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Literacy Game in a virtual world

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AKO AOTEAROA NATIONAL CENTRE FOR TERTIARY TEACHING EXCELLENCE

MANUKAU INSTITUTE OF TECHNOLOGY Te Whare Takiura o Manukau

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Glossary of Virtual World Terms

virtual world	Navigable, visual, digital environments.
virtual reality	A term coined by Jaron Lanier in the 1980s to describe immersive, digitally rendered, visual experiences.
viewer	A program that runs outside of a browser that allows a person to enter a virtual world as an avatar.
avatar	A digital representation of a person that can move and operate inside a virtual world.
Second Life (SL)	A virtual world provided by Linden Lab.
Kitely	A virtual world using OpenSim software (open source, multi-user 3D application).
sim	A sim is an area of land (256m x 256m area hosted by a single simulator).
island (e.g. *Genome Island)*	An island can be a single sim, or several sims.
build	A build is a virtual world creation. Builds are constructed of prims (single units) that can be linked into objects. Mesh builds can now be created outside of the virtual world using a 3D program such as Maya, and then imported into the virtual world.
builder	The person with the skills and knowledge to create artefacts and environments inside virtual worlds.
rezz	Objects can be stored inside a virtual world inventory. When an object is dragged from the inventory into the environment, the object is rezzed.
lag	The delay between the action a person makes in world and the reaction of the server.

Table 1: **Glossary of virtual world terms**

Abstract

The Mythical World of Hīnātore is a new literacy game developed in the virtual world of Kitely. The game was funded jointly by the Northern Hub of Ako Aotearoa and Manukau Institute of Technology. The game is designed to fill literacy gaps for students who desire to follow a tertiary study pathway. Many tertiary students fail papers, even though the concepts they are taught are understood and retained, simply because they cannot adequately express what they know. This game is a small step towards addressing this issue. The game has been tested by students and staff at Manukau Institute of Technology's School of English and Foundation Studies. Student feedback from the pilot test has shown that the game is motivating and engaging, and focusses students' attention on aspects of sentence construction. Lecturers have acknowledged that the game is a useful literacy resource. The game is not restricted to class time and computer laboratories. Students can play the game in their own time, on home computers. If students are enjoying grammar and sentence construction, the result must be seen as positive.

Executive Summary

A Literacy Game, The Mythical World of Hīnātore, has been developed and tested. The game is on a virtual world Open Sim platform called Kitely. This project was funded by the Northern Hub of Ako Aotearoa and Manukau Institute of Technology.

In the past, grammar, sentence structure, and other aspects of writing literacy, have been untaught at tertiary level. An assumption was in place that students who arrive at a tertiary institution "know" how to do these things, but the reality is that many do not. Literacy gaps are a big problem. Many of our students fail, even though the concepts they are taught are understood and retained, simply because they cannot adequately express what they know. This game is a small step towards addressing this issue.

This report examines the ideas underlying the design of the game and the choice of a virtual world for creating game play. The chronological development of the game and method of data collection is outlined.

The data analysed in this report was collected from the first two classes of students who played The Mythical World of Hīnātore. Writing samples were collected from all students, both before and after the game playing experience. Writing samples were also collected from two comparable classes who did not use the literacy game. Two sets of *Adult Literacy and Numeracy Assessment Tool* TEC scores were also examined for all four classes.

Surveys were administered to both students and staff. Students completed their surveys on completion of the game. All staff members on the Foundation Literacy team, plus lecturers from Science and Business, completed a session where they were able to play the game, and then complete an in-depth survey.

Research findings are presented in this order: student surveys and reflections, TEC data, writing analyses, and then staff survey data.

- Student feedback was extremely positive. Students stated that the game helped develop their awareness of sentence structure and improve their knowledge and use of accurate grammar. Students stated that the game highlighted the need to take care when they entered text and made them more aware of the essential, basic skills that underpin academic writing.
- TEC results did not differentiate between student groups. As TEC measures reading literacy and not writing literacy, this result could have been anticipated. A tool for measuring writing literacy would be a valuable addition to the existing TEC testing portfolio.
- Data from writing analyses supported the hypothesis that the game would bridge literacy gaps. Students who participated in the game showed a more pronounced improvement in writing, than students who did not.
- Staff responses were extremely positive. Staff agreed that the game would be a useful tool to help bridge student gaps in literacy.

Further implications of game play for students are discussed in this report. Evidence indicates the game helped students improve their digital literacy and computer ability. In reflective comments, students reported a greater cultural awareness and an appreciation of the Māori legends used in the game narrative.

It is hoped that lecturers and students around New Zealand make use of the game as it is now freely available on the Kitely sim and can be used by anyone. The address is:

hop://osgrid.kitely.com:8002/Hinatore/72/76/24

If they wish to do so, institutions can pick up a copy of the game and use it on their own sim.

The game is accessible to any student group and up to 100 students can play the game at any one time. The sim is open 24/7. Any lecturer could offer this game to a class, a tutorial group, a study group, or an individual student. The lecturer does not need to be proficient in game play or have an avatar. Students play this game independently and do not need a lecturer on the sim with them. All the lecturer needs to know is how to access the software and recommendations for gameplay (these are provided in the Appendices).

Lecturers have acknowledged that the game can assist students with literacy gaps. The game is not restricted to class time and computer laboratories. Because it is fun and motivating, students will use it, even at home and in their own time. Many of the MIT students have downloaded the software on home computers and played the game with their families. This is a change for the better. If students are enjoying grammar and sentence construction, the result cannot be negative.

Project Outline

Educators have been using virtual worlds for the past decade. Virtual worlds are persistent 3D environments, i.e., they do not cease to exist when the user logs off. Although digital spaces, they provide a sense of real space. These worlds are created and maintained by multiple users who take the form of avatars. “Avatar” comes from the Sanskrit word for "a form of self" and is a computer user’s self-representation or alter ego (Papp, 2010).

For many years Second Life (SL), developed by Linden Lab and launched on June 23, 2003, was the main virtual world used by educators. Enthusiasm for the use of virtual worlds reached its peak from 2007 to 2009. By 2009, there were hundreds of leading universities and institutions around the world using SL as a part of their educational programs (Virtual Environments Enable New Models of Learning, 2009, para. 1). Following the decision of Linden Labs to abandon discounts for educators, a policy that was reversed on 1 July, 2013, there was a movement out of SL and into OpenSim and other alternative platforms such as Kitely and Sim-on-a-Stick. Educators still find SL unique in the availability of varied resources and communities of learners. Kitely is increasingly used by educators for a number of reasons: on-demand sims (the server only operates when someone is on the sim) leading to low cost, and cloud-based systems, that allow for very large worlds with low lag (Ashwood, 2013). For definitions of virtual world terms, please see *Table 1*, p. 5.

In the early days of virtual world teaching, there was little research data available to substantiate the claims of educators that virtual worlds could provide an enhanced learning environment where learners were more engaged and motivated. Now a body of research substantiates the continued use of virtual worlds for teaching and learning.

The link between games and learning has received a lot of attention in research publications. The body of research data is diverse and incorporates fields as dissimilar as business, cultural diversity, psychology, ICT and neuroscience. There is great potential for cross-discipline insights as long as researchers respect alternative perspectives, can establish a common vocabulary, explicitly articulate research assumptions, gather meaningful data, and formulate robust analyses (Whitton, 2014).

The main aim of this research project is to create a game in a virtual world to address literacy gaps in pre-tertiary and tertiary students. The learning outcomes for the game will be directed at writing literacy, including sentence structure and grammar. It is believed that students will also demonstrate an improvement in digital literacy. Other aims of this project include: improving retention and success, especially for students most “at risk”; providing a flexible learning environment that can be used by the greatest numbers of students and lecturers; and, providing a uniquely NZ environment that will immerse and engage students.

Figure 1: **Manukau Institute of Technology foundation students**

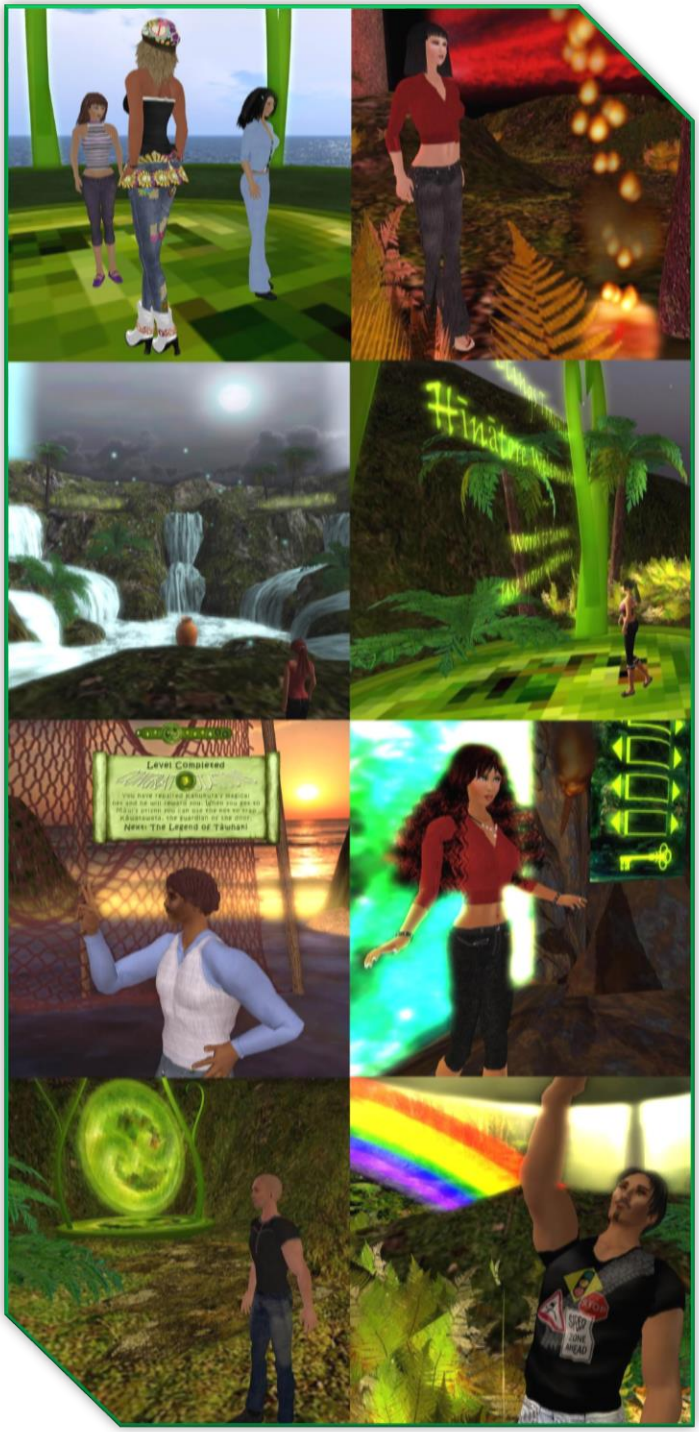


Figure 2: **Scenes from the Literacy Game**

Introduction

Virtual worlds have been used by educators for a decade. By 2007, it was suggested that virtual worlds would be the 3D web of the future. “Virtual worlds looked like a utopian technology with lots of zealous folks ready to evangelize the masses” (Essid, 2013). Although virtual worlds did not live up to the original hype, there is now a body of research that substantiates a continued interest in the potential of virtual worlds for teaching and learning. This research underpins the developing pedagogy of virtual world teaching and provides a firm basis for the provision of teaching excellence in virtual world environments.

Sections of this report include: Introduction, Method, Results, Discussion, Conclusion, and Limitations.

Five areas will be discussed in the introduction: the educational context, virtual worlds and virtual world education, digital games for learning, research in virtual worlds, and the underlying pedagogy.

The educational context will provide working definitions for very broad concepts underlying this research study: adult education, foundation (bridging or enabling) education, and literacy.

The second area of focus will be virtual worlds and gaming. This will include a discussion of learning and teaching, and research in these worlds. This will lead into a discussion of the pedagogical frameworks that illuminate educational practices in virtual worlds.

Following the introduction, this report will examine the development of the literacy game, The Mythical World of Hīnātore, and the research into the game’s potential for filling student literacy gaps.

The Mythical World of Hīnātore was conceived as an adult education tool, specifically designed to address gaps in literacy. Dewey (1926) stated, "Education is a social process; education is growth; education is not a preparation for life but is life itself" (p. 542). Rogers (2002) defined education as “a *process* of assisted or guided learning” (p. 45). He suggested that education can occur in any environment as long as there are planned learning experiences designed around “constructed and purposeful activities” (p. 47). Bonnett (1995) defined adult education in terms of change; that an educated adult would be able to assume the responsibility for the direction of his/her life, to overcome problems and manage situations through change. Adult learners come to any learning activity with varied experiences that should be utilised to maximise learning potential. The literacy game aimed at providing the opportunity for change through guided learning activities and the maximisation of learning potential.

Students who have trialled the literacy game were all foundation (bridging or enabling students/ second chance learners). Bridging/enabling students are “undoubtedly talented but …don’t have the specific skills and credentials for entry to further study and the workforce” (Anderson, 2007, p. 3). For many foundation students, life experience has included failure and rejection, and this

can make learning seem an overwhelming task. These students can be supported in the relative safety of a virtual world environment. Students are a mixture of those who chose to leave education early as the high school system was not working for them; those who were forced to leave out of financial necessity, teen pregnancy or family need; those who are at crossroads and have made a conscious decision to change direction; and those who are battling with a new life in a new country and having to retrain in the English language. Middleton (2003) analysed the question of success for foundation students. He suggested that "in all the work that we do we help people by giving them success - the only currency that education has that is worth striving for" (p. 5).

Literacy is a key to educational success. Literacy is an integrated process that includes the complete functioning of the individual within his/her society. A comprehensive and holistic view of literacy is reflected in the definition of literacy used by *Literacy Aotearoa*:

> Literacy is listening, speaking, reading, writing, numeracy and critical thinking, interwoven with the knowledge of social and cultural practices. Literacy empowers people to contribute to and improve society (2011, para. 3).

In South Auckland, the home of Manukau Institute of Technology, literacy levels are lower than the national average (Satherle & Law, 2007). Developing the literacy levels of students will allow them a much greater chance of achieving both academic and life goals. The Mythical World of Hīnātore was developed to help address literacy needs.

The New Zealand Government has been instrumental in promoting the development of literacy and numeracy at all levels in the New Zealand educational curriculum. Part of this drive has been the development of the Learning Progressions. These progressions provide a framework for examining literacy levels (competency steps explained with comprehensive descriptors). The progressions show what adults should achieve at various points in their learning and provide a guide for knowing the next step or aspect of learning that needs to be achieved. The Literacy and Numeracy Progressions are tested by the Tertiary Education Commission using the *Adult Literacy and Numeracy Assessment Tool*. This test is used by all Foundation Level 3 students so was seen as a tool to examine progress in literacy over a semester course.

Merchant (2009) suggested that literacy itself is changing with the infusion of new technology. He described virtual worlds as places where students have a motivation for using literacy in a multiplicity of different and purposeful ways. He pointed out that more and more everyday activities involve screen-based literacies and that digital literacy is an integral part of integrated literacy. It was believed the literacy game would lead to an improvement in digital literacy as well as written literacy.

The conceptualisation of a game in a virtual world hoped to tap into the advantages of both games and virtual worlds as educational tools. A virtual world is a persistent three-dimensional environment. A persistent environment does not cease to exist when a user logs out (leaves the program). Virtual worlds are richly immersive and highly scalable 3D environments. Bartle

(2004) characterized virtual worlds as places where the imaginary meets the real, indicating the balance that designers try to achieve between reality and fantasy in the virtual environment.

Participants represent themselves as avatars in the virtual space. A virtual world is populated with multiple simultaneous participants who are social beings and can communicate with each other through text or voice chat. Lombard and Ditton (1997) stated that virtual worlds use a metaphor of a physical area ("space and place") to create the illusion of "being in the virtual world" (p. 25). Users of virtual worlds report a unique sense of presence that is very distinct from other forms of Internet communication (Riva, Mantovani, & Gaggioli, 2004). Researchers in neuropsychology have found evidence that the human brain performs "body mapping", forming an internal map of the physical body and the environment (Riva, et al., 2004). This mapping can be extended to objects outside the body. Body mapping of the self can be transferred to the avatar in a virtual world, allowing for a sense of being really "in" this world (Riva, et al., 2004). Emotional closeness through shared experience and a sense of immediacy arises out of interaction in virtual worlds (Salt, Atkins & Blackall, 2008).

The number of virtual worlds is growing steadily, as the range in types of virtual worlds also increases. Recent advances in technology indicate that accessibility to virtual worlds will accelerate with advances in technology such as Sim-on-a-Stick (Hax, 2012; 2013) web-based html5 with a canvas element that enables 3D rendering (Hax, 2010; Paul, 2010), and virtual world mobile apps (Taylor, 2011; Trier, 2013). Kay and Fitzgerald (2008) in the *Second Life in Education Wiki*, stated:

> The unique qualities of a 3D virtual world can provide opportunities for rich sensory immersive experiences, authentic contexts and activities for experiential learning, simulation and role-play, modelling of complex scenarios, a platform for data visualisation and opportunities for collaboration and co-creation that cannot be easily experienced using other platforms (para. 1).

A further unique characteristic of a virtual world, the ability to be represented by an avatar, provides a sense of security so that more reserved students can be encouraged to participate in a less threatening environment. de Freitas et al. (2010) provided evidence to support the benefits of virtual worlds for under-served learners. They further stated that virtual worlds support distributed learners. Adult and non-traditional learners benefit from flexibility in meeting times and delivery (Visger, 2007, p. 11).

