Design, Development and Evaluation of a Virtual Environment with children for Moral, Social & Emotional Leaning

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ABSTRACT

Virtual environments have the potential to be an important teaching tool for emotionally-sensitive issues capable of producing a sense of presence, perspective-taking and introspection in users in a risk-free, rapid feedback experience. In designing such experiences, it is essential that users are regularly engaged in a collaborative design process. However, engaging in design, development and evaluation can in itself provide a learning experience. Here, we present our approach to engaging children in the design, development and evaluation of a virtual learning environment, specifically a Serious Game, focused on inculcating empathy, ethical reasoning and reflection for coping with bullying. We demonstrate that children's involvement not only contributed to an improved virtual environment, but significantly, engaging in the design process provided children with a novel and effective learning opportunity. Through using innovative child-centered participatory design practices, this research provides perceptive insights into how engaging children in design can be employed as a learning experience for emotionally-sensitive learning as well as an approach to gathering user design input. The material outlined in this article is directly linked to virtual worlds for positive change— meeting the needs of children, empowering them to be consulted and take responsibility for issues that affect them at school.

Keywords: Virtual Learning Environment, Values Education, Social and Emotional Learning

INTRODUCTION

Child suicides in Japan, due to school bullying, are the highest they have been in more than three decades (BBC News, 5 Nov 2018). Kersten (2012) calls bullying victimization a "*collapse of moral code and a symptom of the passing of everyday values*" such as empathy, kindness, compassion and tolerance. Although Virtual Learning Environments (VLEs) are seen as an effective vehicle to transfer moral value orientations and positive emotions (Paracha & Yoshie 2013; Hodhod et al., 2011; Zagal 2009), they have never been considered pedagogically imperative by the Japanese school system. This is despite a growing wider focus on developing active and dynamic learning environments which incorporate digital technology and encourage a participative relationship between students and practitioners (Borges et al.,

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2014). In Japan, moral, social and emotional learning approaches are suppressed in the curriculum rather than given the precedence they deserve. Schools are focused more on improving academic skills of children (Paracha & Yoshie 2013) than offering them with opportunities to explore personal, social and emotional issues, and related coping strategies in a virtual environment without involving any real-world risks (Chaffe 2016; Abt 1970).

Social and emotional skills are critical to being a successful student, citizen, and worker (Greenberg et al., 2003). This type of learning involves acquiring knowledge and skills to understand and manage emotions, set and achieve positive goals, feel empathy for others, establish positive relationships, and make responsible decisions (Casel 2013). For virtual learning, Buck (2013) states that integration of game theory into non-game environments can create positive emotional responses such as joy, relief, curiosity, and creativity. This in turn may facilitate deeper understanding and management of emotion. Similarly, Granic et al. (2014) believe that serious games can provide immersive and compelling social, cognitive, and emotional experiences that can be transferable to real-world contexts, whilst operating as sites to apply problem-solving skills and enhance creativity. Granic et al., (2014) and Greitemeyer (2013) found that intergroup collaboration in multiplayer serious games reduces prejudice and increases empathy towards the outgroups. In this respect, learning may be achieved through the development of relatedness, a key element of self-determinism (Seaborn, 2015). Cuhadar & Kampf (2014) suggest perspective-taking in serious games is a prerequisite for developing empathy— one of the most important aspects of anti-bullying education.

Values education aims to stimulate ethical reasoning, reflection (Zagal 2011), awareness, responsibility, and compassion, thereby nurturing respectful and empathetic attitude towards others (Chowdhury 2016) and supporting learners to overcome prejudice, discrimination, and immoral behaviors (Bruno et al., 2015; Weil 2016; 2009; 2004; & 2003; Brown 2014; Chitkalamba 2011). Serious Games developed in Virtual Learning Environments with embodied characters offer particular benefits for values education, such as coping with bullying. The feeling of presence, ethical reasoning and reflection coupled with the potential for learners to empathize with virtual agents in complex emotional situations (Hall, 2006a) allows the child to assume realistic roles, face problems, formulate strategies, make critical decisions and to get fast risk-free feedback on the consequences of their actions.

Shimpai Muyou ("Don't be afraid!" in English) was proposed in order to promote empathy and moral reasoning as an effective means to prevent school violence and delinquency issues in Japan (Paracha & Yoshie 2008). The aim was to design and develop Shimpai Muyou for Japanese pupils to help them learn about bullying victimization and related coping strategies, and to evaluate the usability, user experience, and efficacy of the system. The child's role in Shimpai Muyou was as an advisor or invisible friend to the victim in the bullying scenario, interacting with the victim at key points in the narrative. Value Sensitive Design (VSD) a theoretically grounded approach to designing technology that promotes human values e.g., peace, equality, empathy and tolerance (Hourcade et al., 2012; Friedman, Kahn, & Borning 2006) provided the ethos for development.

Inspired by the emerging paradigm of "*engaging in research with rather than on children*" (Hill, Laybourn and Borland 1996), child-centered approaches (Druin 2002) and the need for learner involvement in VLE development (Paracha & Yoshie 2011), the Shimpai Muyou project was the first in Japan to use Participatory Design with children in the school setting to design educational technology involving over 200 children in the process (Table 1). Participatory Design provides engaging approaches and methods that enable users to participate and collaborate in (and throughout) the design process. Following the pragmatic stance, as seen in several studies (Hall et al., 2004, 2006 & 2015; Read et al., 2013; Khaled & Vasalou 2014; Read 2015) the goal with Shimpai Muyou was to support children's input as informants.

