of participants' extremely high level of interest in the process, engagement with the process and motivation. The participants were aware of the end goal set out by the process, 'Showing', and wanted to make sure they achieved this end goal within the time limitations of the research.

Surprisingly, as then end date drew closer, the participants requested another third day of computer club sessions. Participants were willing to spend three hours a week after-school working on building the learning experience. The extra sessions were requested by the participants and this demonstrates their interest, levels of engagement and motivation.

During the designing of the process, the founding ideas of the decreasing teacher role, increasing participant role and increasing participant engagement with the process were seen as important and complimentary to each other but separate. It is now clear that these founding ideas were free moving, very much interlinked and key to the success of the process. As the teacher role faded, the participant role naturally increased and along with this so too did the participant engagement. A rise in engagement and participation levels lead to increases in participant motivation and ownership levels. Increase in motivation and ownership lead to an increase in the participants' sense of pride and achievement. All of these changes over time helped to keep the participants focused and interested which ultimately kept the participants interested in and learning about the chosen country. Without the motivation, participants would have lost interest in the chosen country early on and learning could have been negatively affected.

It is important to discuss here the impact of the individual teacher on the process. In this study, the researcher worked with participants not taught on a day-to-day classroom basis by the researcher. The participants had never experienced the researcher as a classroom teacher and this had an effect upon the success of the process. Had the classroom teacher conducted the research, behaviour may have replicated that of the traditional classroom. The participants would have felt no distinct difference between the traditional classroom and the computer club and behaviour and attitude would may have been different than that reported in the research due to the teacher and participants' preconceived expectations based on the traditional classroom. In contrast, working with an unfamiliar teacher added to the informal setting of the computer club. General school rules were adhered to; however it was observed that participants' behaviour matched that of an informal setting. Participants expressed during interviews that they loved being able to move around and to work with different people in an unconstrained manner. Having no expectations of the participants behaviour (other than that they adhere to general school rules) added to the relaxed atmosphere associated with the computer club. This in turn added to the interest levels and motivation of the participants. They had a chance to be in control and direct the process.

Unexpected Outcomes

Learning of development education issues was noted in the data analysis; nevertheless the learning achieved was disappointing to the researcher. The purpose of the process was to explore the use of virtual worlds for the teaching and learning of development education in primary schools. Data analysis illustrated that participants learned a great deal about the chosen country, Uganda however only one development education issue was dealt with in the learning experience, fair trade. It was hoped that more would have been included as there was plenty of development education information and resources provided in the 'Preparing' stage of the process. This is the paradox of discovery based learning. As educators we acknowledge the importance of children acquiring knowledge, information and skills for themselves through the pedagogy discovery based learning. Unfortunately we also want the children to 'discover' certain knowledge, information and skills that we have pre-identified as important. This paradox is difficult to address. Anymore didactic teaching or extra input at any stage of the process from the researcher would have affected the success of the process as ownership levels would have been significantly reduced. Is it possible for a greater emphasis to be placed on the inclusion of development education issues in the building of the learning experience without changing the outcomes reported in the research?

Another unexpected outcome was the impact of the 'Showing' stage on the participants. The researcher did not expect this stage of the process, while important, to have such a driving on the process. This end goal affected behaviour of the participants and the building of the learning experience. The 'Showing' stage affected behaviour in the way that it gave purpose and meaning to the build the participants were undertaking. They took the task seriously and wanted to impress those they would be showing to. It was reported during interviews that many participants' behaviour would have been remarkably different if they were not showing off their work to others. Participants expressed that they would have been more likely to mess and attend computer club for a 'laugh' and to have time to mess with their friends.

Furthermore the 'Showing' stage of the process affected the actual build of the learning experience. Participants saw this 'Showing' stage as an opportunity to 'show off' what they had learned and impress people with both their knowledge of the content and the virtual world. This in turn added to the challenge aspect associated with the process and acknowledged by the participants. It was a challenge for the participants to build a learning experience for a 5th class group what would teach them about the chosen country and development education issues that would be enjoyed by the peers and appreciated.

Limitations of the Research

One of the limitations of this research was the specific cohort, the participants and 5th class group. Many of the outcomes associated with this research were related to the specific personalities of the cohort. It is possible that outcomes could vary with a different group of 11 and 12 year olds.

Member checking and validation of the process designed by the researcher was conducted and lead to the design of a revised process for the use of virtual world in the teaching and learning of development education in primary schools. The revised process is presented on the following page.

The revised process sees Scratch being moved from the 'Entering' stage to the 'Preparing' stage and Scratch 4 Opensim (created by Rich White) being moved to the 'Doing' stage. This change allows participants to practice and develop skills associated with scripting in the virtual world alongside their building the virtual world. In using the old process, participants had forgotten the skills of Scratch and Scratch 4 Opensim (created by Rich White) when it was time for them to be putting the information into their build. This had an effect on interactivity and creativity levels of the build. All but two of the participants agree that the revised process is better than the original one.

The researcher had also thought about taking Logo out of the process as it appeared participants didn't enjoy their engagement with Logo, but during member checking and validation it became clear that Logo was an important stepping stone and acknowledged as such by the participants. It is important to recognise that this change to the process could affect the outcomes reported in this research as Scratch was taught using didactic methods, meaning decreasing teacher role would inevitably be changed. Nonetheless, the researcher believes that this change is necessary and could add greatly to the success of the process overall. Data analysis noted that participants were more motivated to build than script; the revised process would certainly address this imbalance and could result in a higher participant engagement with Scratch 4 Opensim (created by Rich White) and therefore add to interest in the content area through interest in scripting.

Revised Process - Stages in the Process

Entering - Less time than in initial process

Didactic Teaching

Used initially to ensure participants have acquired basic skills necessary to progress through the process. Logo programme.

Discovery Based Learning

Specifically designed tasks and challenges to encourage exploration, experimentation and discovery. Logo programme.

Peer Teaching and Learning

Small group structure with participants sharing computers. Specifically designed tasks and challenges to facilitate and encourage peer learning. Logo programme.

Experiential Learning

Semi-structured reflection journals to encourage reflection on experiences and learning.

Preparing

Didactic Teaching

Providing the participants with vital basic facts and information about the chosen country. Didactic teaching of skills associated with Scratch programme.

Simulation through Demonstration

Showing the participants various characteristics of the virtual world at work through demonstration. Demonstration of Scratch and Scratch 4 Opensim programme.

Discovery based Learning (Content)

Using reference materials and resources to discover facts and information. Exploration of Scratch and Scratch 4 Opensim programme.

Discovery Based Learning (Domain)

Time given for free exploration of the virtual world to discover the possibilities of the virtual world and how the virtual world works. Exploation of Scratch and Scratch 4 Opensim in the virtual world.

Peer Teaching and Learning

Sharing knowledge and information gained through discovery with peers. Specific small group tasks and challenges based on Scratch.

Experiential Learning

Semi-structured reflection journals to encourage reflection on experiences and learning.

Immersion

Naming and editing avatars leading to increased sense of immersion. Using the various functions of the virtual world to further immersion.