Other educational advantages of virtual worlds for teaching include: social interactions and collaboration, learner empowerment through engagement, role plays and mentoring that foster creativity, new learner spaces, and problem-based learner-led activity (de Freitas & Veletsianos, 2010). According to Erenli and Ortner (2011) the three most important reasons for using virtual worlds are: that young people grow up with these worlds and there is a commitment to their use; motivation is high when there is visual appeal; and, virtual worlds are fun.

Dickey (2006) discussed the importance of the learning environment in educational practice today. "New models and methods must be sought to support learner scaffolding for complex,

multimodal learning environments" (Dickey, 2006, p. 249). Dickey stated her belief that computer games provide this type of multimodal learning environment.

Hundreds of articles, and even entire books, have been dedicated to defining the word "game". The definition provided by Whitton (2014) is the accepted definition for this research study.

A game is:

- a challenging activity;
- structured with rules, goals, progression and rewards;
- separate from the real world;
- undertaken with a spirit of play (p. 5).

Effective learning experiences and learning environments share many of the characteristics of games. These include: having tasks that are challenging but achievable, scaffolding learners through levels of difficulty, having clear, measurable learning objectives, providing appropriate assessment and feedback, and enabling learning though interaction. Constructive alignment (Biggs, 2003) through the provision of learning objectives, activities, and assessment, is found in tertiary course design and game design.

Whitton (2010, p. 99) provided a guideline for game design. The aspects she listed were key considerations in the design of The Mythical World of Hīnātore. These included:

- The environment should support *active learning* – the provision of opportunities for problem-solving and the alignment of game goals with learning outcomes
- The environment should *engender engagement* – having clear, achievable goals, interaction, and a stimulating environment
- The gaming world should be *appropriate for the learning context* – a resource that is designed to fit a recognised need, to be manageable in terms of time, and to engender positive student response
- The environment or associated activities should support and provide *opportunities for reflection*
- The environment must provide *an equitable experience* for all users
- The gaming world needs to provide *ongoing support* – the provision of "quick initial success… a gradual introduction of increasing complexity, supported with help, hints or clues" (Whitton, 2010, p. 99).

Game design guidelines overlap with the key elements of digital game-based learning (DGBL) which are:

- Effectively meeting learning outcomes
- Motivating
- Efficient (All et al., 2014).

The idea for a literacy game initially came from discussions held with the Second Life Education New Zealand (SLENZ) Project Team, at their first face-to-face workshop, held in Wellington in November 2008. The SLENZ Foundation Project was designed to train foundation students in interview skills (Lemon & Kelly, 2009). The SLENZ Project, funded by the New Zealand Tertiary

Education Commission's Innovative Learning Fund, found that learner engagement was increased in a familiar game-like environment and that learning was intentionally enhanced through "play" (Winter, 2010, p. 8). Further results collected after the SLENZ Project confirmed initial SLENZ findings. In an interview assessment, students trained in SL achieved a 100 per cent success rate (classroom trained students achieved 82.3 per cent success rate). A Merit Pass for this assessment was possible, with 22 per cent of classroom-trained students achieving this higher pass. 94 per cent of SL students achieved a Merit Pass in interviewing (Hearns, 2012, p. 253).

Hearns (2011) indicated that a virtual world had the potential to fill literacy gaps with indigenous students. This was a further source of inspiration for the later development of the literacy game. A group of Māori pre-degree nursing students, studying foundation communication, participated in a literacy intervention in SL. Students were assessed using literacy diagnostic testing, and the aim was to move students forward on the literacy progressions outlined by the NZ National Centre of Literacy and Numeracy for Adults. Two interventions were used: a set of activity sheets that were available to all class members, and SL tasks designed to assist a small group of students with identified literacy needs. In SL students visited the Red Mesa sim and completed activities comparing their own culture to that of the indigenous American. Students reported this work satisfying, feeling more confident using a computer, and they perceived an improvement in their own writing skills. They also showed a faster progression on the literacy progressions than students who did not use SL.

The use of virtual worlds can enhance teaching but sound teaching principles must always be a prerequisite. Adult education is a very diverse area and virtual world adult education and game research increase this diversity. The SLENZ Literature Review (Salt et al, 2008), examined some of the pedagogical perspectives of relevance in virtual world teaching. Learning in any virtual world can be examined in terms of behaviourism, cognitivism and constructivism, as well as newer pedagogies such as linguistic and socio-cultural (Salt et al, 2008, p. 39).

The pedagogical foundation for the research into the literacy game can best be shown in a diagram (see *Figure 3.* Pedagogical underpinnings of the Literacy Game). One of the most influential pedagogical underpinnings of this study was a model of instructional design, Keller's ARCs Model of Motivational Design (Keller, 2006), that has its grounding in the cognitivist perspective.

Keller's ARCs Model of Motivational Design (Keller, 2006) was utilised extensively in game design. Motivational design refers to the process of arranging procedures and providing resources that lead to increased levels of student motivation (p. 3). Motivational design aims at determining replicable principles and processes that can be used to improve students' motivation to learn and skills in self-motivation.

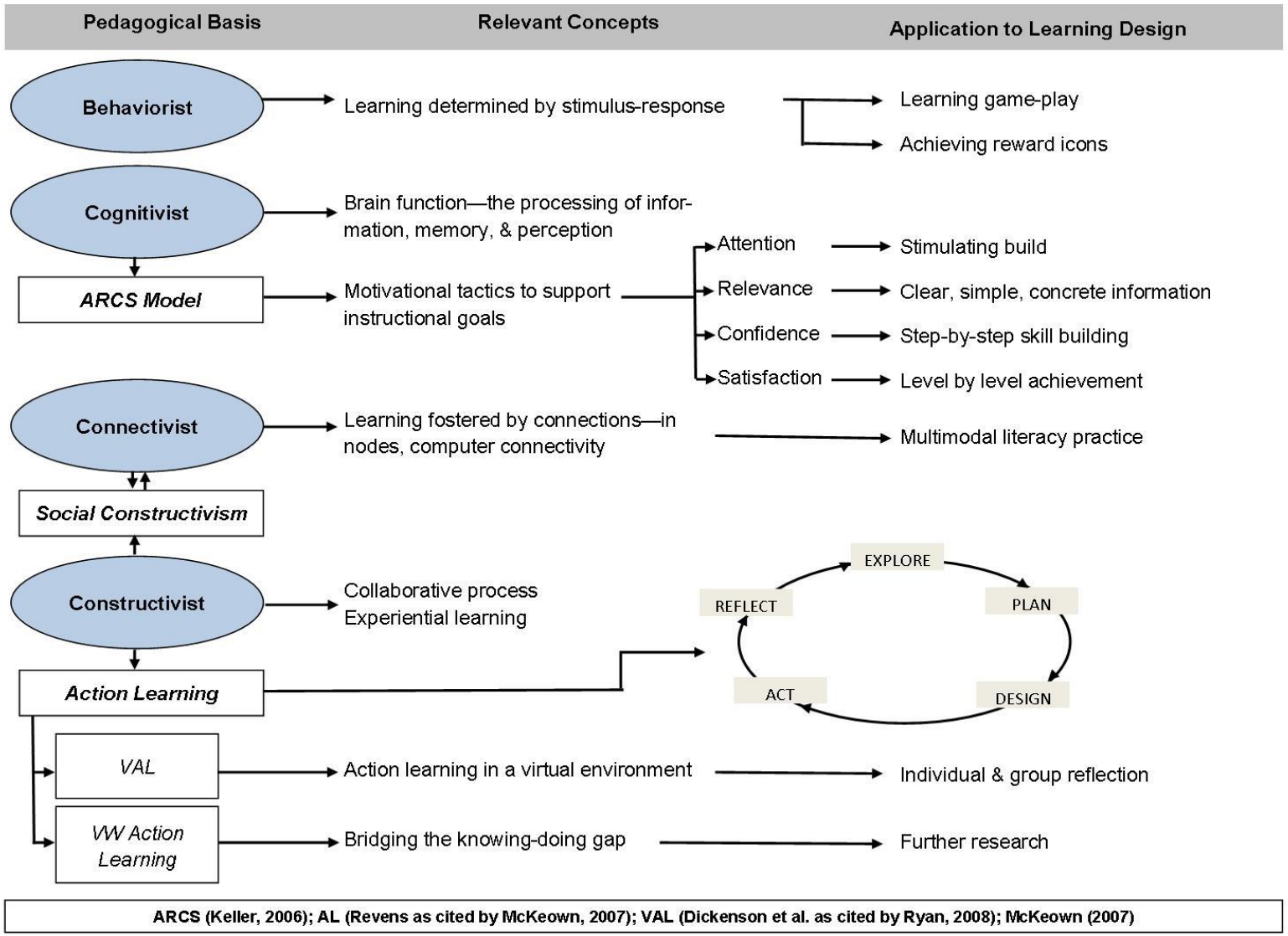


Figure 3: **Pedagogical underpinnings of the Literacy Game**

Traditionally, the focus of learning design has been the technique and process of producing effective instructional resources. Keller's design adds a different perspective where the designer needs to consider processes and strategies for making learning appealing and rewarding. The key is that learning must be efficient in terms of teaching resources and time, inherently interesting and effective. This can be done by ensuring that motivational tactics support instructional goals. Several reviews of educational projects in virtual worlds have emphasised the importance of motivation in learning and transfer (Prawat, 1989; Erenli & Ortner, 2011; Dass et al., 2011).

According to Keller's ARCS Model, promoting and sustaining learning motivation is accomplished by: attention (through perceptual or inquiry arousal), relevance (using concrete language and examples), confidence (helping students realise they can succeed), and satisfaction (providing positive results and feedback) (Keller, 2006, p. 7). These four aspects were guiding principles behind the construction of the literacy learning activities. Game development was guided by an understanding of the importance of providing effective and relevant experiences and efficient resources and processes.

Research hypotheses

The following hypotheses were examined:

- That the virtual world literacy game will fill literacy gaps by improving writing accuracy
- That the virtual world literacy game will fill literacy gaps by improving reading accuracy
- That the virtual world literacy game will improve digital literacy levels in students
- That students will meet learning outcomes through game play
- That student retention and success will be improved through the introduction of the literacy game
- That students will find the game environment and narrative interesting and engaging

Research aims

The aims of the Literacy Game include: filling identified gaps in student literacy profiles; improving retention and success, particularly for students most at risk, i.e. those with deficiencies in literacy; providing a learning environment that is flexible and will be of use to the greatest number of lecturers and students; and, providing a uniquely New Zealand environment with which all students can identify. The Literacy Game is a safe environment where students can succeed, and learn about grammar and sentence structure. There are no scores – students receive rewards for their efforts. There is a lot of reinforcement, encouragement, hints, and support for learning.

Implications of this study include:

- Understanding why learning in virtual worlds is transferable will encourage other educators to try virtual world teaching for themselves

- Literacy skills transferable to pathway courses and careers will allow gaps in literacy to be filled
- Utilising what is perceived as the motivating and engaging nature of virtual worlds and gaming for learning will enrich the educational experience of adult learners, especially adult learners in bridging programs, who may have previous negative experiences in traditional classroom environments

Method

The Game

The development of the Literacy Game was funded by the Northern HUB of Ako Aotearoa and by MIT.

Steps that led to the game, in chronological order, include:

- The lead researcher collected data on literacy gaps in all classes at MIT for five years before first entering virtual worlds.
- 15th to the 17th of December, 2008, the lead researcher and the game builder/scripter participated in the first face-to-face workshop of the Second Life Education NZ (SLENZ) Project. Informal discussions touched on the possibility of virtual world games for learning.
- 2008 to 2010 success in virtual world teaching was documented in several publications (Lemon & Kelly, 2009; Lemon, 2009; Hearns, 2011; Hearns et al., 2011; Hearns, 2013a; Hearns, 2013b). This included a literacy intervention in Second Life (Hearns, 2011).
- MIT funding and ethics approval was granted. A funding application to the Northern HUB of Ako Aotearoa was accepted.
- Brainstorming meetings of the MIT School of Foundation's literacy teaching team, with guests invited from the MIT School of English, stimulated ideas for the game, tapped into a wealth of expertise, and enabled the allocation of suitable tasks for levels of play that would scaffold and nurture literacy learning.
- A meeting between the lead researcher and the well-known NZ author, David Hare confirmed the decision to use Māori legends as the game narrative. David suggested legends should be regarded as taonga (treasures), and used with reverence and respect.
- The lead researcher and builder/scripter met regularly on Kitely as the game was developed. The lead researcher confirmed the learning outcomes, wrote the legends and tasks, while the game builder/scripter gave life to the game in Kitely. A record of building/scripting decisions and processes has been recorded on the builder/scripter's blog (Griffiths, 2013).
- The first students entered The Mythical World of Hīnātore in Kitely, March 11, 2014.

The basic game story for the Kitely Literacy Game, The Mythical World of Hīnātore incorporates elements of Māori mythology. The game setting resembles New Zealand before colonisation. Development decisions were reached with the specific aim of facilitating the ease and comfort of tangata whenua, local Māori, as well as Pacifica students, in the game setting. It was also hoped that manuhiri, New Zealand immigrants, would find it both fascinating and informative. The Mythical World of Hīnātore, is not only suitable for face-to-face classes, but for blended and online learners as well. The game has Creative Commons Licensing.

The main objectives of the literacy game are:

- to help students recognise a well-structured sentence;
- to help them to identify a complete sentence; and,
- to help them identify solutions to common problems in grammatical structure.

Each player completes the game level in an enclosed game space. The game spaces are rezzed (brought into play) as they are needed above the Kitely sim and then de-rezzed once the level has been completed. This allows multiple players to proceed through game levels at the same time and multiple levels to be played simultaneously. The player is confined to the part of the game to which he/she has progressed and he/she is not able to access higher levels of play until skills are demonstrated and a certain level of proficiency achieved, i.e. he/she has “levelled up”.

There are six levels of play. Each level is based on a myth or legend. Each of the first five levels has seven challenges where a correct sentence has to be constructed from a given bank of words, or a sentence corrected. As soon as students type the correct sentence, the level is continued. Once all challenges are met, the player obtains a reward that can be used to help the student achieve the ultimate objective on the final level. (Literacy game url: hop://osgrid.kitely.com:8002/Hinatore/72/76/24).

Each level of play has its own literacy objectives. A sample of these objectives appears below:

- **Level 1: The Legend of Uenuku**
    - Recognise that a sentence must start with a capital letter and end in a full stop
- **Level 2: The Legend of Rona**
    - Use prepositions and articles correctly
    - Correct a sentence fragment
- **Level 3: The Legend of Kahukura**
    - Correct inaccurate use of verb tense
    - Correct a run-on sentence and a sentence fragment
- **Level 4: The Legend of Tāwhaki**
    - Identify a lack of agreement between singular/plural subjects and verbs

    - Identify unnecessary apostrophes and unnecessary capital letters
- **Level 5: The Legend of Mahuika**
    - Identify a lack of agreement in the use of singular/plural pronouns in sentences
    - Split and join sentences correctly
- **Level 6: The Legend of Hīnātore**
    - Recognise sequencing words
    - Construct a logical paragraph using sequencing markers

Participants

All students who participated in the game were Level 3 Foundation students, enrolled at Manukau Institute of Technology (MIT) in South Auckland.

These students represent over 60 different countries of origin. The amount of ethnic diversity is higher than student populations in other NZ centres. *Figure 4* shows a comparison of the ethnic mix of students from MIT foundation (2012) compared to Massey University distance students (Massey University, 2012) and Waikato University general student body (The University of Waikato, 2010). There has been a general trend towards an increase in Pacifica and Asian students and a decrease in European/Pakeha students.

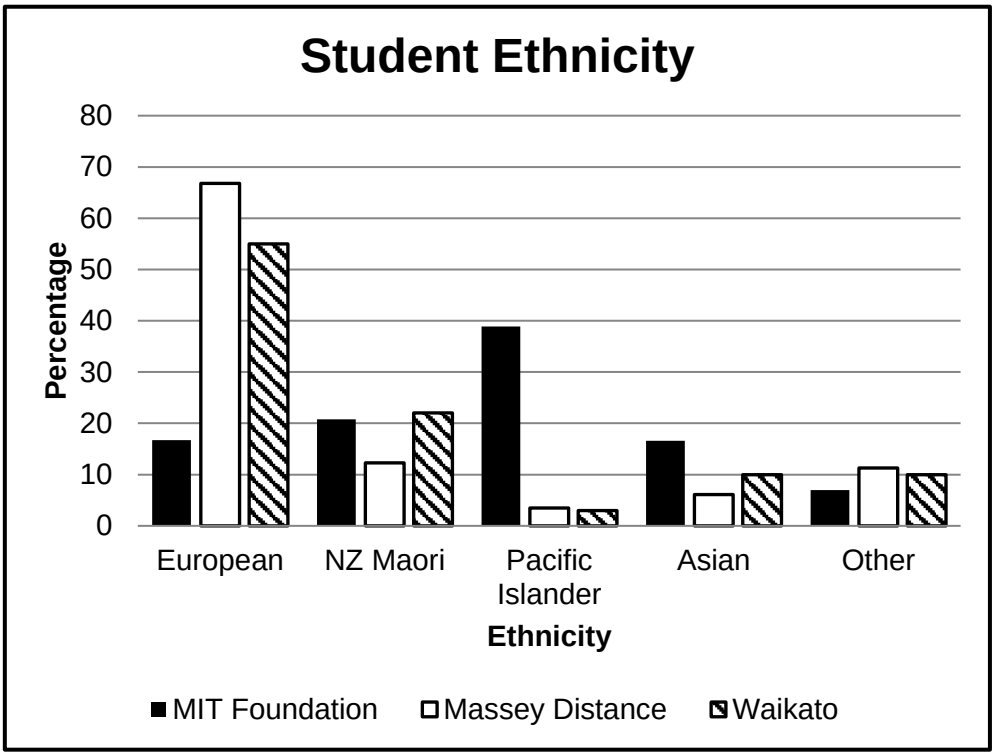


Figure 4: **Comparison of ethnicity: foundation students from MIT, Massey distance students, and Waikato student population**

A rise in younger students is a general trend in current NZ bridging programmes (Tertiary Education Strategy, 2007, p. 15). The recent influx of younger school leavers is not surprising as in South Auckland, Manukau City statistics show 800 students leave school each year with few or no qualifications (Quality of Life, 2009, p. 64).

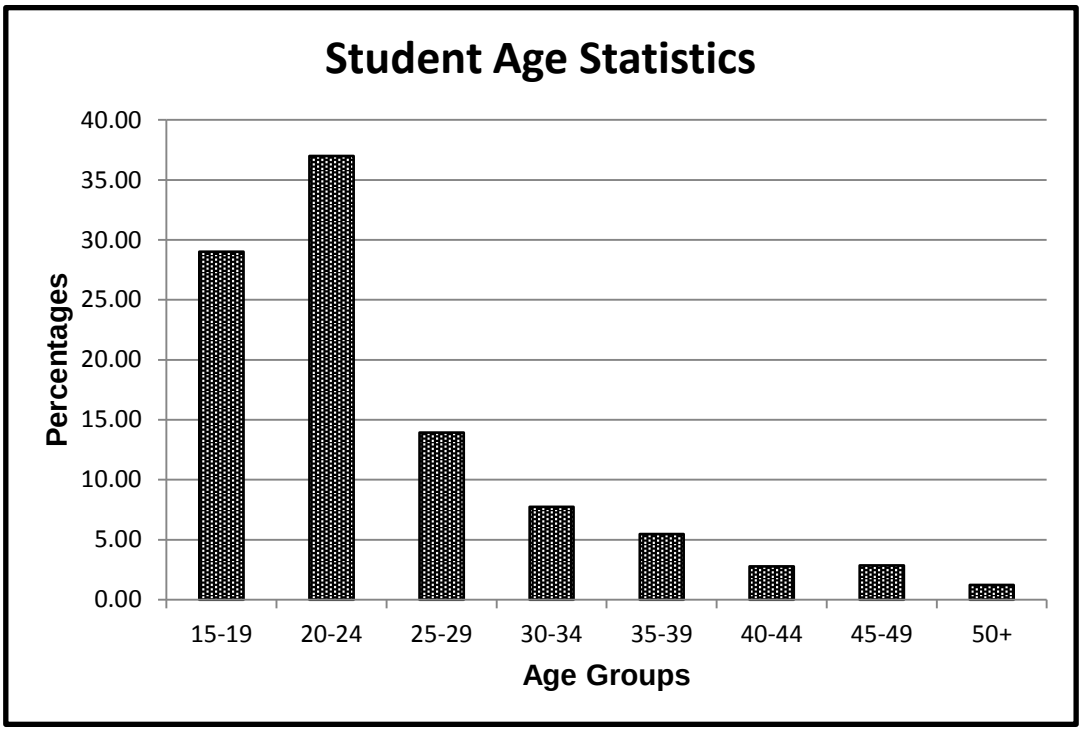


Figure 5: **Age groups for foundation students from MIT**

There are always more females than males in foundation classes at MIT. This may be due to the fact that the majority of the classes are pre-degree nursing, and there is only one class per semester for pre-degree engineering. Statistics for MIT (2012) foundation students were 77 percent female and 23 percent male.

Two classes were selected to trial the Literacy Game. The selection of these classes was based on availability. Only one computer laboratory at MIT is equipped to run virtual worlds. This lab (A402) has adequate specifications for the computers, and IT have allowed relaxations of firewall restrictions for this single laboratory, in order for the virtual world software to run successfully (please see Appendix A, p. 43-44 for the necessary technical information for the literacy game to run on institutional computers). Only two Level 3 classes (40 students) were timetabled to use the A402 lab for two sessions per week. These classes were invited to participate and all students signed a consent form. These classes were matched on overall class size, gender, age, and ethnicity, with two classes who were not timetabled to use A402.

Data collection

- Data collection included diagnostic literacy assessments conducted with all classes.
- A writing error analysis, looking at a comparison of work from students who agreed to take part in the game scenario, with those who did not have the same opportunity,

was conducted. 100-word samples from pre-and post-game play were analysed. The writing samples were taken from in-class writing tests.

- The Adult Literacy and Numeracy Assessment Tool, used for pre- and post-testing by every Foundation Studies class, provided a reliable and valid source of data.
- Students also completed a survey on the game experience and a reflective journal after playing the game. Insight into several factors was revealed through reflective statements and survey data collection: student's personal attitudes to themselves as writers, and whether or not the virtual world learning environment affected their approach to literacy.
- Lecturers from the Foundation literacy, science and business teams were introduced to the game, played the game, and gave feedback using a comprehensive survey.

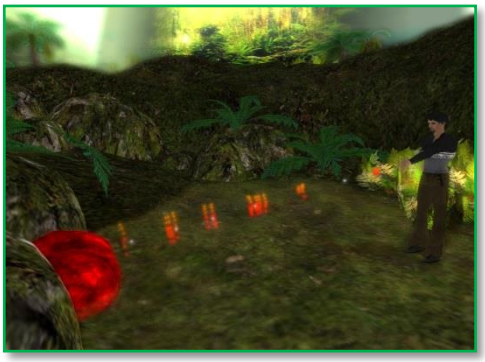


Figure 6: **Student on Level 1 of the game**

Figure 7: **Crossing the bridge to the portals on Level 2**

Figure 8: **Game Finale**

Results

Four sets of data were examined:

1. Student surveys and reflection
2. TEC data
3. Writing error analysis
4. Lecturer feedback

Student surveys and reflection

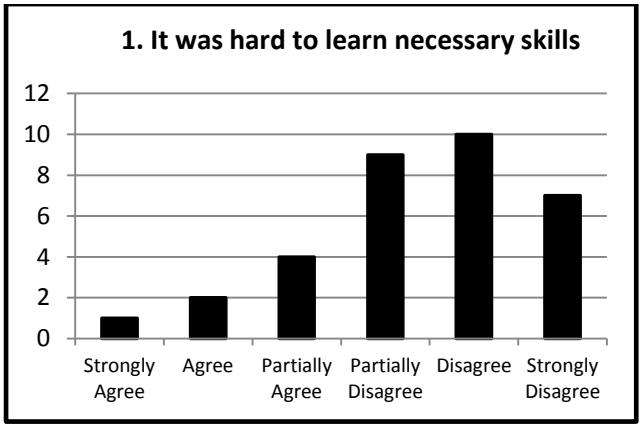
All students who completed the Literacy Game were asked to complete a paper survey. This survey used a Likert scale (with both positive and negative statements), as well as questions requiring reflection and comment. The 12 statements were:

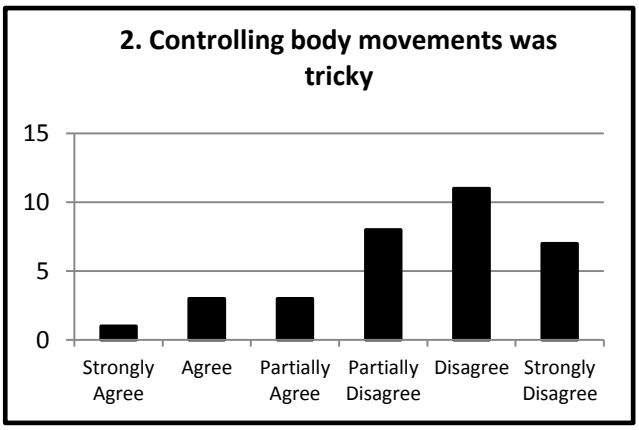
1. It was hard to learn necessary skills, e.g., controlling the camera, knowing where to type the answer, etc. in the Kitely virtual world.
2. Controlling body movements was tricky, e.g., walking, clicking, teleporting, in Kitely.
3. I enjoyed reading the legends.
4. The game instructions were easy to follow.
5. I had to think hard to complete the tasks correctly.
6. The time I spent in the game was a waste of time.
7. I learned how to construct a correct English sentence.
8. Thinking about the tasks made me more aware of sentence structure.
9. I found the tasks were too difficult.
10. I am happy that I performed well in the game.
11. I will be more aware of my sentences when I have to write in class.
12. I would never again choose to use a virtual world for learning.

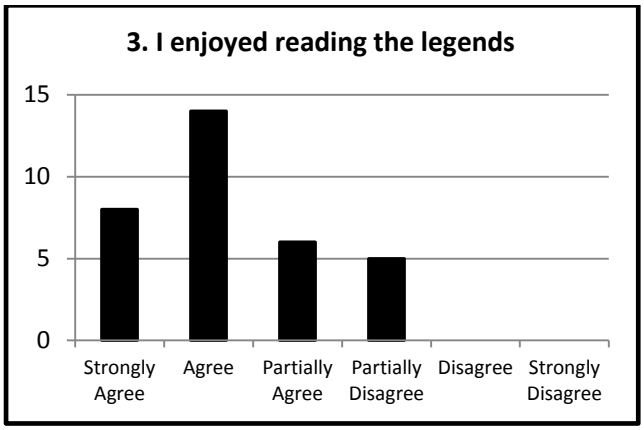
Results are summarised in the following table

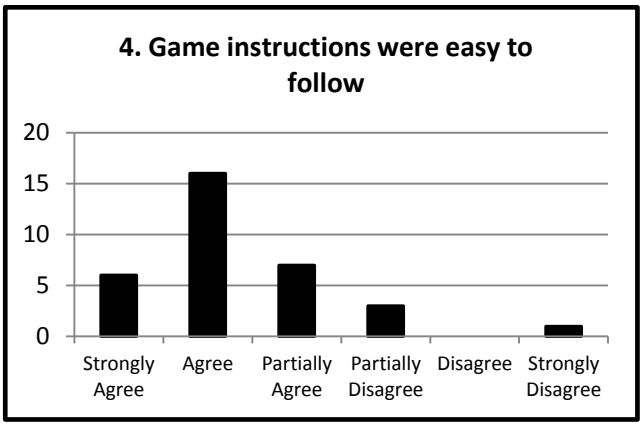
		Strongly Agree	**Agree**	**Partially Agree**	**Partially Disagree**	**Disagree**	**Strongly Disagree**
1	Hard to learn skills	3.03	6.06	12.12	27.27	30.30	21.21
2	Controlling movement tricky	3.03	9.09	9.09	24.24	33.33	21.21
3	Enjoyed legends	24.24	42.42	18.18	15.15	0.00	0.00
4	Instructions easy to follow	18.18	48.48	21.21	9.09	0.00	3.03
5	Had to think hard	18.18	30.30	33.33	9.09	9.09	0.00
6	Waste of time	0.00	3.03	12.12	15.15	33.33	36.36
7	Construct sentence	21.21	48.48	27.27	3.03	0.00	0.00
8	More aware of sentence structure	33.33	48.48	12.12	3.03	3.03	0.00
9	Tasks too difficult	3.03	9.09	27.27	12.12	45.45	9.09
10	Happy I performed well	27.27	54.55	12.12	0.00	3.03	3.03
11	More aware when I write	24.24	42.42	24.24	6.06	3.03	0.00
12	No more vws	3.03	0.00	9.09	15.15	36.36	36.36

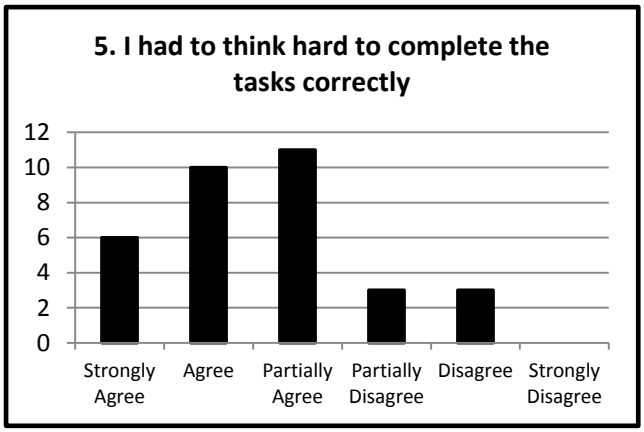
Table 2: **Percentages for student surveys**


1. It was hard to learn necessary skills
12
10
8
6
4
2
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree

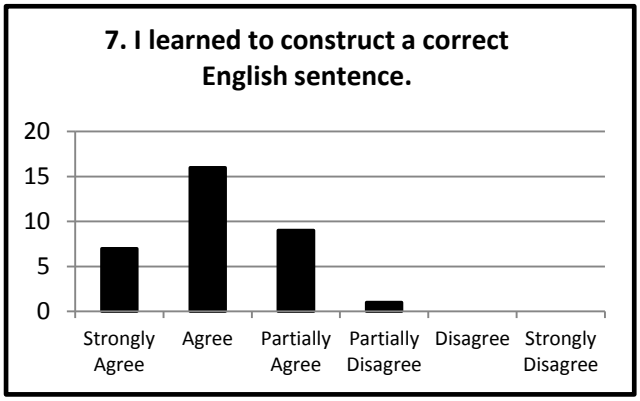

2. Controlling body movements was tricky
15
10
5
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree

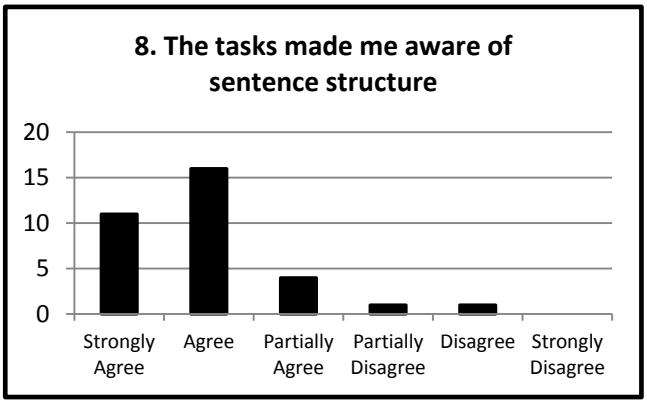

3. I enjoyed reading the legends
15
10
5
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree

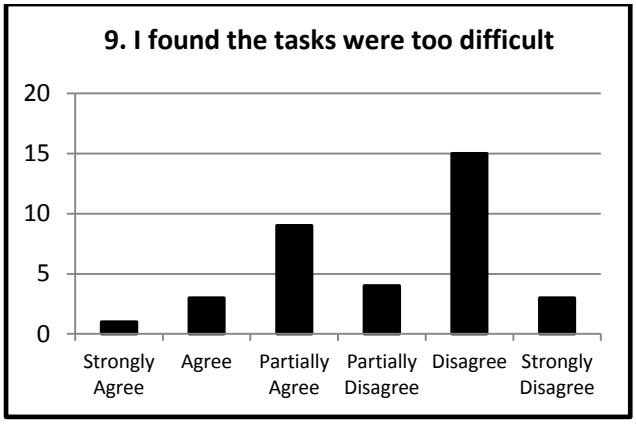

4. Game instructions were easy to follow
20
15
10
5
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree

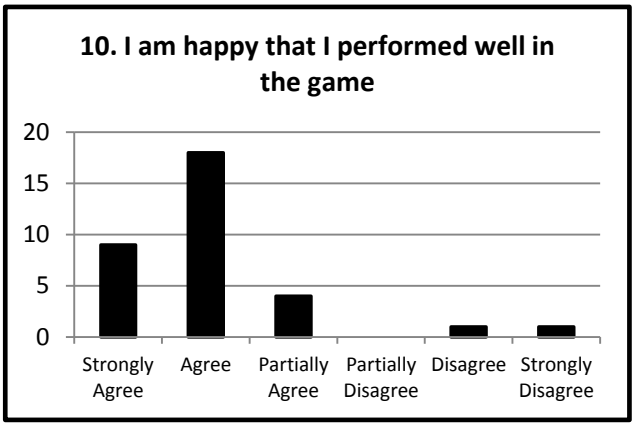

5. I had to think hard to complete the tasks correctly
12
10
8
6
4
2
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree

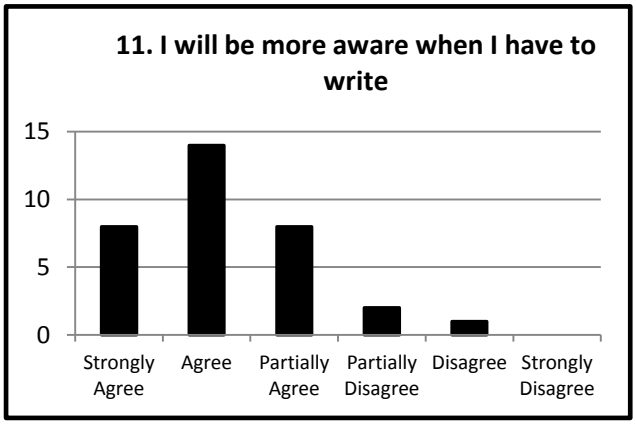
6. The time in the game was a waste of time
15
10
5
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree

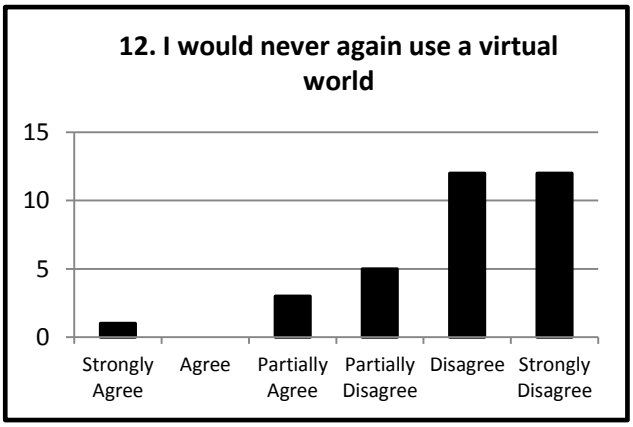

7. I learned to construct a correct English sentence.
20
15
10
5
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree


8. The tasks made me aware of sentence structure
20
15
10
5
0
Strongly Agree
Agree
Partially Agree
Partially Disagree
Disagree
Strongly Disagree









Figures 9 to 20: **Student survey Likert-style statement results**

The remaining questions were reflective and dealt with the best and worst aspects of the game, and any further comments students may have wished to make.