Doing - More time than in initial process

Experiential Learning

Participants draw on their experiences and reflections to date to inform their design and build. The building of the learning experience is hands-on and active. To complete the build participants will need to constantly engage with and reflect upon the building experience.

Peer Teaching and Learning

Participants use each other to solve problems related to the build, either through small group work or the sharing information and skills.

Discovery Based Learning

Problem solving of technical issues through experimentation and exploration within the virtual world. Free exploration of Scratch 4 Opensim programme. Specific individual challenges to practice and develop skills associated with Scratch 4 Opensim.

Didactic Teaching

To ensure participants have acquired necessary skills to allow them to add interactivity to the learning experience. Scratch 4 Opensim.

Showing

Peer Teaching and Learning

Participants teach basic virtual world skills to the peer group. Peer group learn about the chosen country through an experience built by the participants.

Discovery Based Learning

Learning about the virtual world and the chosen country through exploration and experimentation.

Immersion

Naming and editing avatars leading to increased sense of immersion. Interacting with and through avatars and the environment to further enhance immersion and the experience.

Experiential Learning

Semi-structured reflective journals will encourage the peer group to reflect on their experiences and learning. Observation of the peer group by the participants will encourage reflection on the design and construction of the experience. Engaging with the learning experience through the use of avatars.

Table 6.1 – the revised four-stage process

Future Work

As this is a relatively new area of research, more research is needed. This research could be applied to a wider group to investigate generalizability of the outcomes reported.

The paradox of discovery based learning and its associated pitfalls as discussed previously need to be addressed if virtual worlds are to be used for the teaching and learning of development education as planned for in the process. The researcher suggests that it is possible to overcome this without negatively affecting the outcomes reported. It could be stipulated during participant briefing that a certain number of development education issues need to be included in the building of the learning experience. Participants should be allowed to choose the development education issues addressed in the build therefore not having a negative impact upon ownership levels and as a result interest and motivation levels. Data analysis of this research noted that participants often referred to the building of the learning experience as teaching others about the chosen country rather than teaching them about development education. The degree of participant freedom in choosing content in this research led to participants placing an emphasis on teaching others about Uganda.

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Appendix 1: Participant's Parent / Guardian Information sheet

Project: Using virtual worlds to teach development education to senior primary school children
Parent/Guardian Information Sheet for children participating in the design and construction of the learning experience

Dear Parent/Guardian,

The children of 6th class have the opportunity to take part in the design and construction of a learning experience for their peers in a virtual world. In allowing your child to participate, they will attend the after-school Scoil Mhuire Computer Club from 2.30-3.30 on Tuesdays from 5th of September 2011 to May 2012. The children will experiment with basics of computer programming through the use of Lego Mindstorms and Scratch before working in virtual worlds. The children will undertake a short learning experience in a virtual world before designing and constructing a specific environment for the rest of 6th class to use and learn from. In designing the environment in the virtual world, the children will be learning about development education issues, specifically life in Uganda in the aftermath of conflict. This is part of a research project, led and conducted by Francesca Hunt, teacher in Scoil Mhuire and student of Trinity College Dublin. The purpose of this research is to investigate if children can learn development education issues through peer learning and collaboration in a virtual world.

The virtual world the children will use is called JokaydiaGrid. JokaydiaGrid is a 3D interactive world that children explore using a character (avatar) on the screen. All of the activities are appropriate for the children. They have been designed by 6th class children with the 6th class curriculum in mind and are linked to the Irish Primary School Curriculum for Geography, Science, English, Maths and Social, Personal and Health Education.

ReactionGrid was built for use by young children and is open to anybody to use at any time. However to ensure the children's safety they will be working in a secure and protected area within JokaydiaGrid where only the children participating and myself have access. In addition to this the children will not know the passwords to log in to JokaydiaGrid, I will log them in and keep the passwords secret. The children will never be in the environment unsupervised by me.

The period of participation runs for just under one school year, however I will only be collecting information about the children's experiences of virtual worlds. During the activities in the virtual world, the children's actions on the computer will be recorded using text logs and audio recordings. The children will also complete a journal of their experiences, a questionnaire and an interview with me in groups of 4. The interview will be audio recorded and all audio recordings will be anonymised when transcribed for analysis.

All information collected by me will be anonymised and stored in accordance with the Data Protection Act at Trinity College, Dublin. In the unlikely event that information about illegal activity should emerge during the study, I will follow the school's child protection policy and inform the relevant authorities. The children will not be identified in any further work resulting from this study.

The Principal and Board of Management have given permission for the project outlined here to take place in the school as part of the curriculum involving all children who would not be at risk. However, for the research part of this project, information about your child can be recorded used with your permission. This will include their actions recorded during the activity, journal writing, questionnaire and interview.

Participation in the research part of the project is voluntary and you may remove your child from the project at any time, for any reason, without penalty and any information already recorded about your child will not be used. As this research involves the use of computers, children with epilepsy cannot take part in either the learning activity or research study. Please inform me or the class teacher if this is the case. If there is a family history of epilepsy your child may take part but does so at your risk.

If you have any questions before, during or after the project, please do not hesitate to contact me, Francesca Hunt, through the school secretary Phone Number: 282 3507 or by email at fhuntscoilmuire@gmail.com. There will also be an information meeting about the project on (as agreed by the Board of Management).

Conflict of Interest

Although the researcher is conducting the learning activity herself, she is unaware of any conflicts of interest regarding this research. The data collected during this study will not be used against you in any way.

Appendix 2: Participants' Parent / Guardian Consent Form

Project: Using virtual worlds to teach development education to senior primary school children
Parent/Guardian Consent Form for children participating in the learning experience

I(name of parent)
consent to.....(name of child)
taking part in this research project.

I have been provided with an information letter which outlines the activity my child will take part in, how research data will be collected and stored and how I can contact the researcher. I understand that I may withdraw my child from the research project at any time should I wish to do so for any reason and without penalty. I am aware that my child must also give consent to be included in this study.

Data Protection: I agree to Trinity College, University of Dublin storing any personal data relating to my child which results from this project. I agree to the processing of such data for any purposes connected with the research project as outlined to me.

Signature of parent..... Date.....

Signature of Project Leader (TCD):.....
Date.....

Please note: As this research involves the use of computers, children with epilepsy cannot take part in either the learning activity or research study, please inform the class teacher or myself if this is the case. If there is a family history of epilepsy the child may take part, but does so at your risk.

Contact the researcher, Francesca Hunt at:

Phone: 282 3507

Email: fhuntscoilmhuire@gmail.com

Appendix 3: Participant (Child) Information Sheet

Project: Using virtual worlds to teach development education to senior primary school children
Child Information Sheet for children participating in the design and construction of the learning experience

This information sheet is to be read by the child or to the child by their class teacher. The teacher may choose to paraphrase the text to clarify understanding. (This section will be omitted for the child)

You will be taking part in the after-school Scoil Mhuire Computer Club which will run from 2.30-3.30 on Tuesdays from September to May. In the computer club you will learn the basics of computer programming by using Lego Mindstorms and Scratch. After using Mindstorms and Scratch, you will undertake a short learning experience in a virtual world. After this you will work as part of a team to design and build an environment within a virtual world to teach other 6th class children about life in Uganda in the aftermath of conflict. I will help you do this. I will be collecting information from your work in the virtual world for a research project I am conducting. The aim is to investigate if 6th class children can learn about development education issues through peer learning and collaboration in a virtual world.

If you agree to participate in the research about this learning experience, then as you do the activities the computer will record what you do, including what you type on the computer. There will also be a voice recorder recording what you say. You will complete two simple tests, a questionnaire and record your experiences in a journal. At the end of the activities, you will take part in a short interview in a group of 4 with me which will be recorded with a voice recorder.

If you agree to participate, this information will be used in my research and will be anonymised (all names will be removed so no one will know who said what). If the researcher finds out about any illegal activities during the study, they will have to tell the authorities (Principal). When publishing the results of the project, you will not be identified.

If you don't want to take part in the research project you don't have to. You can still take part in the activities but none of your information will be recorded and you will not be used in the research. There is no problem if you choose to take part now but change your mind later, just tell you class teacher or myself.

Conflict of Interest

Although the researcher is conducting the learning activity herself, she is unaware of any conflicts of interest regarding this research. The data collected during this study will not be used against you in any way.

Appendix 4: Participant (Child) Consent Form

Project: Using virtual worlds to teach development education to senior primary school children
Child Consent Form for children participating in the design and construction of the learning
experience

I agree to take part in this
research project.

I have read, or had read to me, information about the project and know how information will be
collected and stored. I understand that I can chose not to take part in the research at any time. I
understand that my parent/guardian must also give consent to be included in this study.

Data Protection: I agree to Trinity College, University of Dublin storing and using my information from
this project.

Date:.....

Signature of Project Leader (TCD):.....
Date.....

Appendix 5: 5th Class Group's Parent / Guardian Information Sheet

Project: Using virtual worlds to teach development education to senior primary school children
Parent/Guardian Information Sheet for children participating in the learning experience

Dear Parent/Guardian,

The children of 5th class have to opportunity to take part in a learning experience designed by 6th class children in a virtual world. The learning experience will take place in the after-school Scoil Mhuire Computer Club from 2.30-3.30 on Thursday March 29th and Friday March 30th 2012. The learning experience is aimed at teaching the children about development education issues. This is part of a research project, led and conducted by Francesca Hunt, teacher in Scoil Mhuire and student of Trinity College Dublin. The purpose of this research is to investigate if children can learn development education issues through peer learning and collaboration in a virtual world.

The virtual world the children will use is called JokaydiaGrid. JokaydiaGrid is a 3D interactive world that children explore using a character (avatar) on the screen. The children will be participating in activities that have been designed to teach them about life in Uganda in the aftermath of conflict. All of the activities have been designed by 6th class children with the 5th / 6th class curriculum in mind and are linked to the Irish Primary School Curriculum for Geography, Science, English, Maths and Social, Personal and Health Education.

ReactionGrid was built for use by young children and is open to anybody to use at any time. However to ensure the children's safety they will be working in a secure and protected area within JokaydiaGrid where only the children participating and myself have access. In addition to this the children will not know the passwords to log in to JokaydiaGrid, I will log them in and keep the passwords secret. The children will never be in the environment unsupervised by me.

During the period of participation (2 hours) I will be collecting information about the children's experiences of the activity. During these activities the children's actions on the computer will be recorded using text logs and audio recordings. The children will also complete 2 short simple tests, a journal of their experiences and an interview with me in groups of 4. The interview will be audio recorded and all audio recordings will be anonymised when transcribed for analysis.

All information collected by me will be anonymised and stored in accordance with the Data Protection Act at Trinity College, Dublin. In the unlikely event that information about illegal activity should emerge during the study, I will follow the school's child protection policy and inform the relevant authorities. The children will not be identified in any further work resulting from this study.

The Principal and Board of Management have given permission for the project outlined here to take place in the school as part of the curriculum involving all children who would not be at risk. However, for the research part of this project, information about your child can be recorded used with your permission. This will include their actions recorded during the activity, journal writing, questionnaire and interview.

Participation in the research part of the project is voluntary and you may remove your child from the project at any time, for any reason, without penalty and any information already recorded about your child will not be used. As this research involves the use of computers, children with epilepsy cannot take part in either the learning activity or research study. Please inform me or the class teacher if this is the case. If there is a family history of epilepsy your child may take part but does so at your risk.

If you have any questions before, during or after the project, please do not hesitate to contact me, Francesca Hunt, through the school secretary Phone Number: 282 3507 or by email at fhuntscoilmuire@gmail.com. There will also be an information meeting about the project on (as agreed by the Board of Management).

Conflict of Interest

Although the researcher is conducting the learning activity herself, she is unaware of any conflicts of interest regarding this research. The data collected during this study will not be used against you in any way.

Appendix 6: 5th Class Group's Parent / Guardian Consent Form

Project: Using virtual worlds to teach development education to senior primary school children
Parent/Guardian Consent Form for children participating in the learning experience

I(name of parent)
consent to.....(name of child)
taking part in this research project.

I have been provided with an information letter which outlines the activity my child will take part in, how research data will be collected and stored and how I can contact the researcher. I understand that I may withdraw my child from the research project at any time should I wish to do so for any reason and without penalty. I am aware that my child must also give consent to be included in this study.

Data Protection: I agree to Trinity College, University of Dublin storing any personal data relating to my child which results from this project. I agree to the processing of such data for any purposes connected with the research project as outlined to me.

Signature of parent..... Date.....

Signature of Project Leader (TCD):.....
Date.....

Please note: As this research involves the use of computers, children with epilepsy cannot take part in either the learning activity or research study, please inform the class teacher or myself if this is the case. If there is a family history of epilepsy the child may take part, but does so at your risk.

Contact the researcher, Francesca Hunt at:

Phone: 282 3507

Email: fhuntscoilmhuiire@gmail.com

Appendix 7: 5th Class Group (Child) Information Sheet

Project: Using virtual worlds to teach development education to senior primary school children

Child Information Sheet for participation in the learning experience

This information sheet is to be read by the child or to the child by their class teacher. The teacher may choose to paraphrase the text to clarify understanding. (This section will be omitted for the child)

You will be taking part in a 2 hour learning experience in the after-school Scoil Mhuire Computer Club which will take place from 2.30 – 3.30 on Thursday March 29th and Friday March 30th 2012. You will be doing activities in a virtual 3D world on the computer. As well as doing the activities, I will be collecting information for a research project I am conducting. The aim is to investigate if primary school children can learn about development education issues through peer learning and collaboration in a virtual world.

If you agree to participate in the research about this learning experience, then as you do the activities the computer will record what you do, including what you type on the computer. There will also be a voice recorder recording what you say. You will complete two simple tests, a questionnaire and record your experiences in a journal. At the end of the activities, you will take part in a short interview in a group of 4 with me which will be recorded with a voice recorder.