When reporting on *the best aspect of the game*, common themes can be represented in the following quotations:

- “It was a challenge learning new things and learning how to structure sentences properly. It was a good educational game” (Student response)
- “It was easy to follow. Reading the legends through the game was cool” (Student response)
- “Playing the game, correcting the sentences” (Student response)
- “To follow the steps and complete each sentence in one level and then move on. To read the question carefully so that I knew what to do on the game level” (Student response)

The responses to *the worst aspects of the game*, mainly dealt with issues that arose from inexperience playing this particular game. A selection of these comments is reported below:

- “At the end of some levels, it didn't let you go to the next level even if you got the right answer, even when you tried it over and over, it was still like that” (Student response)
- “When you got stuck at a certain place and had to start over again” (Student response)
- “When items didn't work, e.g. clicking on a sphere” (Student response)

- “Putting the answer I thought was correct over & over & it was wrong and having to put a macron over a word” (Student response)

In response to these comments, a video has now been made giving students hints on what to do and what not to do, to ensure a pleasant game experience (Hearns, 2014).

Some other issues that arose in this section include:

- Getting questions wrong repeatedly, e.g. “Getting frustrated that it was coming up wrong” (Student response)
- Lagging on the computer, e.g. “Having to wait for it to load” (Student response)
- Feeling a little lost and confused when first in the game, e.g. “For me the worst part of the game was level one when I didn't know what to do” (Student response)

In the reflective question, asking for *additional comments*, some themes that arose were:

- General appreciation (most common), e.g. “Thanks! Was really fun!” (Student response)
- A desire to customise the avatar, e.g. “Should be easier to customise your character” (Student response)
- Having more variety, e.g. “It was cool but a bit repetitive. Maybe have more activities like in the last stage, e.g. moving sentences into place, time trial, rather than just find and click” (Student response)
- Not being able to play from home, e.g. “I recommend making this game more effective for play from home, not only from class. Mine doesn't work at home” (Student response)

Overall, student satisfaction was expressed in the majority of the feedback received, e.g.

- “Overall the game was great and definitely enhanced my literacy knowledge” (Student response)
- “Awesome way to learn… should have similar games” (Student response)

TEC data

The TEC Adult Literacy and Numeracy online tests were completed by all students at the start and end of Semester 1, 2014. The data that was collated was not useful, in that there was no indication of any difference between students who participated in the game, and those who did not. In hindsight, this should have been expected. The Mythical World of Hīnātore was designed as a tool for writing literacy improvement, to improve grammar and sentence structure. It was not designed to enhance reading, although there was a lot of reading involved in understanding the instructions, legends, and tasks in the game. The TEC Adult Literacy test is purely a reading assessment. A summary of the data obtained, can be seen in *Table 3* on p. 27.

Group	Pre-Test Average	Post-Test Average	Pre to Post Difference	Matched Pre-Test Average	Matched Post-Test Average	Matched Pre to Post Difference
Game 1	605.3	599.9	**-5.4**	604.0	605.5	**1.5**
Game 2	595.4	593.5	**-1.9**	620.9	593.5	**-27.4**
Control 1	588.5	571.0	**-17.5**	613.5	571.0	**-42.5**
Control 2	571.0	575.9	**4.9**	566.5	575.9	**9.5**

Table 3: **TEC results**

Please note that the first three columns show all results; the last three only display results from matched cases. i.e. where students completed both the pre- and post- assessments. In the first control group, several students were unable to complete the post-assessment, and this may have skewed the results obtained.

The TEC graphs for students display similarity rather than disparity and do not show anything valuable relating to the game.

Writing error analysis

The first writing sample used was a diagnostic formal writing task, completed in class, by all Level 3 students. The second writing sample analysed was a piece of formal writing, completed in class, on the project they were studying. This was also a common assessment completed by all Level 3 students. Both were completed in class time, under test conditions.

The first 100 words of each piece of writing were analysed. The marking of scripts was manually completed, and later moderated by the literacy teaching team.

- Each sample was marked for errors in: spelling, punctuation, use of plurals, tense, subject-verb agreement, pronoun agreement. A grammar error total was calculated.
- Each sample was also marked for word choice, style, missing words/phrases, common word confusion, words split or joined in error, article errors. A miscellaneous error total was calculated.
- The number of total sentence structure errors was calculated. This included run-on sentences and sentence fragments.

The raw data, full table summary (*Table 4*), appears as Appendix C, p. 47.

Results showed that the students who participated in the Literacy Game displayed an improvement of 200 fewer errors in writing following game-play, while students who did not use the game showed an improvement of 120 fewer errors in writing, in the identical period. The samples were of equal size.

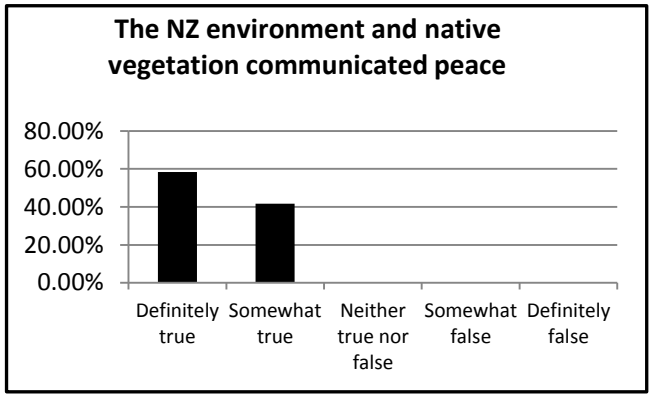
It is interesting to note that the biggest gap between the students who did and did not play the game, is in the improvement in grammar in the writing analyses. Students showed a drop of 14 errors in grammar in the Control group, and a drop of 39 in the game group.

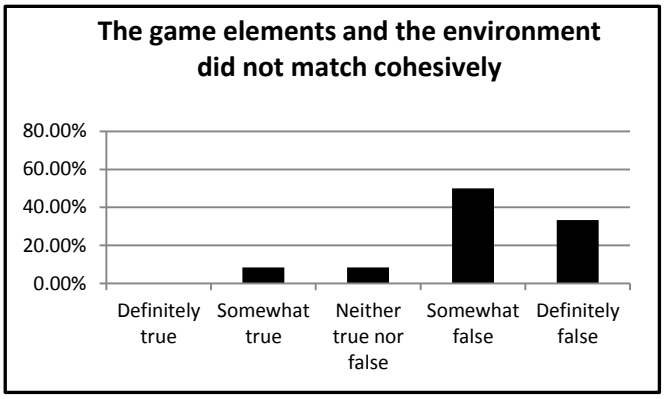
Lecturer feedback

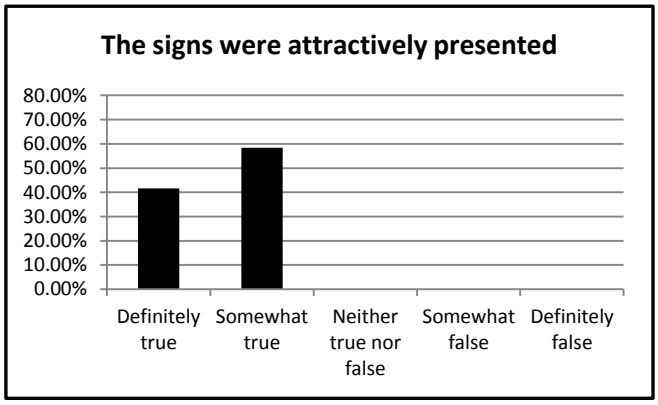
As with the student survey, the lecturer survey used a Likert scale (with both positive and negative statements), a rating scale, and questions requiring reflection and comment. The survey was much longer and more complex than the student survey. There were four sections to the survey, as follows:

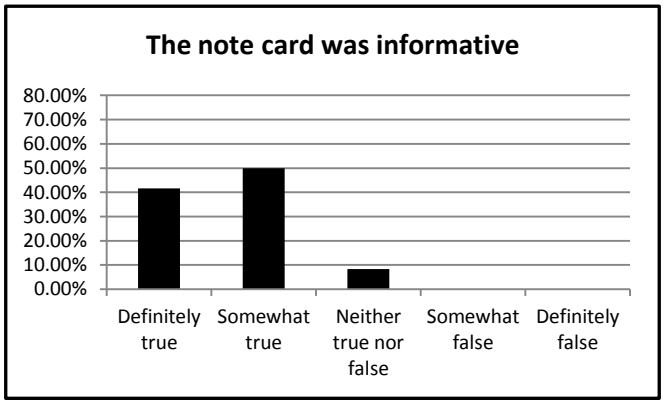
1. Initial impact and introduction to the game (20 questions: 19 using a Likert scale and one comment).
2. Ratings of the first five levels of play – each level rated on a Likert scale for five factors: suitability of task, presentation, interest value, ease of navigation, and fun.
3. Ratings for Level 6, the finale of the game, using five Likert-style statements.
4. Overall game responses, including six Likert scale questions and three open-ended questions.

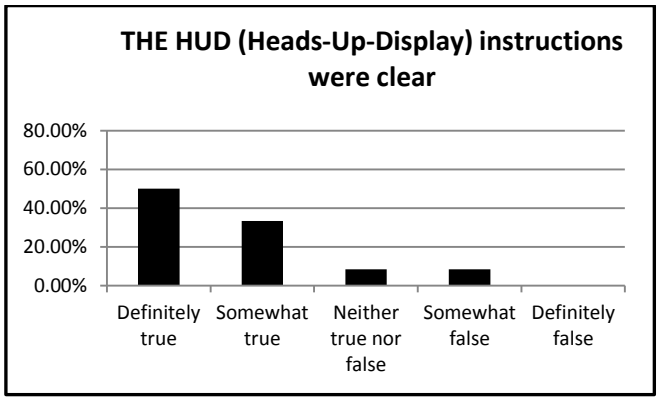
Section 1. The first set of Likert scale questions, were general questions about the initial stages of the game. In the following 19 figures (*Figures 21* to *39*), each statement appears in brief form as a header. The full table of percentage results for these statements, appears as *Table 5*. Appendix D, p. 48).

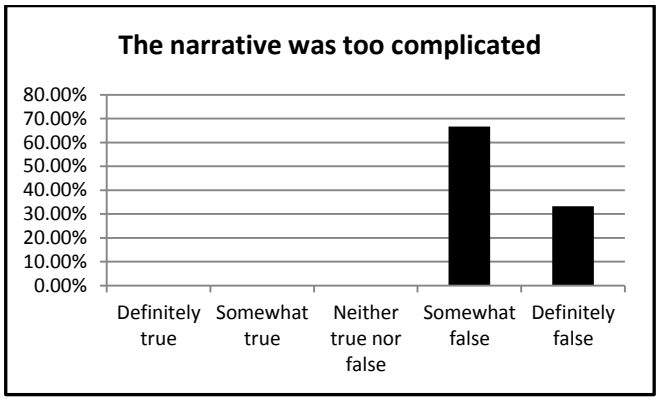


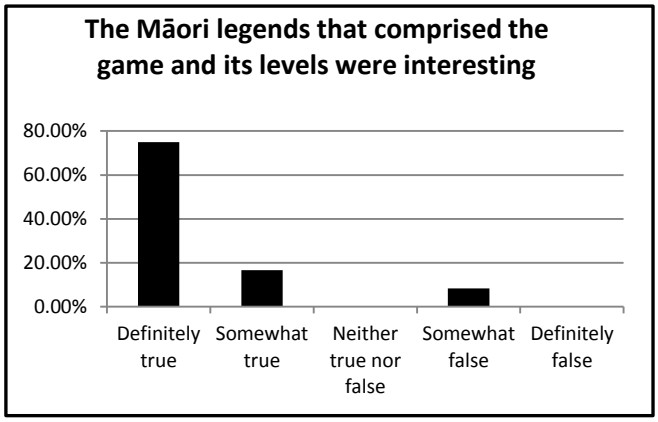


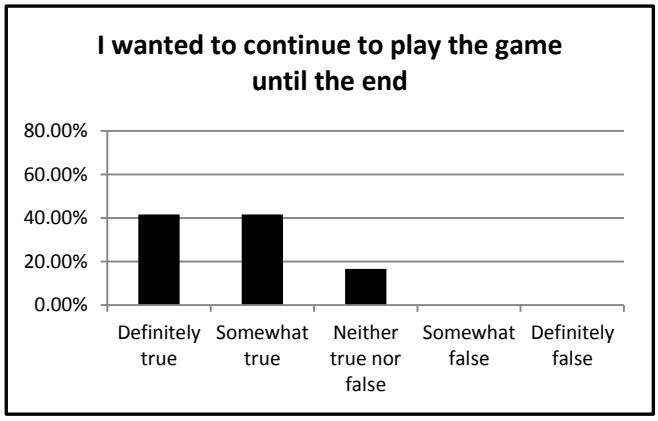


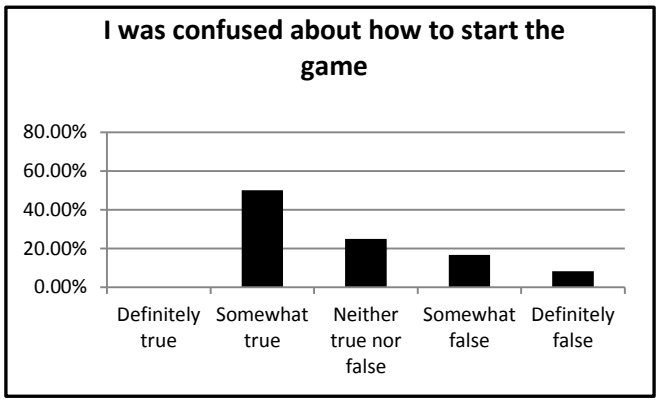


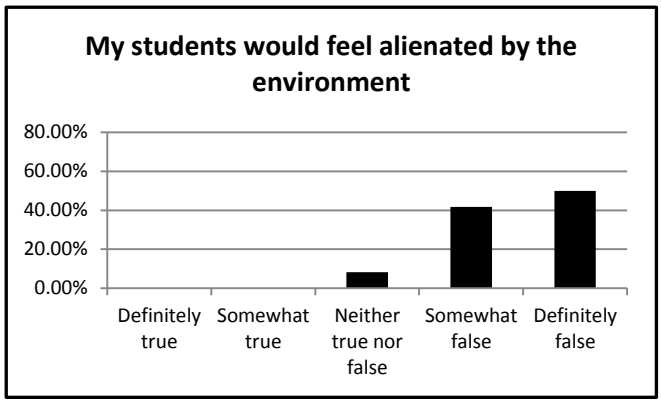

THE HUD (Heads-Up-Display) instructions were clear
80.00%
60.00%
40.00%
20.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

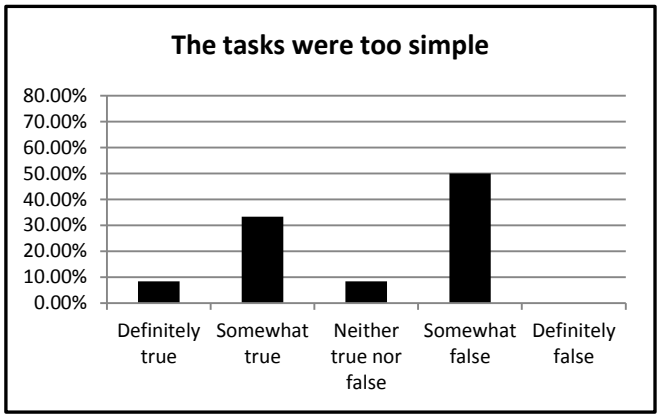

The narrative was too complicated
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

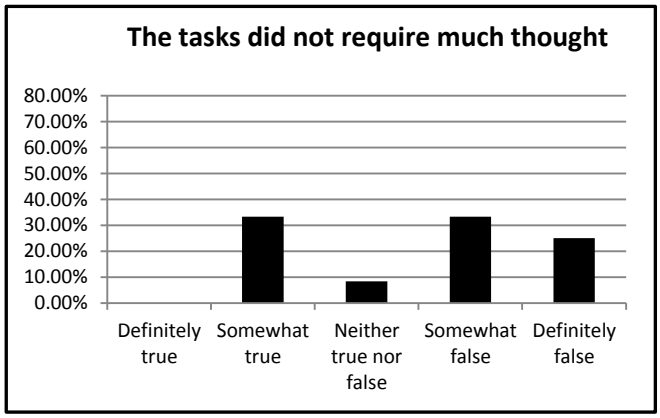

The Māori legends that comprised the game and its levels were interesting
80.00%
60.00%
40.00%
20.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