If you agree to participate, this information will be used in my research and will be anonymised (all names will be removed so no one will know who said what). If the researcher finds out about any illegal activities during the study, they will have to tell the authorities (Principal). When publishing the results of the project, you will not be identified.

If you don't want to take part in the research project you don't have to. You can still take part in the activities but none of your information will be recorded and you will not be used in the research. There is no problem if you choose to take part now but change your mind later, just tell you class teacher or myself.

Conflict of Interest

Although the researcher is conducting the learning activity herself, she is unaware of any conflicts of interest regarding this research. The data collected during this study will not be used against you in any way.

Appendix 8: 5th Class Group (Child) Consent Form

Project: Using virtual worlds to teach development education to senior primary school children
Child Consent Form for participation in the learning experience

I agree to take part in this research project.

I have read, or had read to me, information about the project and know how information will be collected and stored. I understand that I can chose not to take part in the research at any time. I understand that my parent/guardian must also give consent to be included in this study.

Data Protection: I agree to Trinity College, University of Dublin storing and using my information from this project.

Date:.....

Signature of Project Leader (TCD):.....
Date.....

Contact the researcher, Ms. Hunt at:

Phone: 282 3507

Email: fhuntscoilmhuiire@gmail.com

Appendix 9: Principal and Board of Management Information Sheet

Project: Using virtual worlds to teach development education to senior primary school children
Principal and Board of Management Information Sheet

12 6th class are invited to participate in the after-school Scoil Mhuire Computer Club for an hour a week (2.30-3.20 Tuesdays) from September to May. In the computer club, the children will learn basics of computer programming by using Lego Mindstorms and Scratch. Once the basics have been covered, the children will then undertake a short learning experience in a virtual world. The children will use their programming skills and experience of virtual worlds to build a learning experience for 5th class group to use and learn from. The learning is aimed at teaching 5th class about development education issues with specific emphasis on life in Uganda in the aftermath of conflict. Additionally a further 6 5th class children are invited to participate in the learning experience designed by the initial group. This learning experience will be conducted in the computer club and will run for 2 hours. This is part of a research study by Francesca Hunt (teacher in the school) to investigate if senior primary school children can learn development education issues through the use of peer learning and collaboration in a virtual world.

The virtual world they will use will be JokaydiaGrid. JokaydiaGrid was created for children and is open to use by anybody at any time. I will install the environment on the school computers and delete them immediately after the completion of the study. The children will be working within a secure and protected area with JokaydiaGrid and will not know any of the log in passwords required to enter the environment. The children will never be in the environment without my supervision both in the virtual world and in reality. JokaydiaGrid allows the children to move around and explore the 3D through the use of an on-screen character (avatar).

The activities that they will take part in are outlined in the accompanying lesson plans. The activities have been designed and linked to the Irish Primary School Curriculum for Geography, English, Maths, Science and Social, Personal and Health Education.

During the period of participation, I will only be collecting information about the children's experiences of the activities in the virtual world. During these activities their actions on the computer will be recorded using text logs and audio recordings. The participants will also complete a journal recording their experiences. After completion of the activities, the children will complete a short questionnaire and take part in a group interview where they will be given an opportunity to ask any questions about the project. The interview will be audio recorded and all audio recordings will be anonymised when transcribed.

All information that is collected by the researcher will be anonymised and stored in accordance with the Data Protection Act at Trinity College, Dublin. In the unlikely even than any information pertaining to illegal activities should emerge during the study, the researcher will follow the school's child protection policy and inform the appropriate authorities. The children and school will not be identified in any future work arising from this study.

Your permission for the learning activities and research to take place in the school is requested. Children will also require their own and parental consent to take part in the research. Participation is voluntary and you may withdraw the school from the project at any time for any reason without penalty and any information already recorded from the school will be removed. As this research involves the use of computers, children with epilepsy cannot take part in either the learning activity or research study. If there is a child with a family history of epilepsy the child may take part but only with parental permission.

If you have any questions before, during or after the project, please do not hesitate to contact me, Francesca Hunt.

fhuntscoilmhuiire@gmail.com or 087 9895139

Appendix 10: Principal and Board of Management Consent Form

Project: Using virtual worlds to teach development education to senior primary school children
Principal and Board of Management Consent Form

The Board of Management has been provided with an information sheet which outlines the activities the child will take part in, how the data will be collected and stored and how it can contact the researcher.

The Board of Management understands that it may withdraw the school from the project at any time should it wish to do so for any reason and without penalty.

Signature of the chair of the Board of Management: Date:

Signature of the Principal: Date:

Name of School:

.....

Signature of Project Leader (TCD) Date:

Appendix 11: Reflective Journal Used for Stages 1 and 2 of the Process

1. What did you do today?
2. How did you do it?
3. What was the most challenging thing you did today?
4. What did you learn today?
5. What was the most enjoyable thing you did today?
6. Were you able to help anybody today?
7. What do you think you need help with / what would you like to learn more about?
8. What was enjoyable and / or difficult about working with a partner today?
9. Any other comments or thoughts about today's session?

Appendix 12: Reflective Journal used for Stage 3 of the Process

1. What did you do today? Please explain in detail.
2. What did you enjoy or dislike about working with a partner today?
3. Were you able to help anyone today? Please explain how in detail.
4. How are going to include interactivity into you area? Please explain your ideas in detail.
5. What exactly are you going to do in the next computer club session?

Appendix 13: Reflective Journal used for Stage 4 of the Process

1. Explain in detail what you did in today's session. Explain how you did the commands, scripts etc.
2. What new things did you learn today – can be about Uganda, the virtual world, Scratch 4 Opensim? How did you learn these new things – ask somebody, figure it out for yourself (and if so how?), look it up on the internet?
3. What did you like / dislike about working with a partner today? If you had no partner would you have liked one – why / why not? Explain your answer in detail.
4. Are you enjoying the project / computer club – please explain your answer; tell me exactly why or why not? Do you like the virtual world? Do you like learning about Uganda?
5. What is on your mind? Any thoughts, ideas or comments you have about computer club. Do you think the group is working well? Did you have a good session? What do you think the group needs to work on?

Appendix 14: Sample Coding of Reflective Journals

Evidence of content learning

Evidence of technical learning

Evidence of immersion

Evidence of peer teaching and learning

1. What exactly did you do today?

Today I had to log in using a different avatar, but I forgot to make everyone able to edit things so I had to use my original one instead. I then finished rotating things and made a table and a chair for the teacher.

2. What did you enjoy or dislike about working with a partner today?

I didn't really work with anyone today except asking P1 why the walls were invisible inside the school.

3. Were you able to help anyone today? Explain how.

Nobody needed my help. If anyone needed help they just asked the project manager.

4. How are you going to include information in your area?

I will try to put my information on a black board which I will make by using just a cube and stretching it thin and big. I will include schools and main subjects in Uganda on the board.

5. What exactly are you going to do on Friday?

Hopefully I will know how to make the inside walls visible and make the black board. I will also do any other things people could suggest for me to do.

Appendix 15: Reflective Summary Document Questions

Section 1

1. What did you make for the virtual world? Describe it in detail – how it looks, how it is to be used, how do users get information?
2. Why did you design your area the way you did? Why did you want it to look that way and work that way?
3. Why did you choose to work on that area of the Uganda build?
4. Why did you choose the information that you did?
5. Why did you choose to present your information the way you did?
6. Now that 5th class have used your learning experience and you observed them, would you make any changes to what you did? Why?

Section 2

1. Why did you sign up for computer club?
2. Why did you keep coming to computer club every week?
3. What did you learn from computer club – can be about Uganda, computers or yourself.
4. What was your highlight of computer club?
5. What changes to computer club if you could?
6. Do you think virtual worlds are good for learning in school? Why?
7. Do you think virtual worlds are good for learning about Uganda and other developing countries? Why?
8. Would you recommend computer club to other children in 6th class? Why?

Appendix 16: Sample Coding of Reflective Summary Document Questions

Simulation

Evidence of engagement

Evidence of technical learning

Evidence of peer teaching and learning

Ownership

Enjoyment

Evidence of content learning

Motivation

1. In the virtual world I made a house and a coffee field. The coffee field looks like any other coffee field but smaller and I copied the house from the village built by P4 and P9. It is used because the coffee in Uganda is its main export of food and everything else that's why my coffee is there and we got most of our information off the internet.
2. I made my areas that way because I wanted to make it as if you were in Uganda.
3. I choose to work on that area because I wanted to know where coffee beans come from and to learn more about fair trade.
4. P11 and I picked that bit of information because it seemed interesting and people would stop and look and say that's good I didn't know that – Wanted to teach others.
5. I did it in an information board because it looks nice and gives you information instantly.
6. No I wouldn't make any changes. I think that all the experiences have been good.
7. I signed up for computer club because I wanted to learn more about computers.
8. I kept coming to computer club because I think if you start something you should finish it.
9. I learnt about fair trade, coffee beans and about Uganda.
10. My highlight of computer club was teaching 5th class how to use the virtual world.

Appendix 17: Sample Coding of Researcher Observations

Metacognition

Evidence of engagement

Evidence of technical learning

Evidence of peer teaching and learning

Ownership

Enjoyment

Fading teacher role

Motivation

- Participants are observing the 5th class group with one participant observing from within the virtual world.
- Strong peer teaching and learning – asking each other questions.
- Participants are clearly enjoying the experience of teaching the 5th class group, overheard one participant saying “*This is so much fun, I love it.*”
- Some of the participants are finding it hard to let go of the project and hand it over to the 5th class group. This could be related to their high levels of ownership of the project. Participants are telling the 5th class group what to do rather than just shadowing and watching them.
- Participants are controlling the 5th class group’s behaviour and work, keeping them focused on the task. Participants were overheard asking the 5th class group “*Are you taking notes?*” “*Did you read all that information?*”
- The participants had agreed upon a three strike system for behaviour management of the 5th class group. Upon receiving three strikes a member of the 5th class group would be logged out and their engagement with the virtual world cancelled. I believe this is a good system and shows that participants are taking the ‘Showing’ stage very seriously thus furthering their engagement levels, motivation and ownership levels.
- When there was a concern about one 5th class group member’s comment in the virtual world chat, participants got together to discuss whether the comment was okay or not and how the situation should be dealt with. The participants decided that the comment was ‘*messing*’ and gave the 5th class member a strike.
- P4 is very excited about teaching the 5th class group saying “*It’s like putting ourselves in your shoes. It’s cool. Like P16 is actually learning*”

- 5th class group are responding well to the participants. They appear to be on their best behaviour, I have seen some of the 5th class group members behave more difficultly for teachers – It is possible that the 5th class group don't want to *let down the participant group*.
- There is a very quiet, working atmosphere in the room.
- It is obvious that the participants have excellent virtual world skills, especially related to their use of the camera. Many of the skills displayed and shortcuts used by the participants were not taught by the researcher – Evidence of discovery learning
- Participants are keeping track of time to ensure the 5th class group complete their task.

Appendix 18: Participant Observation Template

<p>What are they doing?</p> <p>What do you think about this?</p>	
<p>What are they saying?</p> <p>What do you think about this?</p>	
<p>Do you think they are enjoying the experience? Why?</p>	
<p>Do you think they are learning about Uganda? Why?</p>	
<p>Is the experience working? Why do you think so?</p>	
<p>Are they using virtual world language?</p>	
<p>Are they using virtual world chat?</p>	
<p>Is the experience working the way you wanted / expected it to? Explain</p>	

Appendix 19: Sample Coding of Participant Observations

Evidence of engagement

Evidence of content learning

Evidence of enjoyment

Evidence of technical learning

Evidence of immersion

<p>What are they doing?</p> <p>What do you think about this?</p>	<p>They are taking information from everywhere. They are taking information from the gorilla. They are reading the general info boards. I think it's good to know they listened yesterday.</p>
<p>What are they saying?</p> <p>What do you think about this?</p>	<p>They are not saying much just what they think is important. It's good they're not writing everything down although it could come back in the challenge badly.</p>
<p>Do you think they are enjoying the experience? Why?</p>	<p>Yes because they seem very happy.</p>
<p>Do you think they are learning about Uganda? Why?</p>	<p>Yes because they seem very interested and are taking lots of notes in notecards.</p>
<p>Is the experience working? Why do you think so?</p>	<p>Yes, they are using all the skills we taught them yesterday.</p>
<p>Are they using virtual world language?</p>	<p>Sometimes</p>
<p>Are they using virtual world chat?</p>	<p>They are yet to use chat at all. One person has but nothing important.</p>
<p>Is the experience working the way you wanted / expected it to? Explain</p>	<p>Yes. They are very interested and learning lots of information from the infoboards.</p>

Appendix 20: Sample Coding of Group Interviews

Evidence of content learning

Evidence of engagement

Evidence of enjoyment

Evidence of peer teaching and learning

Evidence of discovery learning

Ownership and Motivation

Pride and achievement

Evidence of technical learning

Researcher: Did you like doing the virtual world?

P12: I did, yeah.

Researcher: Why?

P12: Because it was great to like, learn how like, to learn how to like create buildings and like to learn more stuff about Uganda and to also teach like 5th class who came in.

Researcher: Would it have been the same process for you then, the same enjoyment if you didn't teach 5th class?

P12: Yeah it would because like, it was fun like being able to like go around not just like build but talk and have fun and em, it was just really fun I think it was.

Researcher: What do you think? Did you like doing the virtual world?

P4: Yeah I really enjoyed it because, not only is it like em, learning about Uganda but we're learning like new things on the computer. I didn't even know how to do half the things on the computer at the start of the computers and now I do. And also I like, it's something to do on a Tuesday and we don't do anytin on a Tuesday. And yeah I really enjoyed it.

Researcher: How about you P3?

P3: I loved it.