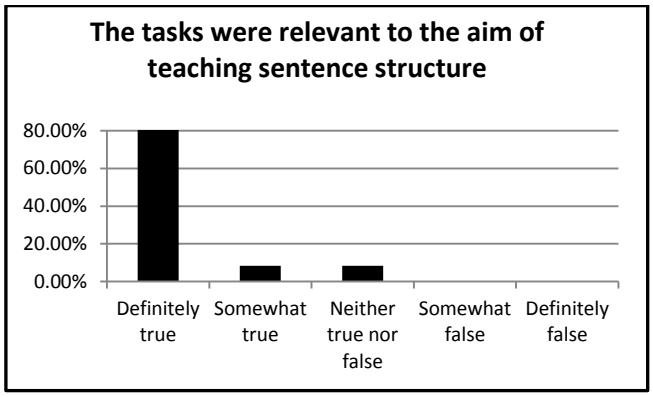

I wanted to continue to play the game until the end
80.00%
60.00%
40.00%
20.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

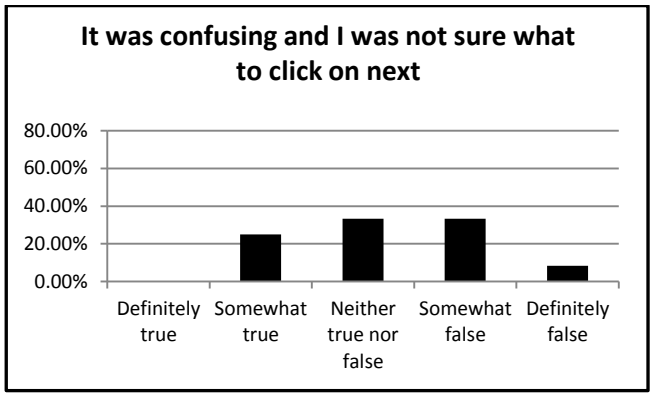

I was confused about how to start the game
80.00%
60.00%
40.00%
20.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

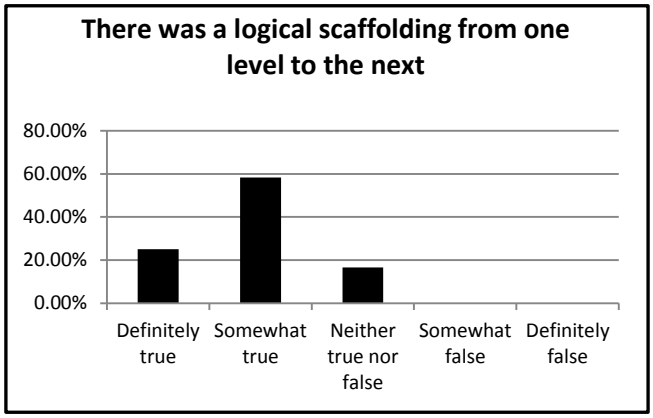

My students would feel alienated by the environment
80.00%
60.00%
40.00%
20.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

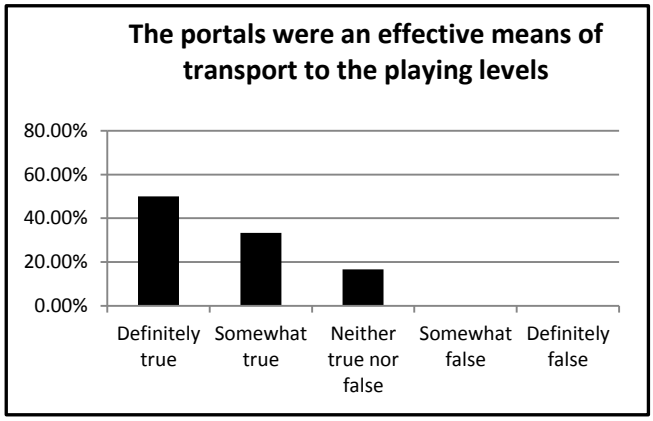

The tasks were too simple
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

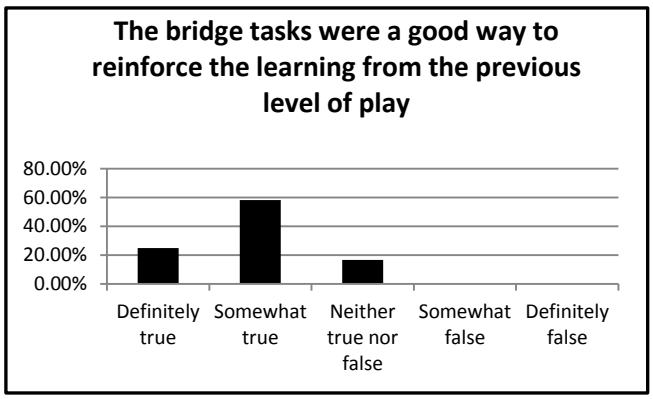

The tasks did not require much thought
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Definitely true
Somewhat true
Neither true nor false
Somewhat false
Definitely false

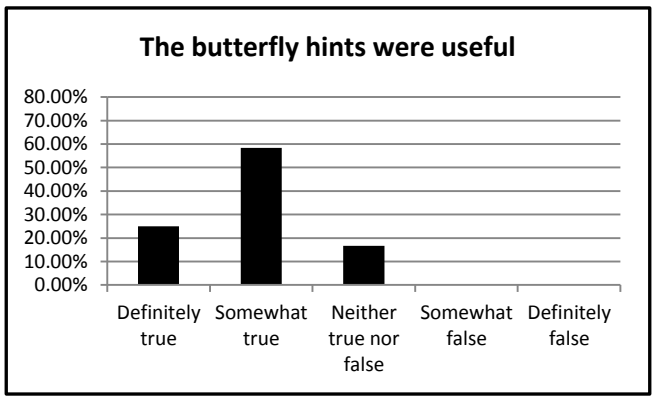


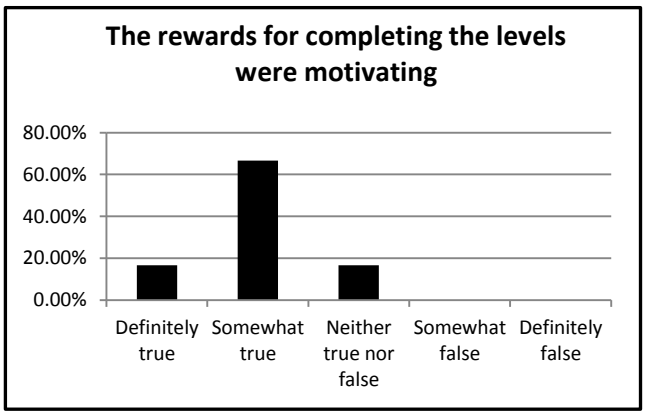








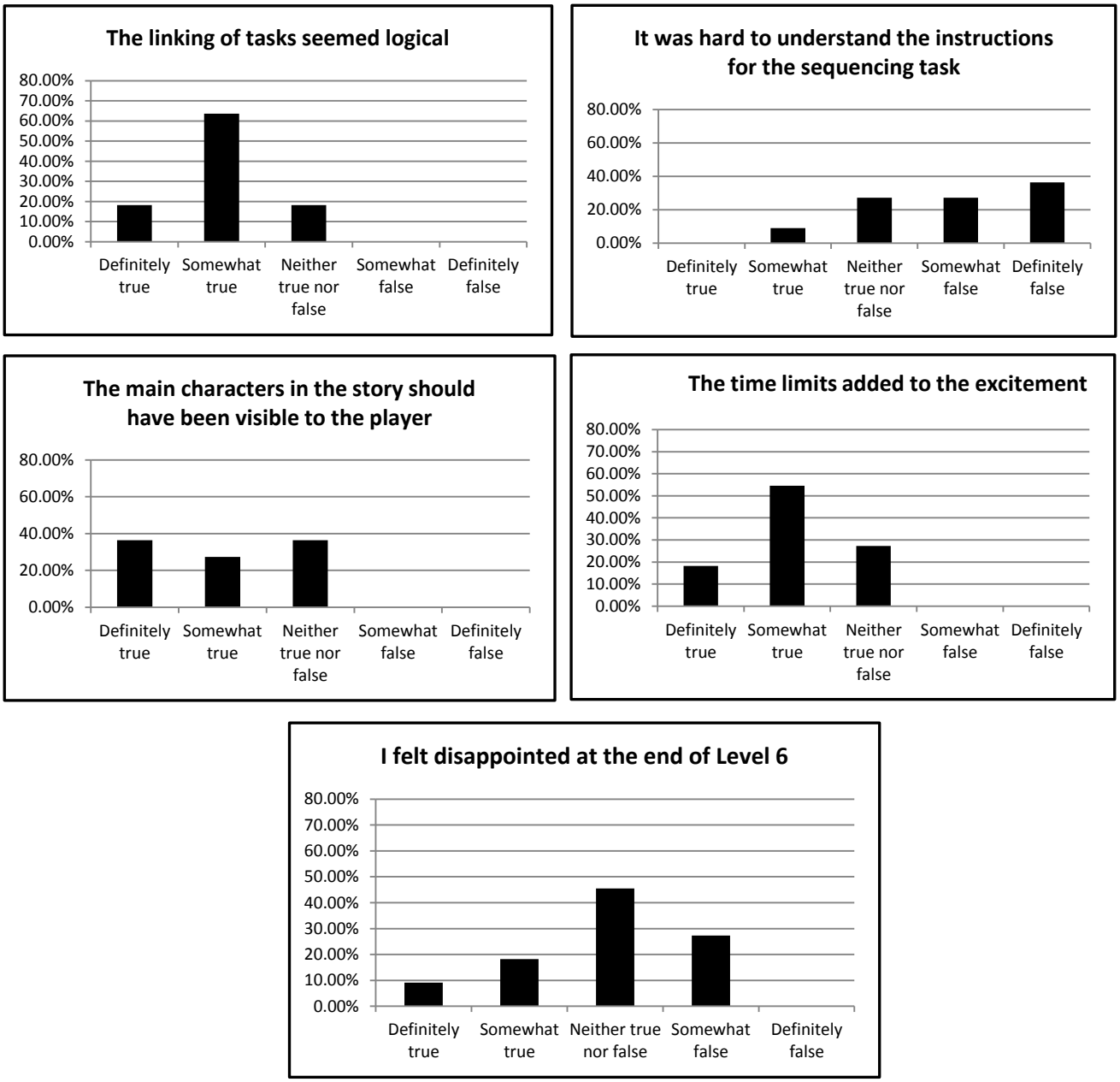




Figures 21 to 39: **Lecturer survey initial Likert-style statement results**

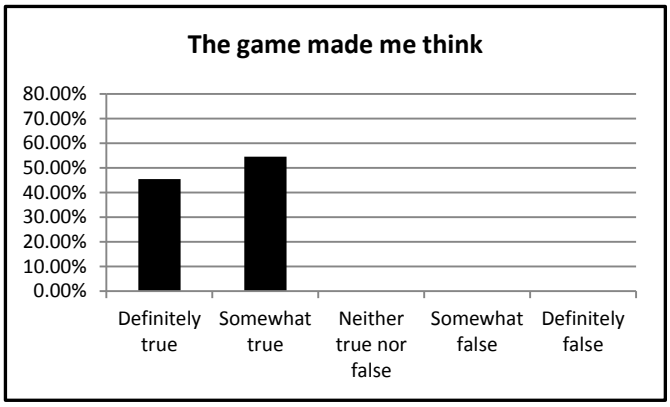
Section 2. The next set of responses examined each level of play for five characteristics: suitability of task, presentation, interest value, ease of navigation, and fun. As this data is prolific and repetitive, it has been added as an appendix. A summary of percentages for this data appears as *Tables 6-11*, Appendix E, p. 49-50. This data can be seen graphically in *Figures 54 to 78*, also in Appendix E, p. 51-53.

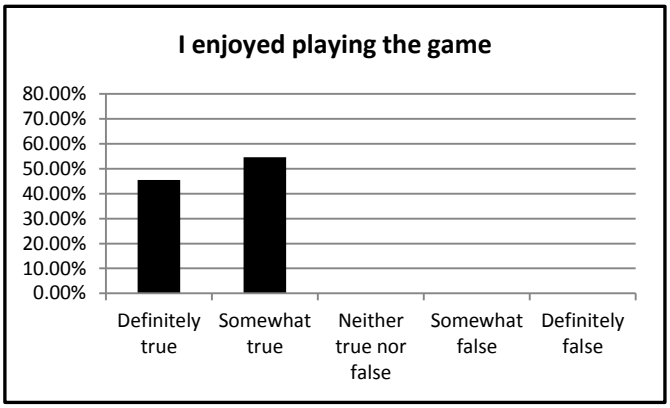
Section 3. Five Likert scale questions were asked specifically on Level 6. The percentages appear in *Table 12*, Appendix F, p. 55. The graphic results are shown below, *Figures 40* to *44*. Once again, each statement appears in brief form as a header.

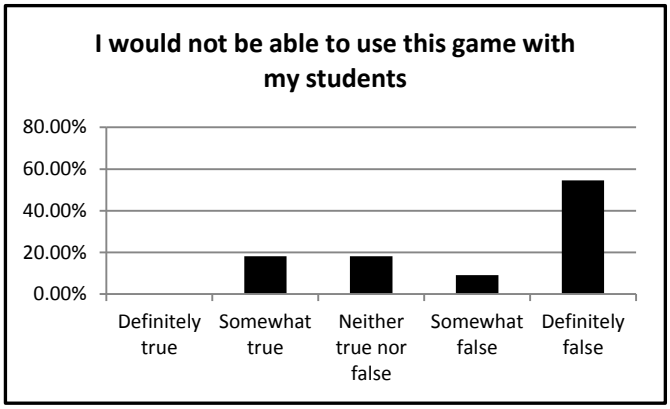


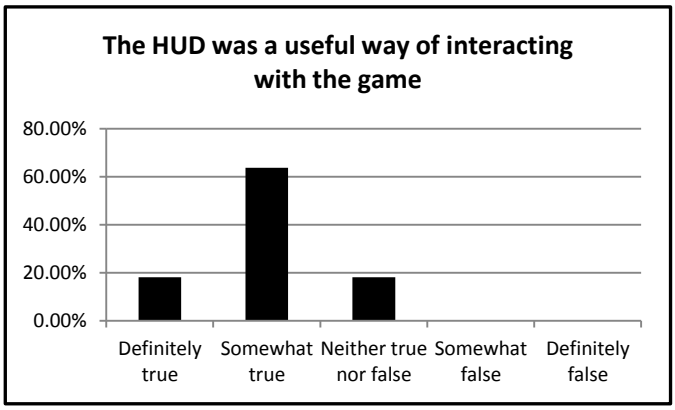
Figures 40 to 44: **Lecturer survey Likert-style statement results for Level 6**

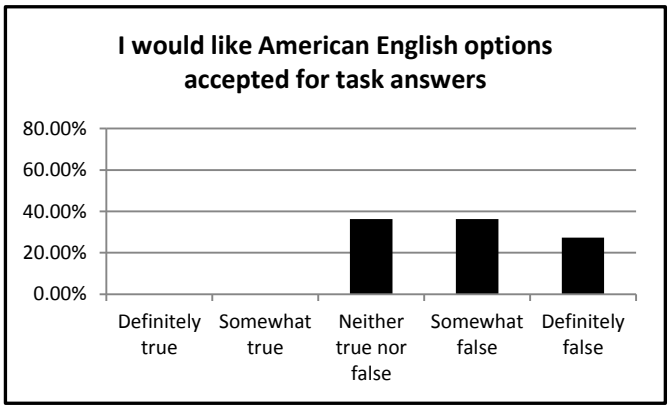
The last set of Likert scale questions were general statements. The percentages obtained appear in Appendix F, p. 55 and are shown graphically in *Figures 45 to 50* below. They were followed by questions that required reflection and open answers.

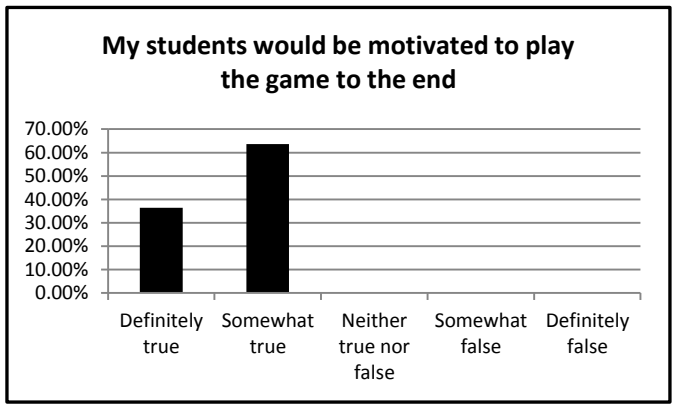












Figures 45 to 50: **Lecturer survey general Likert-style statement results**

Lecturer respondents were asked to clarify the answer they gave for, “I would not be able to use this game with my students”. Responses ranged from those who felt they could definitely use the game because “I think the game would be able to run itself” (Lecturer response), to those who felt they would not be able to use the game because of their own lack of confidence, e.g. “It would be valuable for my students even though I am not sure about my ability to work in that environment” (Lecturer response).