Researcher: Why?

P3: Because it's fun to learn about Uganda and like build loads of things.

Researcher: So you like the building?

P3: Yeah

Researcher: Okay that's fine.

P9: Like it was really good coz em like you would help us at the start but then if we got stuck sometimes you'd give us the booklet, and we had to try and figure it out ourselves. And like it was good that we could build whatever and we could learn about our village not like you would help us with it but not all to do it.

Researcher: Does anybody else agree with P9?

Pupils: Yeah

Researcher: Was that a big part of the enjoyment? Was that it was your, you were in charge of it?

P4: Yeah, other teachers would just go ah here I'll do it for you because it's quicker but like, it was sorta like you were sorta like little hints

Researcher: And you like figuring out stuff on your own?

P4: Coz then when you actually get it, like you're sitting there for ages and you're like 'what I don't get this' and then you give us little hints and then you get it and like 'oh, that's it'. It's like doing something good to do it yourself.

P12: You feel happy about yourself. That you find that you found it out

Researcher: Without being told?

Pupils: Yeah, definitely.

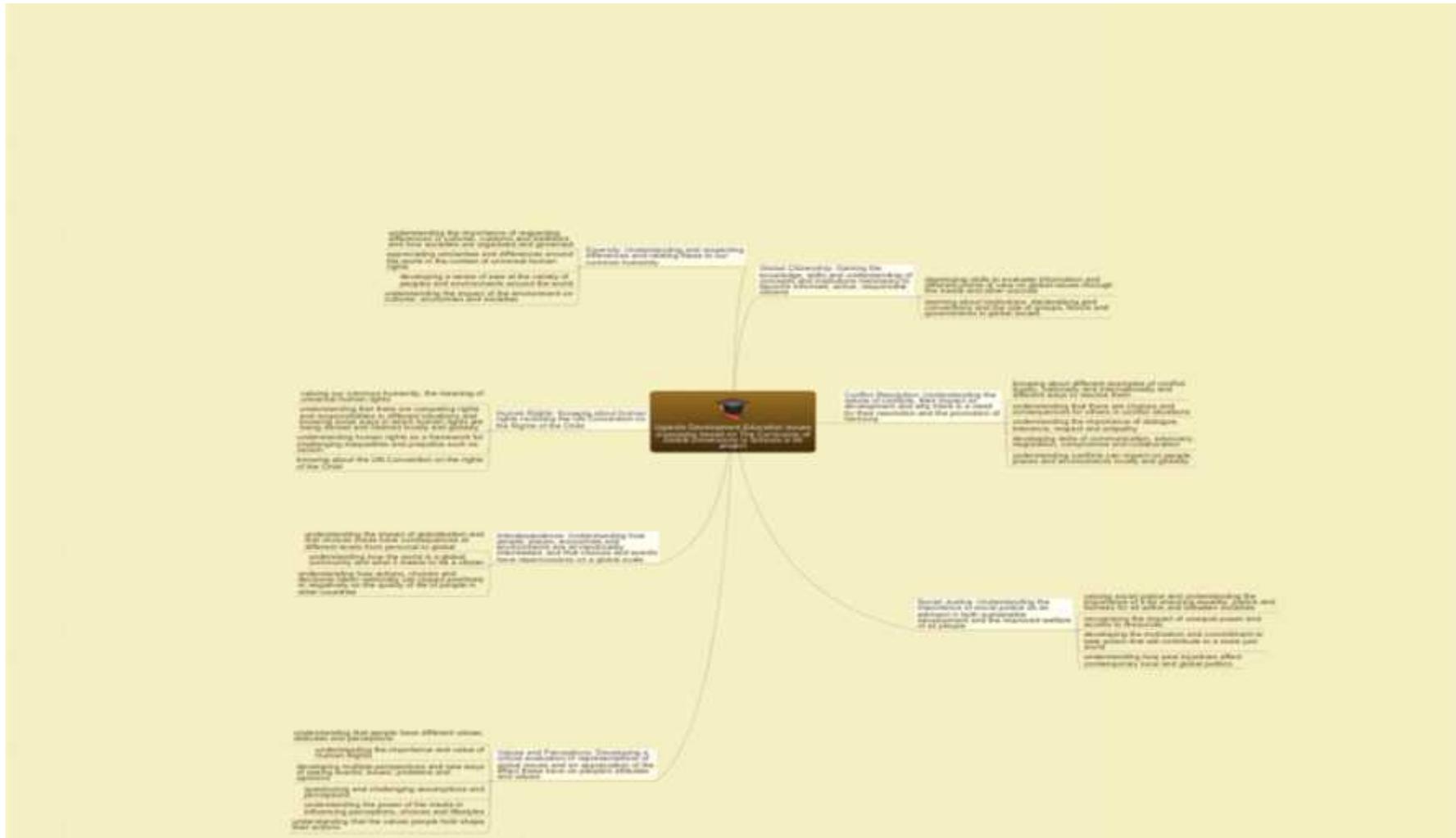
Researcher: You were building in the virtual world, which the other group didn't get to do. What do you think you learned from building?

P12: Like you learn from scratch how to put in stuff to make it move and like say if we ever wanted to do something like that we could actually do it now whereas then we would have been like 'how do you build the square, how do you build, how do you do this how do you do that?' Like now we actually know how to do it.

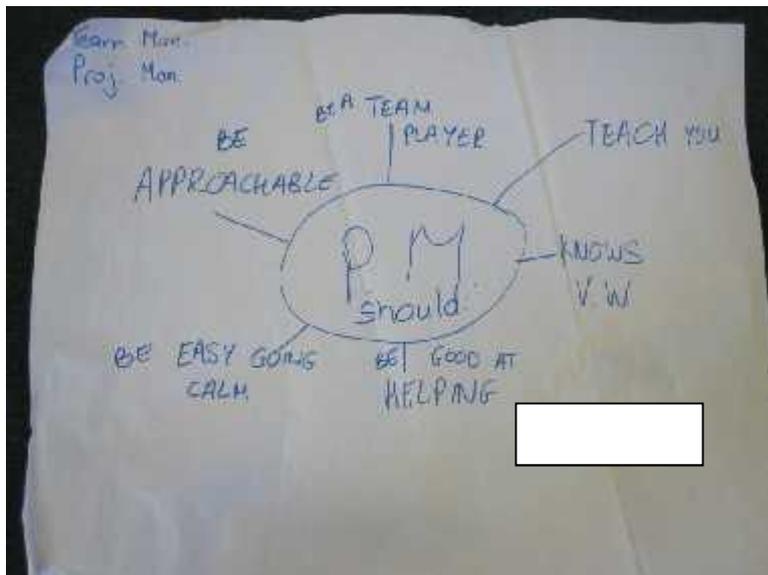
Appendix 21: Irish Primary School Curriculum Objectives for the Traditional Classroom Content Learning - 'Preparing' Stage



Appendix 22: Development Education Objectives for the Traditional Classroom Learning taken from http://www.oxfam.org.uk/education/teachersupport/global_dimension/files/The%20Eight%20Key%20Concepts%20of%20the%20Global%20Dimension.pdf – ‘Preparing’ Stage