When lecturers were asked if their students would be motivated to continue playing the game to the end, responses included the following ideas:

- It is motivating and absorbing
- Instructions are suitable and the learning is relevant. There is good feedback via the rewards
- Hints received when a task is failed are external to the game and this is not good

Lecturers included the following responses when asked who would benefit most from the Literacy Game:

- Students who do not enjoy traditional classroom environments
- Kinaesthetic learners
- Students with literacy gaps
- ESOL students and low literacy achievers
- Younger students
- Students who do not readily engage in writing using traditional pen/paper approach
- Independent learners who enjoy visual cues
- Maori students

An open response was requested for the best aspect of the game. Responses included:

- A novel way of teaching grammar
- The legends were interesting and the stories well told
- Colourful and interesting, good graphics
- Tasks were well stair cased and levels seemed to step up at an acceptable speed
- The incorporation of Maori legend

This was followed by an open question asking for a negative aspect of the game. Responses to this question prompt included:

- Navigating between places on a level (those that required movement)
- Getting the game started was time-consuming (creating an account, an avatar, etc.)
- Not actually seeing any of the legend characters, especially on the final level
- The game was too short and a bit repetitive

Suggested improvements for the game included the following responses:

- Add characters of interest like Maui and Hine-nui-te-po
- The last basket of bones on Level 4 doesn't seem to work properly (that is currently being corrected)
- It seemed a bit slow to play – tasks could come faster
- More assistance at the start
- A more obvious pathway from one section to another
- More levels or another legend to move the participant onto the more challenging basics of English

A few responses were received such as:

- "It is perfect as it is" (Lecturer response)
- "Very enjoyable, I can see how participants could be hooked on this game while they are learning some English basics" (Lecturer response)

There were a few comments relating to not having completed the game, therefore not being able to evaluate a game level. Lecturers were asked to complete the survey once they had completed the game, so instructions were not adequately followed.

Discussion

The results for student and lecturer surveys were very positive. Students enjoyed the game, found it relatively easy to play, and found the instructions clear. They felt they had been challenged to think, and that they were more aware of sentence structure. The results for Question 9, regarding the difficulty of the game were fairly evenly spread across all categories. This is a positive result. If some perceived it as easy and some as difficult, the game must have hit the middle level of difficulty quite accurately.

Student comments on the game reflected a positive belief in the value of the game for education and literacy. Negative comments mostly centred on problems that arose from inexperience with gaming and this game in particular. The video, *The Mythical World of Hīnātore: Successful game play - what to do and what to avoid* (Hearns, 2014), was made to prevent the negative aspects that arose in student comments in future iterations of game research and play.

Although reading results did not show improvement after game play, the writing results supported the belief that the game would help students improve their writing and fill literacy gaps. It was expected that the writing of all students would improve through completing a foundation or bridging course, but the results clearly showed that the game increased this improvement significantly. Students reported a greater awareness of writing sentences accurately, using correct sentence structure and accurate grammar. This was supported in the analysis of their writing samples.

The improvement in writing literacy supports the previous findings of Hearns (2011) that a virtual world would provide an environment in which literacy gaps could be successfully filled. This research has allowed for some degree of quantitative comparison of literacy achievement, and an indication of transfer of virtual world learning to the real world. The difficulties and limitations of research in this area will be discussed under **Limitations**, p. 38.

Lecturer feedback was strongly supportive of the game features: the environment, the narrative, the tasks, the HUD (Heads-Up Display), the use of butterflies (as player aids – providing instructions and clues) and rising sentence hints. As with student feedback, lecturer feedback regarding the level of difficulty of the tasks was fairly evenly spread across categories. This also indicates that an average level of challenge was achieved.

The categories used to obtain feedback on each level of play were: suitability of task, presentation, interest value, ease of navigation, and fun. All of these categories were well supported for all levels. The lowest level of agreement was for ease of navigation. As most of the lecturers who played the game had little or no gaming experience, this result was not unanticipated. Some lecturers commented on their own lack of confidence being in a virtual world game environment. It should be noted that it is the lecturer's choice to go into the game at all. As long as the lecturer knows how to get students into the game, the lecturer's presence in the game is not necessary. Student game play can be independent. The game

can also be played successfully at home, as long as the student is prepared to download the software onto his/her home computer.

All et al. (2014) listed three key elements in a digital learning game: effectively meeting learning outcomes, being motivating, and efficient. The Mythical World of Hīnātore seems to have met these criteria successfully. The game is efficient in terms of time and cost. Students who have tested the game have spent two periods of 1.5 hours in the virtual world of Kitely. The results indicate that this was a positive multimodal learning environment (Gee, 2003; Dickey, 2006). The only cost of maintaining the game is the sim rental (this cost of $40 US per month is currently being met by the researcher). Other students and lecturers can utilise this sim at no cost, and the sim can support up to 100 simultaneous players. The game has been made under Creative Commons licensing.

The Mythical World of Hīnātore has the 10 characteristics of games suggested by Whitton (2010): students **compete** against their own performance to move to higher levels, tasks are **challenging**, each level has a different environment to **explore**, the virtual world creates a sense of realism while the narrative provides an element of **fantasy**, the **goal** is to complete each task accurately, there is **interaction** with the environment and immediate feedback for tasks submitted, there are measurable **outcomes** as students receive icons or gifts for completing each level, many other **people** can be playing at the same time, there are **rules** that must be followed in order to progress through each of the levels, and a sense of **safety** is provided within the virtual world environment (de Freitas et al., 2010).Evidence suggests that the Literacy Game is an effective learning experience and learning environment (Whitton, 2010).

Conclusions

The hypotheses suggested at the beginning of the study received some support.

- There is strong evidence to suggest that gaps in writing literacy can be successfully met by the Literacy Game
- TEC results failed to reflect any link between playing the game and reading literacy improvement.
- Observation of students in the game, as well as comments made by students, indicate that digital literacy is enhanced through the Literacy Game.
- Data supports the hypothesis that learning outcomes are met by playing The Mythical World of Hīnātore.
- Although there has been an overall improvement in retention and success from 2013 to 2014 in Level 3 Health, it cannot be determined how much, if any, of this improvement can be attributed to the game. A close analysis of ‘at-risk’ students still needs to be completed.
- Students reported the game environment and narrative to be interesting and engaging.

Limitations

- *Quantitative comparison of literacy achievement, and an indication of transfer of virtual world learning to the real world*

There is always difficulty in attributing cause and effect in a learning situation. Previous research into adult education, the transfer of skills and content, education in virtual worlds, and digital game learning, has always noted the limitations in the data collected and analysed. Although the students who played the Literacy Game showed a much greater improvement in writing literacy, especially grammatical accuracy, than control students, it is still impossible to say definitively that the improvement is the result of the game intervention. So many other variables interact in a learning context. It is hoped that the research data collected in semester 2, 2014, as well as the narrative inquiry research study utilising game play in The Mythical World of Hīnātore, currently being completed, will provide further data that will clarify the literacy gains and learning transfer that occurs through the use of the game.

Figure 51: **Staff in the Literacy Game, 27/6/14**

Further research

In semester 2, 2014, the procedure discussed in this report was repeated. A second set of data was collected using two classes who played The Mythical World of Hīnātore and two classes who did not have this opportunity. There was no issue of equity as the two classes who played the game were considered to be a pilot, and the majority of students had no change in their normal classroom delivery. An analysis of the second set of data is underway, but incomplete, at this stage.

A narrative inquiry research study is also underway, using the Literacy Game. A visual representation of the follow-up research that took place in semester 2, 2014, is shown in Figure 52, p. 37.

Initial stories were collected from interview data and initial diagnostic tests completed.

Narratives on the transfer of literacy learning were derived from student reflections, surveys, and interview data. The focus of the research was on the experiences of two groups: the researcher and the student participants.

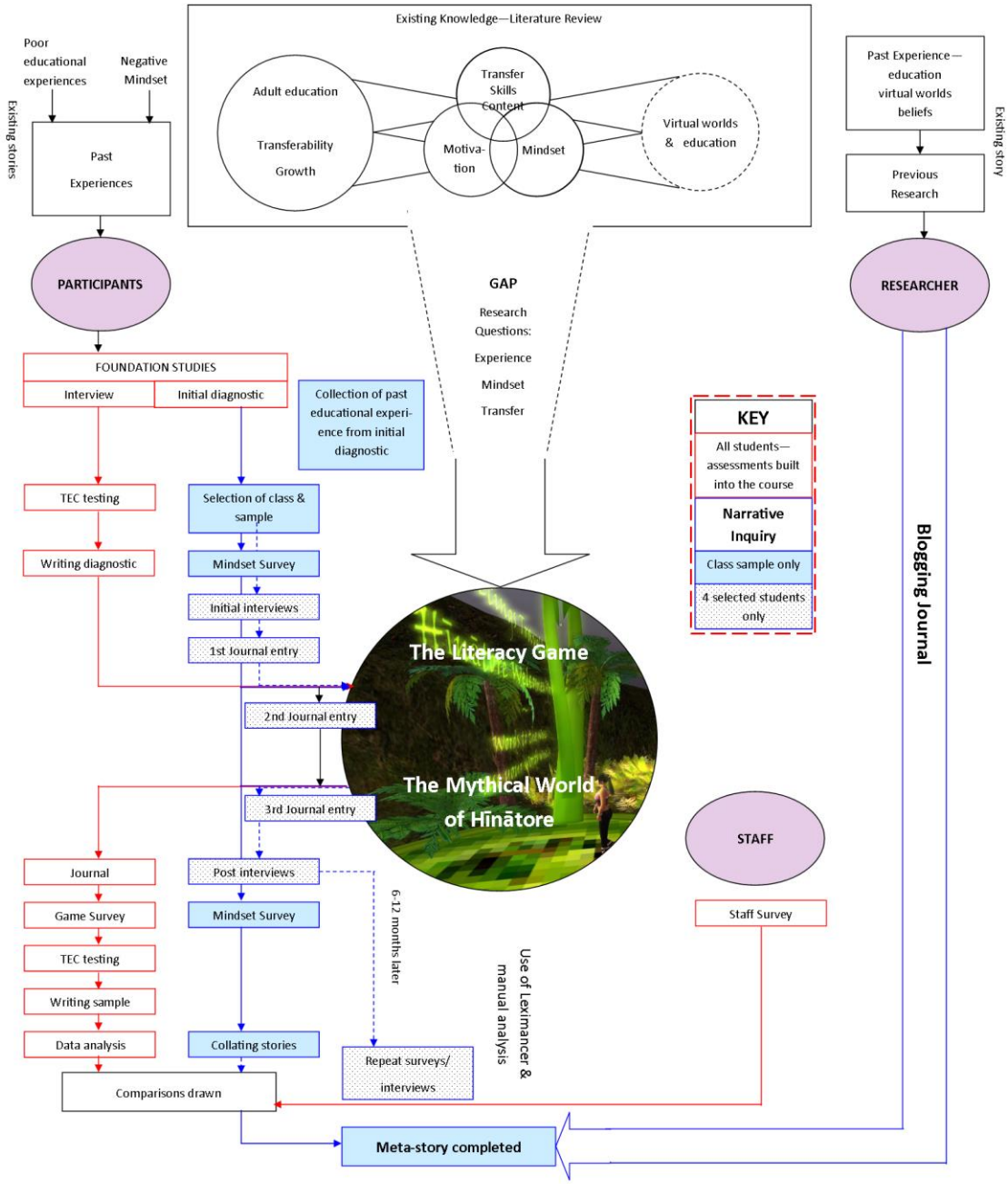


Figure 52: **Further research, Semester 2, 2014**

A single class was selected for the narrative inquiry (approximately 10 students). Insight into several factors have been revealed through reflective writing and survey data collection: student's personal attitudes to themselves as writers; their mind-set regarding their own intelligence, if the experience in a virtual world changed these beliefs in any way; and, whether or not the virtual world learning environment affected their approach to literacy.

The impact of mind-set on the transfer of learning was investigated. A simple survey was used to gauge mind-set. This was repeated at the end of the semester. A journal entry was used as a tool for students to express their perspectives on whether or not the Kitely activities were useful for their learning. In this journal writing students were asked for their perceptions of whether or not they felt the skills they had learned were, or would be, of value. Any alteration in mind-set was investigated in this reflective writing.

Four students were selected for in-depth interviewing. These students were also asked to write two reflections while they were engaged in the virtual world learning experience.

All students will complete a more comprehensive survey once they are in their degree/diploma courses and the four students selected for in-depth interviewing, will complete a final interview (mid-2015). The survey and interviews will further investigate the learning that took place in the literacy game and whether it had an impact on students' pathway studies.

It is hoped that changes will be reflected in the practice of the Foundation lecturers at MIT. The game is relatively easy to understand and the rules and expectations for students clearly outlined. The motivation that students experience in virtual worlds (as outlined in the literature as well as in the researcher's experience), will encourage the use of the environment. This will be measured by further surveys administered to staff who trial the game. All lecturers will be asked for feedback on their experiences and their perceptions of any positive or negative effects on learning, whether they felt motivation was impacted, and what they believe are the repercussions of the virtual world activities.

Figure 53. **Students in the Literacy Game.**

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Appendix A: Technical information for running the Literacy Game

Section 1

(from https://www.kitely.com/faq?id=what-are-kitelys-system-requirements)

What are Kitely's system requirements?

In order to enter virtual worlds you need an OpenSim compatible virtual world viewer. There are several such viewers available for Windows, OS X, Linux and Android, each with its own minimum system requirements. Most of these viewers will work on any computer with at least 1GB of memory, a graphics card manufactured in the last 5 years and a broadband connection.

How do I configure my firewall to allow access to Kitely?

Most users will not need to configure their firewall. But if you do have problems accessing Kitely then please see How to Enter Kitely Virtual Worlds, which contains a section about how to configure the firewall.

How do I get the software I need to access Kitely?

Kitely works best with the Firestorm virtual world viewer, which you can download here.

If you already have Firestorm installed but are having problems connecting to Kitely then you might have a version of Firestorm that only works with Second Life. This is possible because Firestorm comes in two different versions: one for Second Life and one for OpenSim. In order to tell which version you have, start the viewer and select the menu option **Help > About Firestorm**. The version number should include the words "with OpenSimulator support". If it doesn't then this is the Second Life version of Firestorm, and you need to download the OpenSim version of Firestorm.

Although we recommend using Firestorm, this isn't required. If you prefer, you can use any other OpenSim-compatible viewer.

How do I configure my virtual world viewer to access Kitely?

First, make sure you have an OpenSim-compatible viewer. See the question above for more information.

Most viewers have the Kitely grid predefined, so you can select it from a menu. For example, in Firestorm that menu is labeled "Log into Grid" and is located next to where you enter your username and password.

If you are using a viewer that doesn't have Kitely as a predefined option then you will need to add Kitely as a custom grid, using this information:

Grid Name: Kitely

Login URI: http://grid.kitely.com:8002

Section 2

(from MIT IT technician, Bart Keestra)

If you are operating the Kitely viewer from your institution and you receive an error message saying that you cannot Login to Kitely it would be more than likely that your institution has a firewall rule preventing users from accessing Game sites. Game sites are generally blocked by commercial firewalls.

Most firewalls at tertiary institutions will state why the user has been denied access to the site. A splash page should appear with the notification and options for contacting the firewall administrator to make a request for the site to be opened.

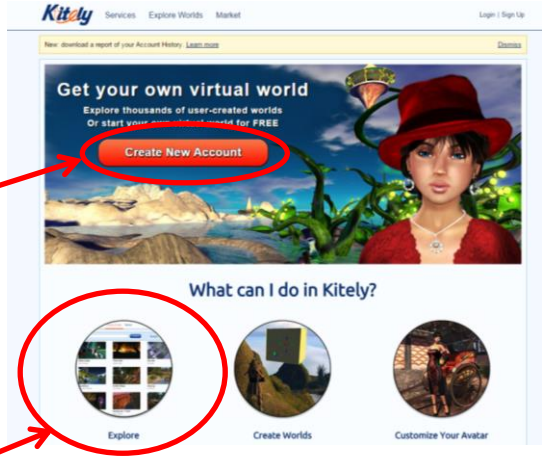
If it is not at the institution firewall level, it is possible that there is Windows group policy in place that prevents access to the Kitely site via the Windows Firewall. Generally, a Windows popup will appear on the screen stating the Windows Firewall has blocked the site. Depending on the policy set by the institution, there may be an option to continue to the site.

Your IT technicians can assist you in overcoming this Login error.