Appendix 23: Photographs of the Participant Planning in the 'Doing' Stage of the Process



Desired qualities of a PM as identified by the participants



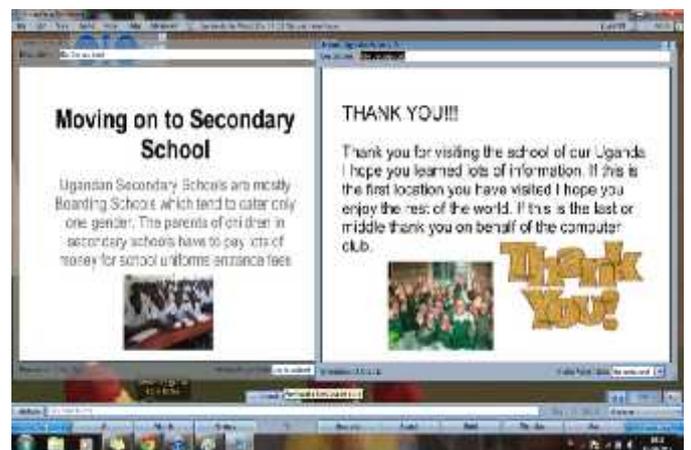
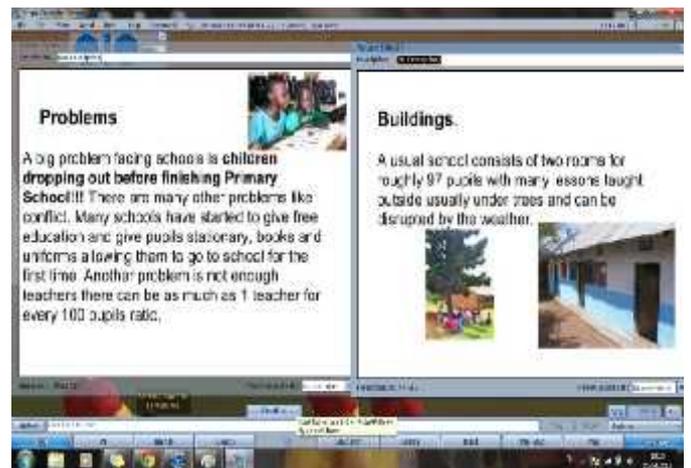
Content to be included in the development education learning experience built by the participants.



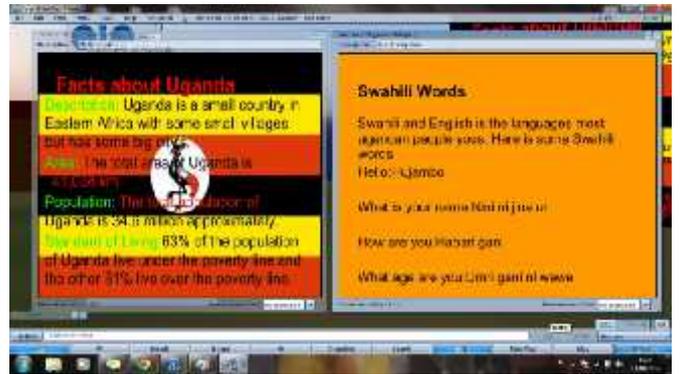
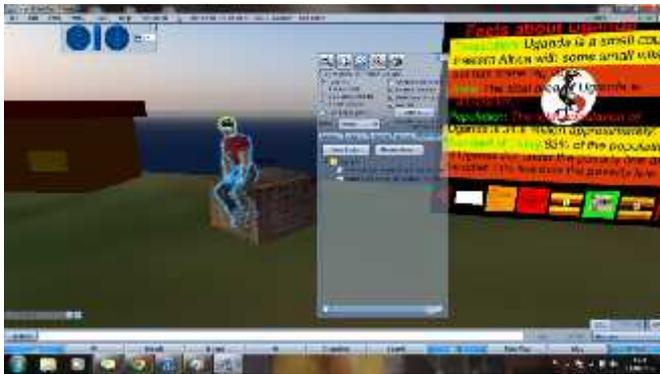
General design and layout of the development education learning experience.

Appendix 24: Screenshots of the Development Education Learning Experience Built by the Participants in the Virtual World. Screenshots show changes to the build over time.

The school building and information



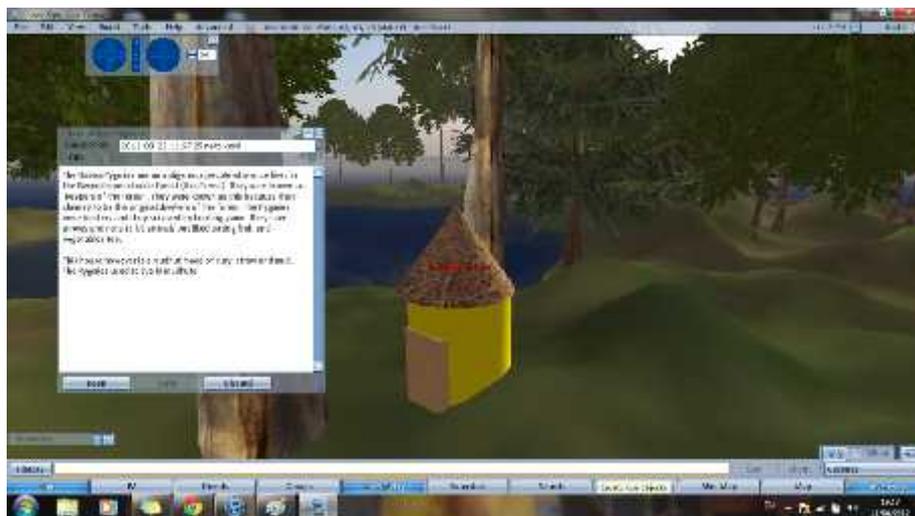
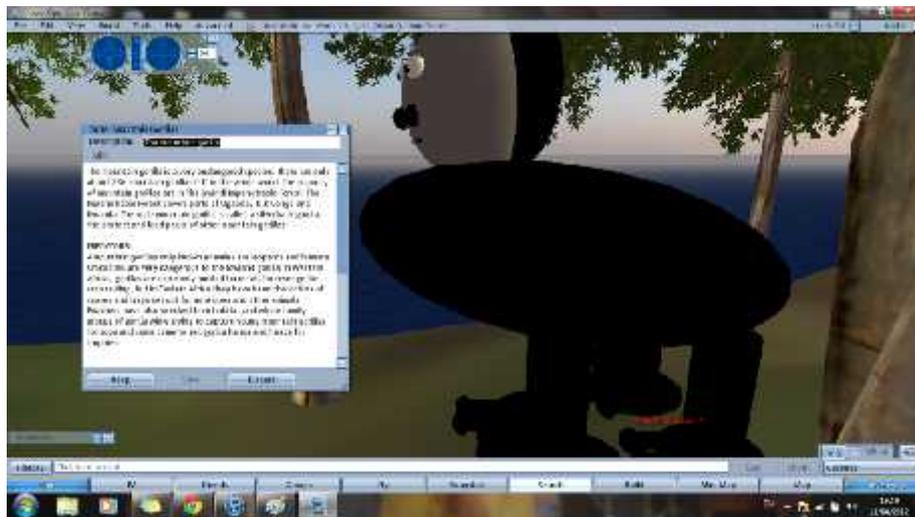
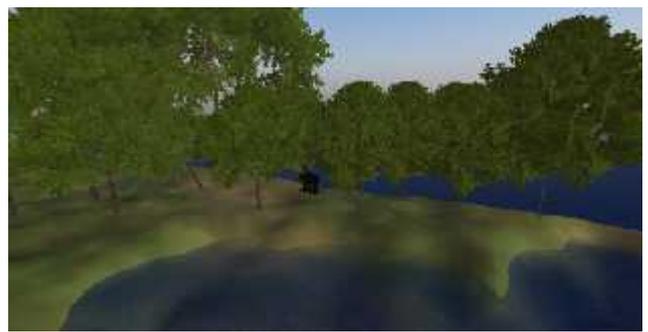
The village and information



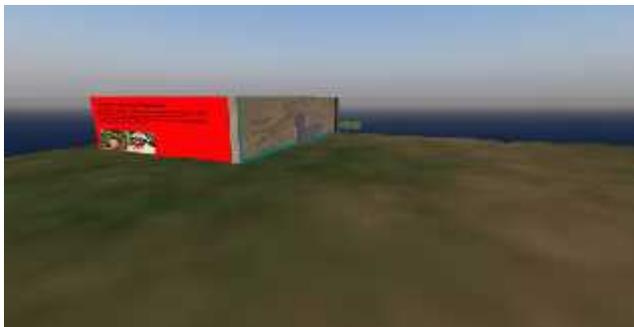
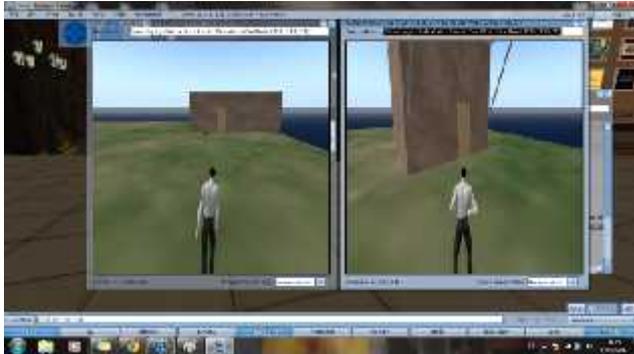
The Coffee Plantation



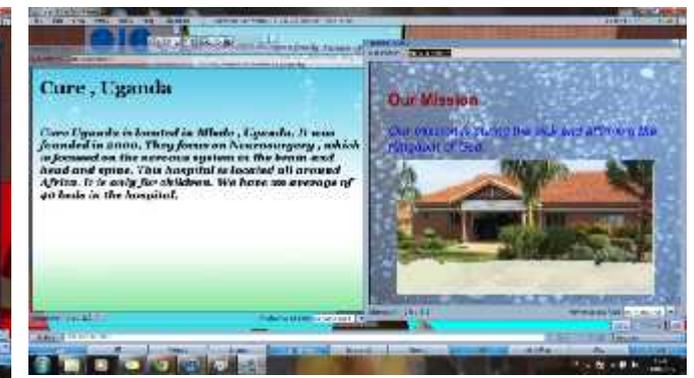
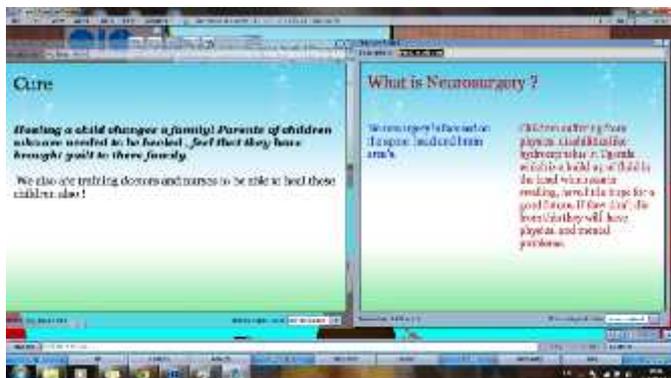
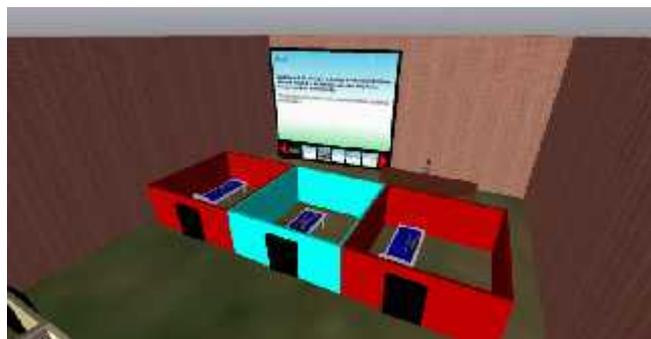
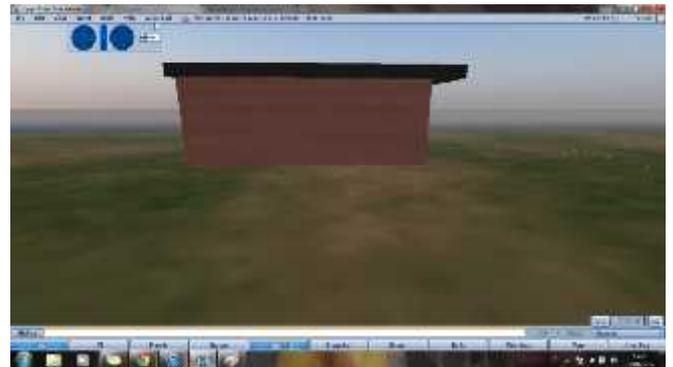
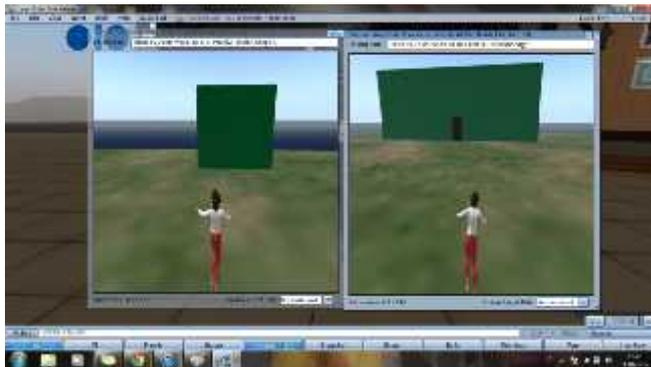
Impenetrable Forest



The Fair Trade Coffee Shop



The Hospital



The Meeting Point