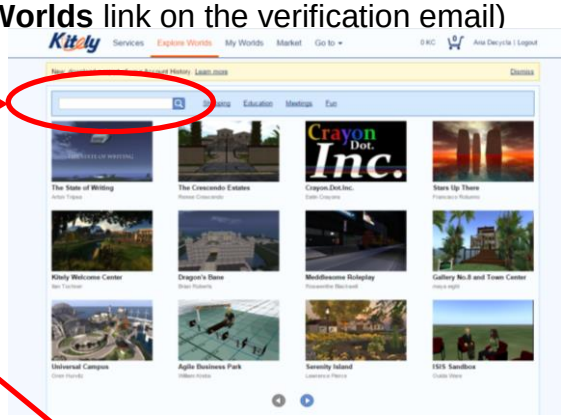
Appendix B. Student instructions for using the game

Steps to the Game

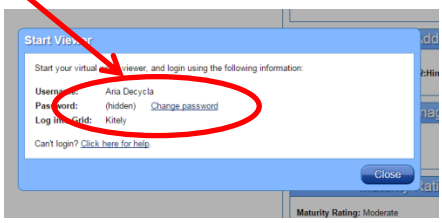
Before starting to play the Literacy Game, The Mythical World of Hīnātore, you need to complete the following steps:



- Create your avatar. To do this:
  - Log in to Facebook
  - Click on www.kitely.com
  - Click on **Create New Account**
  - Then click on **Facebook**
  - If you do not have a **Facebook** account, create your avatar using **email/password**. You will be asked to verify your account
- Then:
  - Click on **Explore** (or the **Explore Worlds** link on the verification email)
  - Type **Hīnātore** into the **Search Box**
  - Click on **Hīnātore** *(you won't need the macrons!)*
  - Click on **Enter World**



- A pop-up box will ask you to change your password to enter the viewer (**Phoenix Firestorm** or an alternative – if you are using the Lab, this will already be on your desktop. If you are working from home, you will have to download the software – *see the final note on this sheet*)
- Remember both your passwords – the one for the **Kitely website** and the one for the **viewer (the viewer software – Phoenix Firestorm)**

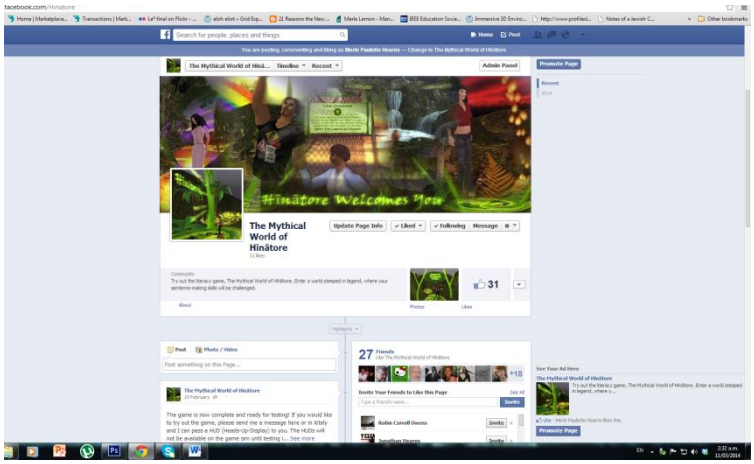


- Open the **Phoenix Firestorm** program
  - Enter your **Facebook Username** (or the **Username** you created using **email/password**), type in your **Viewer Password**, and make sure the destination grid you have selected is **Kitely** and NOT **Second Life**
- Click **Enter**

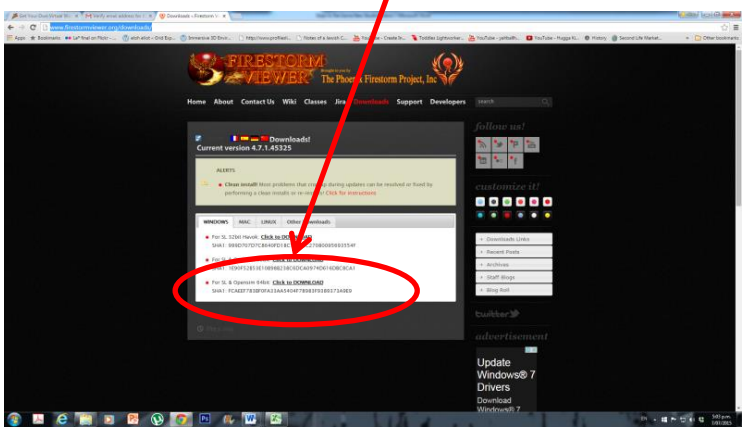
- Once you are in world, a menu will appear on your screen.
- If you want to start playing the game, click on **The Game** and then click on **Attach HUD**

1st menu screen on entry

Don't forget to "Like" the **Facebook** page, https://www.facebook.com/Hinatore



Note for students playing ***The Mythical World of Hīnātore*** *from home.* You will have to download the viewer software onto your home computer before you can **Enter World.** The recommended viewer is **Phoenix Firestorm for Open Sim.** The link for the download is: http://www.firestormviewer.org/downloads/. This is a free download.



Appendix C: Writing error analysis – raw data

		Control Before	Control After	Control After-Before	Control After-Before Main	Game Before	Game After	Game After-Before	Game After-Before Main
	Spelling	23	27	4	4	29	17	-12	-12
	Punctuation	33	31	-2	-2	55	44	-11	-11
Grammar	Plurals	23	20	-3		23	18	-5	
	Tense	16	4	-12		38	13	-25	
	Subject-verb agreement	6	6	0		6	4	-2	
	Pronoun agreement	4	5	1		11	4	-7	
	Grammar Total	49	35	-14	-14	78	39	-39	-39
	Word choice	33	23	-10	-10	52	40	-12	-12
	Style	35	12	-23	-23	22	15	-7	-7
Sentences	Incomplete sentence	5	5	0		4	1	-3	
	Run-on sentences	19	11	-8		8	5	-3	
	Sentence Structure Total	24	16	-8	-8	12	6	-6	-6
Misc	Unnecessary/poor word choice	16	24	8		14	17	3	
	Missing words/phrases	14	25	11		15	21	6	
	Unnecessary capitalisation	21	13	-8		7	5	-2	
	Missing capitalisation	21	5	-16		19	1	-18	
	Split words	1	2	1		3	2	-1	
	Words joined	4	1	-3		5	4	-1	
	Misc Total	77	70	-7	-7	63	50	-13	-13
	Error Total	274	214	-60	-60	311	211	-100	-100
	Apostrophe errors	0	0	0		3	0	-3	
	Article errors	4	9	5		7	11	4	
	Common word confusion	3	4	1		7	0	-7	
				-143	-120			-264	-200
									0.885

Table 4: **Writing error analysis raw data**

Please note, the main columns to examine are those headed Control After-Before Main and Game After-Before Main.

Appendix D: Teacher initial survey Likert-style responses – raw data

Statements	Definitely true	Somewhat true	Neither true nor false	Somewhat false	Definitely false
The New Zealand environment with native vegetation communicated a feeling of peace	58.33%	41.67%	0.00%	0.00%	0.00%
The game elements and the environment did not match cohesively	0.00%	8.33%	8.33%	50.00%	33.33%
The signs were attractively presented	41.67%	58.33%	0.00%	0.00%	0.00%
The note card was informative	41.67%	50.00%	8.33%	0.00%	0.00%
THE HUD (Heads-Up-Display) instructions were clear	50.00%	33.33%	8.33%	8.33%	0.00%
The narrative was too complicated	0.00%	0.00%	0.00%	66.67%	33.33%
The Māori legends that comprised the game and its levels were interesting	75.00%	16.67%	0.00%	8.33%	0.00%
I wanted to continue to play the game until the end	41.67%	41.67%	16.67%	0.00%	0.00%
I was confused about how to start the game	0.00%	50.00%	25.00%	16.67%	8.33%
My students would feel alienated by the environment	0.00%	0.00%	8.33%	41.67%	50.00%
The tasks were too simple	8.33%	33.33%	8.33%	50.00%	0.00%
The tasks did not require much thought	0.00%	33.33%	8.33%	33.33%	25.00%
The tasks were relevant to the aim of teaching sentence structure	83.33%	8.33%	8.33%	0.00%	0.00%
It was confusing and I was not sure what to click on next	0.00%	25.00%	33.33%	33.33%	8.33%
There was a logical scaffolding from one level to the next	25.00%	58.33%	16.67%	0.00%	0.00%
The portals were an effective means of transport to the playing levels	50.00%	33.33%	16.67%	0.00%	0.00%
The bridge tasks were a good way to reinforce the learning from the previous level of play	25.00%	58.33%	16.67%	0.00%	0.00%
The butterfly hints were useful	25.00%	58.33%	16.67%	0.00%	0.00%
The rewards for completing the levels were motivating	16.67%	66.67%	16.67%	0.00%	0.00%

Table 5: **Teacher survey Likert-style response percentages**

Appendix E: Level responses from teacher surveys – raw and graphic data

Please give Level 1: The Legend of Uenuku a rating from 1 to 10 (1 the lowest and 10 the highest) on each of the qualities listed:

	1	2	3	4	5	6	7	8	9	10
Suitability of task	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	8.33%	50.00%	16.67%	16.67%
Presentation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	16.67%	33.33%	33.33%
Interest value	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	8.33%	50.00%	16.67%	16.67%
Ease of navigation	0.00%	0.00%	0.00%	16.67%	25.00%	0.00%	8.33%	33.33%	8.33%	8.33%
Fun	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	25.00%	25.00%	16.67%	25.00%

Please give Level 2: The Legend of Rona a rating from 1 to 10 (1 the lowest and 10 the highest) on each of the qualities listed:

	1	2	3	4	5	6	7	8	9	10
Suitability of task	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%	8.33%	33.33%	33.33%	16.67%
Presentation	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%	0.00%	16.67%	41.67%	33.33%
Interest value	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%	16.67%	33.33%	16.67%	25.00%
Ease of navigation	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	50.00%	25.00%	8.33%
Fun	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%	8.33%	41.67%	16.67%	25.00%

Please give Level 3: The Legend of Kahukura a rating from 1 to 10 (1 the lowest and 10 the highest) on each of the qualities listed:

	1	2	3	4	5	6	7	8	9	10
Suitability of task	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	16.67%	33.33%	16.67%	16.67%
Presentation	0.00%	0.00%	0.00%	0.00%	16.67%	8.33%	0.00%	41.67%	0.00%	33.33%
Interest value	0.00%	0.00%	0.00%	0.00%	16.67%	16.67%	0.00%	41.67%	8.33%	16.67%
Ease of navigation	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	16.67%	50.00%	8.33%	8.33%
Fun	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	25.00%	33.33%	0.00%	25.00%

Please give Level 4: The Legend of Tāwhaki a rating from 1 to 10 (1 the lowest and 10 the highest) on each of the qualities listed:

	1	2	3	4	5	6	7	8	9	10
Suitability of task	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	16.67%	33.33%	16.67%	16.67%
Presentation	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	16.67%	25.00%	41.67%
Interest value	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	8.33%	41.67%	16.67%	16.67%
Ease of navigation	0.00%	0.00%	0.00%	0.00%	16.67%	16.67%	8.33%	41.67%	8.33%	8.33%
Fun	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	8.33%	41.67%	8.33%	25.00%

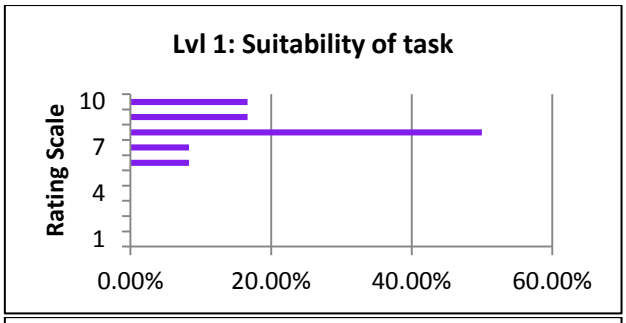
Please give Level 5: The Legend of Mahuika a rating from 1 to 10 (1 the lowest and 10 the highest) on each of the qualities listed:

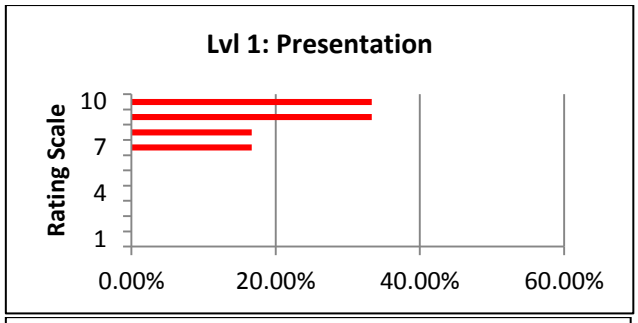
	1	2	3	4	5	6	7	8	9	10
Suitability of task	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	8.33%	33.33%	25.00%	16.67%
Presentation	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	16.67%	0.00%	66.67%
Interest value	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	41.67%	8.33%	33.33%
Ease of navigation	0.00%	0.00%	0.00%	0.00%	16.67%	16.67%	0.00%	58.33%	0.00%	8.33%
Fun	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	50.00%	0.00%	33.33%

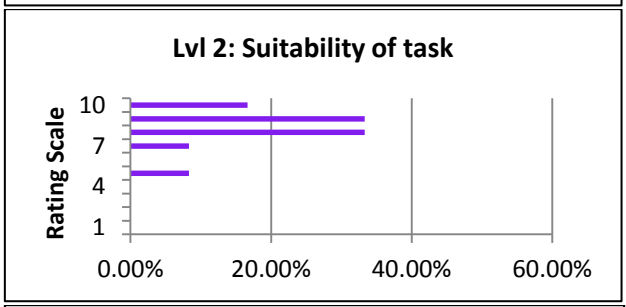
Please give Level 6: The Legend of Hīnātore a rating from 1 to 10 (1 the lowest and 10 the highest) on each of the qualities listed:

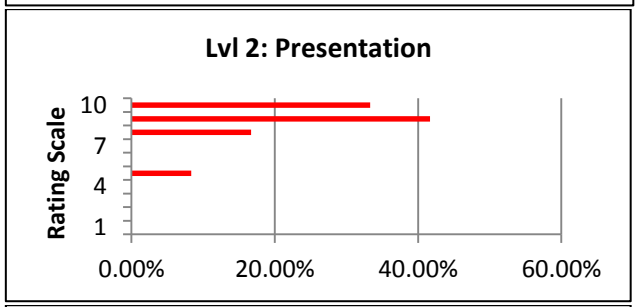
	1	2	3	4	5	6	7	8	9	10
Suitability of task	0.00%	0.00%	0.00%	0.00%	18.18%	0.00%	9.09%	36.36%	18.18%	18.18%
Presentation	0.00%	0.00%	0.00%	0.00%	18.18%	0.00%	9.09%	18.18%	18.18%	36.36%
Interest value	0.00%	0.00%	0.00%	0.00%	18.18%	0.00%	0.00%	36.36%	18.18%	27.27%
Ease of navigation	0.00%	0.00%	0.00%	0.00%	18.18%	0.00%	9.09%	63.64%	0.00%	9.09%
Fun	0.00%	0.00%	0.00%	0.00%	18.18%	0.00%	0.00%	27.27%	27.27%	27.27%

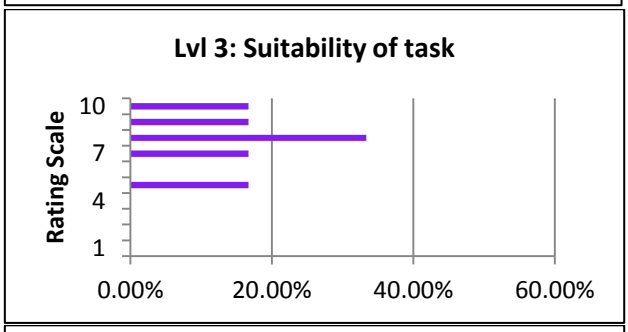
Tables 6-11: **Levels 1-6 rated for five characteristics in percentages (suitability of task, presentation, interest value, ease of navigation, and fun)**

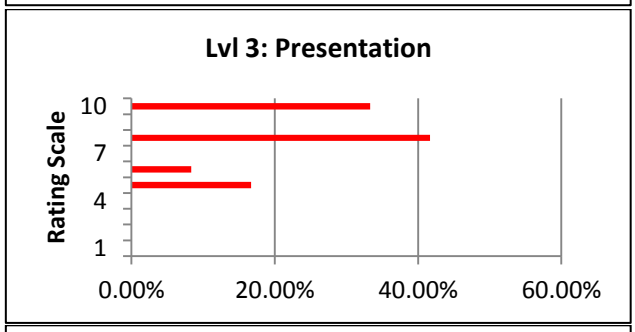

Lvl 1: Suitability of task
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

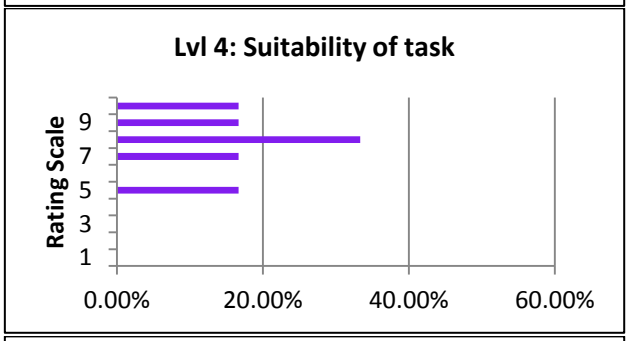

Lvl 1: Presentation
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

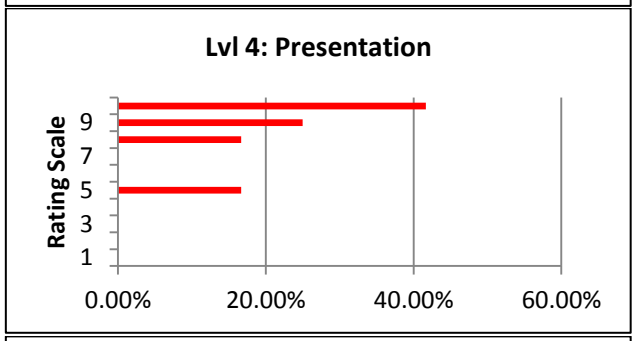

Lvl 2: Suitability of task
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

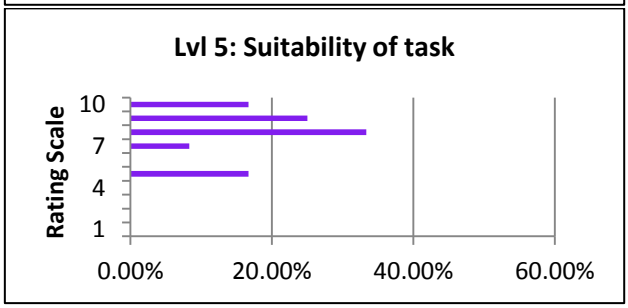

Lvl 2: Presentation
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

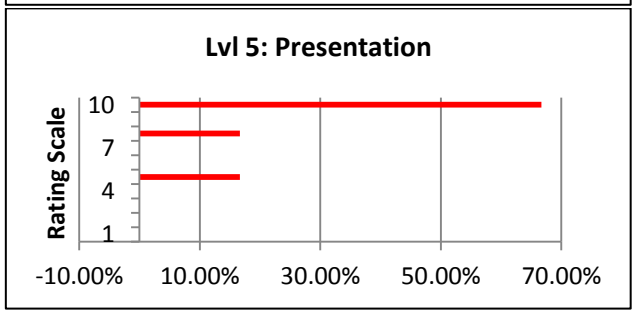

Lvl 3: Suitability of task
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

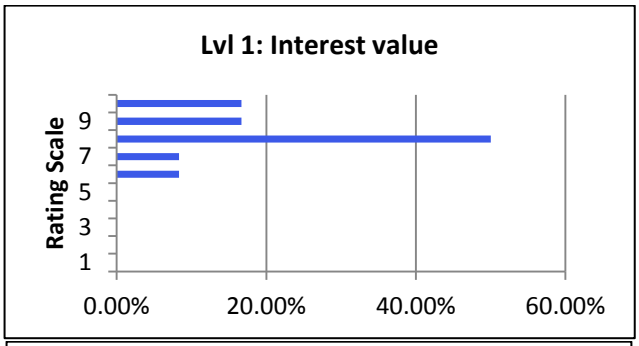

Lvl 3: Presentation
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

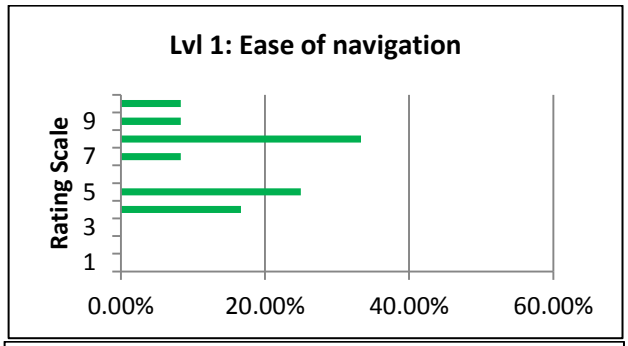

Lvl 4: Suitability of task
Rating Scale
9
7
5
3
1
0.00%
20.00%
40.00%
60.00%

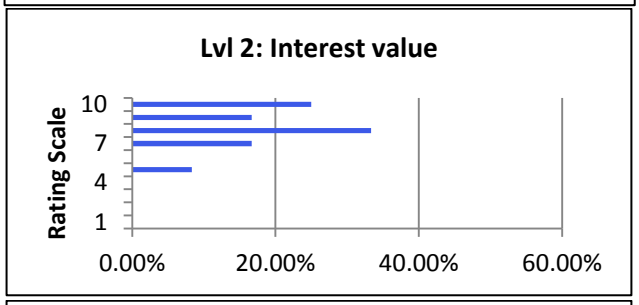

Lvl 4: Presentation
Rating Scale
9
7
5
3
1
0.00%
20.00%
40.00%
60.00%

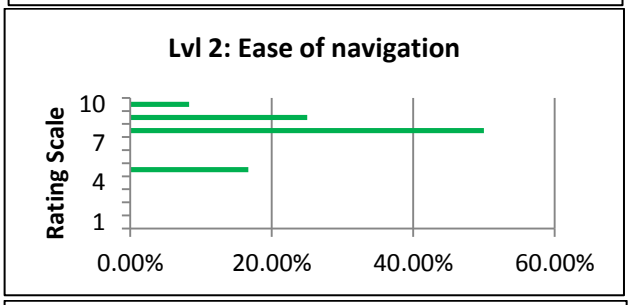

Lvl 5: Suitability of task
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

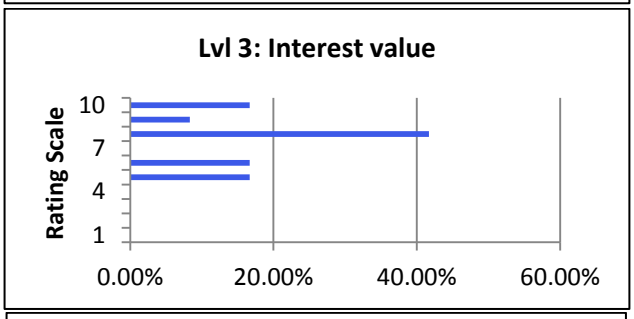

Lvl 5: Presentation
Rating Scale
10
7
4
1
-10.00%
10.00%
30.00%
50.00%
70.00%

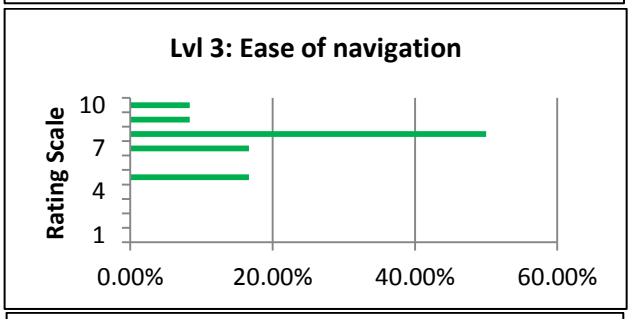

Lvl 1: Interest value
Rating Scale
9
7
5
3
1
0.00%
20.00%
40.00%
60.00%

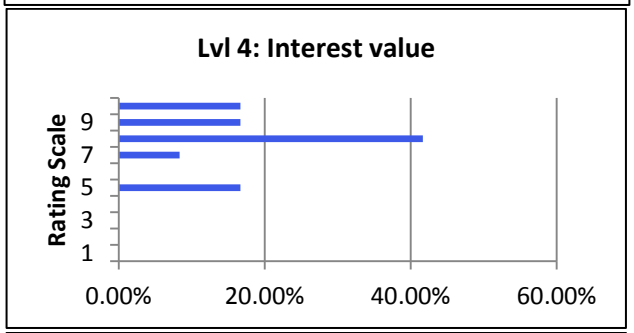

Lvl 1: Ease of navigation
Rating Scale
9
7
5
3
1
0.00%
20.00%
40.00%
60.00%

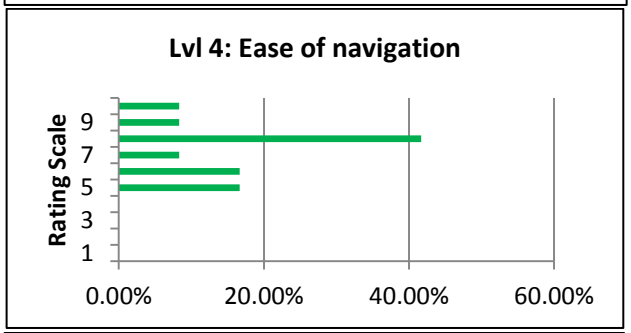

Lvl 2: Interest value
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

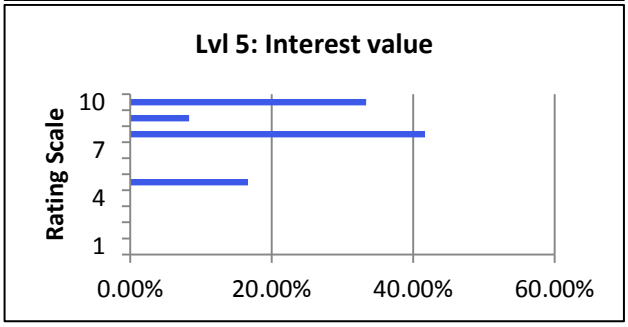

Lvl 2: Ease of navigation
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

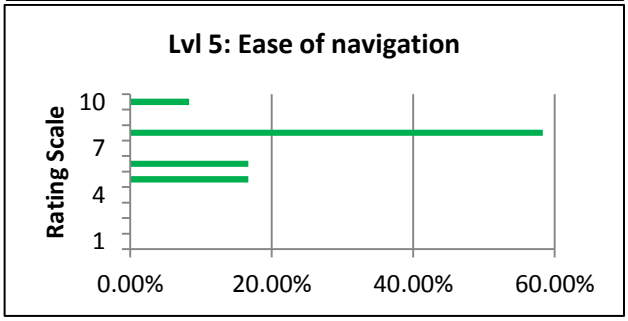

Lvl 3: Interest value
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

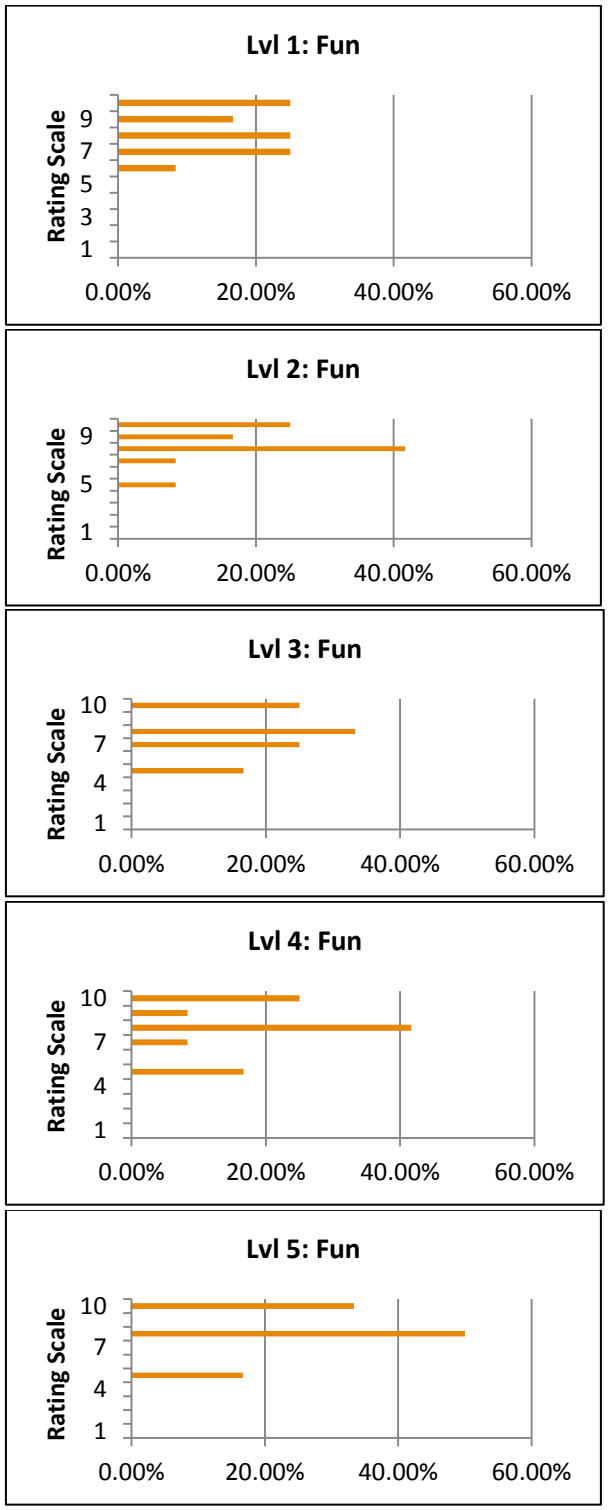

Lvl 3: Ease of navigation
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%


Lvl 4: Interest value
Rating Scale
9
7
5
3
1
0.00%
20.00%
40.00%
60.00%

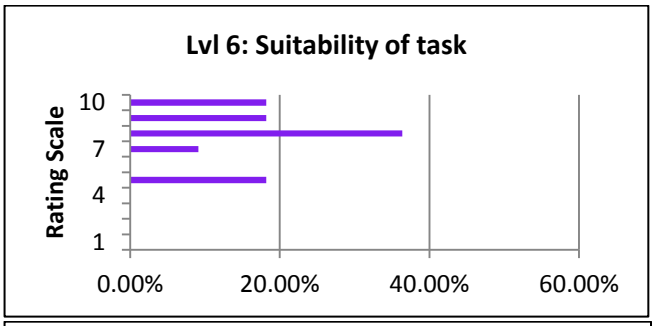

Lvl 4: Ease of navigation
Rating Scale
9
7
5
3
1
0.00%
20.00%
40.00%
60.00%

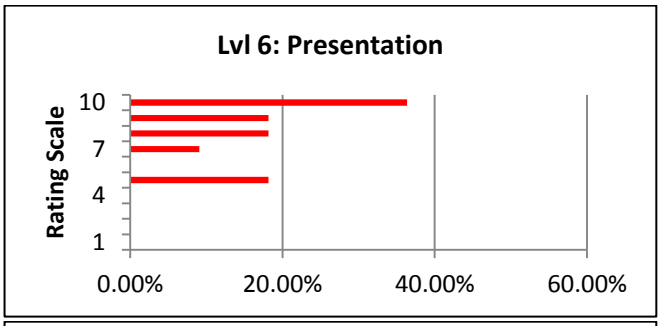

Lvl 5: Interest value
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

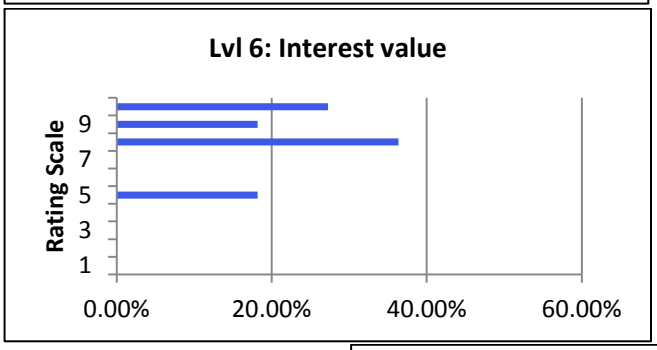

Lvl 5: Ease of navigation
Rating Scale
10
7
4
1
0.00%
20.00%
40.00%
60.00%

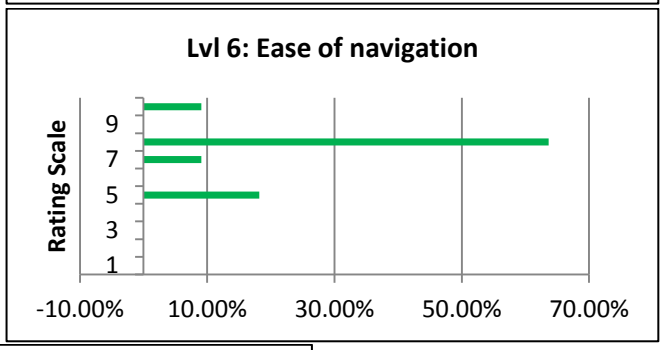


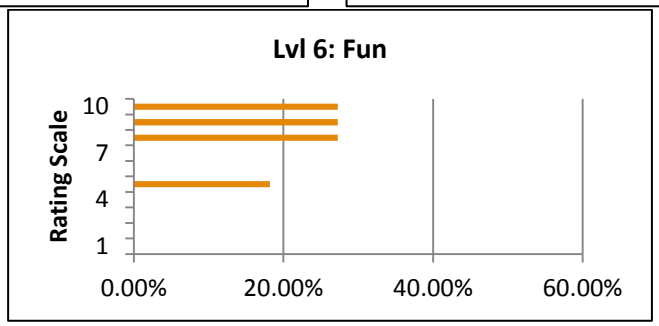
Figures 54-78: **Levels 1-5 rated for five characteristics (suitability of task, presentation, interest value, ease of navigation, and fun)**











Figures 79-83: **Level 6 rated for five characteristics (suitability of task, presentation, interest value, ease of navigation, and fun)**

Appendix F: **Teacher Likert-style statements for Level 6 percentages**

Statements for Level 6	Definitely true	Somewhat true	Neither true nor false	Somewhat false	Definitely false
The linking of tasks seemed logical	18.18%	63.64%	18.18%	0.00%	0.00%
It was hard to understand the instructions for the sequencing task	0.00%	9.09%	27.27%	27.27%	36.36%
The main characters in the story should have been visible to the player	36.36%	27.27%	36.36%	0.00%	0.00%
The time limits added to the excitement	18.18%	54.55%	27.27%	0.00%	0.00%
I felt disappointed at the end of Level 6	9.09%	18.18%	45.45%	27.27%	0.00%

Table 12: **Teacher Likert-style statements for Level 6 percentages**

Appendix G: **Teacher survey Likert-style response percentages for final general statements**

Statements	Definitely true	Somewhat true	Neither true nor false	Somewhat false	Definitely false
The game made me think	45.45%	54.55%	0.00%	0.00%	0.00%
I enjoyed playing the game	45.45%	54.55%	0.00%	0.00%	0.00%
I would like American English options accepted for task answers	0.00%	0.00%	36.36%	36.36%	27.27%
The HUD was a useful way of interacting with the game	18.18%	63.64%	18.18%	0.00%	0.00%
I would not be able to use this game with my students	0.00%	18.18%	18.18%	9.09%	54.55%
My students would be motivated to play the game to the end	36.36%	63.64%	0.00%	0.00%	0.00%

Table 13: **Teacher survey Likert-style response percentages for general statements**