Table 1. Overview of Shimpai Muyou participatory design and evaluation activities

Purpose	Experience & Participants	Participatory and Evaluation methods
Informing early stage design	Conception Participatory Design Workshop (30 children)	Fictional Inquiry Comic-boarding Classroom Discussion Forums (CDFs)
Initial Prototype produced		
Improving narrative and story	Narrative Participatory Design Workshop (30 children)	Interactive Theatre-based Participatory Design Digital Storyboarding Interaction with SM CDFs
Prototypes providing short scenarios to explore storylines and interactions		
Improving the scenarios and interactions with SM during development	Formative Evaluation Sessions involving end-user interaction with limited versions of the prototype (80+ children in 4 formative evaluation sessions)	Interaction with SM Formatively evaluate the look and feel Improve design by creation of artifacts e.g. comic strips to improve characters / story CDFs
Final Prototype produced		
Evaluation phase	Summative user evaluation (20 children)	Questionnaires Logging aggregator Observations Think Aloud CDFs

Although the need to address the current lack of ICT integration into pedagogy is an identified problem in Japan (Aoki 2010) engaging children in design is still not the norm in the Japanese technology design culture, with resistance to adopting user-centered approaches. Furthermore, despite a growing consensus in the value of gamification of learning (Nicholson 2012; Francisco, 2012) and the advantages of incorporating game components into teaching and learning strategies (Gutiérrez & Lopez 2016), there has been little research into the benefits of co-designing gamification environments, including serious games, with the children who will ultimately use the system.

However, as we will highlight in this paper, not only does children's participation contribute to the application design, but further the experience can offer a valuable opportunity for learning. Whilst there are studies considering how engaging in Participatory Design and child engagement in the design process can support design and technical learning (Bødker, Kensing & Simonsen 2004; Simonsen & Hertzum 2010, 2012; Thumlert, de Castell and Jenson, 2018) there is a lack of research that considers how domain learning, such as coping with bullying, can be integrated into design, as well as evaluation activities.

Table 1 provides an overview, with the following sections briefly presenting our approach to involving child-learners in Shimpai Muyou's development. The discussion highlights how design and interaction can empower children with ethical reasoning and reflection in order to enable them to challenge bullying. For full details of our approach and activities, for informing early stage design see Paracha, Khan &

Yoshie (2008) and Paracha & Yoshie (2008); for improving narrative and story see Paracha & Yoshie (2011); for iterative design and development see Paracha & Yoshie (2012) and Li et al., (2013); and for summative evaluation please refer to Paracha & Yoshie (2013) and Paracha, Jehanzeb & Yoshie (2013). Here, we focus our discussion on how this participatory, child-centred approach not only generates input to design, but further that it empowers children with ethical reasoning, drawing upon important findings from each stage in the development.

Informing Early Stage Design: Conception Participatory Design Workshop

The first 1-day Conception Participatory Design workshop aimed to provide inspiration and concepts for narratives and design early in the design process. Design inputs to the workshop included initial paper-based graphics showing character and environment along with partial storylines. The Conception Workshop was held in Oita, at a Japanese school. 30 children aged 7-12 years old were recruited through the Parent-Teacher Association (panel of parents and educators at Japanese schools who help to ensure the safety of children) who gave their ethical approval for the children's engagement.

After a brief introduction, the child participants were divided into 6 groups of five children and engaged in three Participatory Design methods:

- Fictional Inquiry (Dindler & Iversen 2007) which allowed designers to shape the context of collaborative design activities by creating partially fictional situations, artifacts, and narratives. This fiction was provided by children being asked to be "Detectives" investigating bullying on Mars. They drew scenes depicting different bullying situations and presented them using slides. The nature of the inquiry was exploratory, and enquired into the children's personal experience of bullying e.g., fictional bullies & victims and bully/victim gestures and language. Using Fictional Inquiry aimed to develop on an understanding of the children's views on bullying, types, situations, characters and language involved with bullying.

- Comic-boarding (Moraveji et al., 2007) which used specially created comic-based activities related to the bullying context to gather narrative and content ideas. This approach was selected as being particularly appropriate for Japanese children with considerable interest in comic books and anime (Ito 2008). Children were asked to collaboratively complete a partially completed comic strip. The children's comic-boards depicted bullying scenarios, language and gesture contents that could be used for the design of the narrative of Shimpai Muyou.

- Classroom Discussion Forums (CDFs) (Hall et al., 2006) were used instead of focus groups, with pupils more familiar and comfortable with this approach that uses the typical classroom structures of "Table Time" (small group discussion) followed by "Circle Time" or "on the carpet" (whole class discussion) with hands-up questions and answers to obtain verbal feedback from children. CDFs aimed to provide ideas and stories for narratives and experience supporting children in discussing their opinions on bullying, coping strategies and the role of empathy and values.

Key Innovations, Findings & Contributions

Fictional inquiry, comic-boarding and CDFs yielded novel, quality outputs including types of bullying situations at school, emotions, empathy, language and gestures of bully or victims, with 43 design ideas produced from the workshop. Children were highly engaged, vocal and enjoyed collaboratively undertaking activities with useful outputs throughout the conception workshop.

Children provided feedback on the aesthetic and were positive about animation-based problem solving and interacting with Japanese animation characters similar to Nobita Kun, Chibi Maruko and Doraemon, although western animation characters were not popular among Japanese children. The children also preferred text-bubbles rather than natural language support or recorded voiceovers, focusing on simple interaction more similar to that with a comic than a game. This preference resulted in designing the interface (Figure 1) based on free text entry and simple point and click.
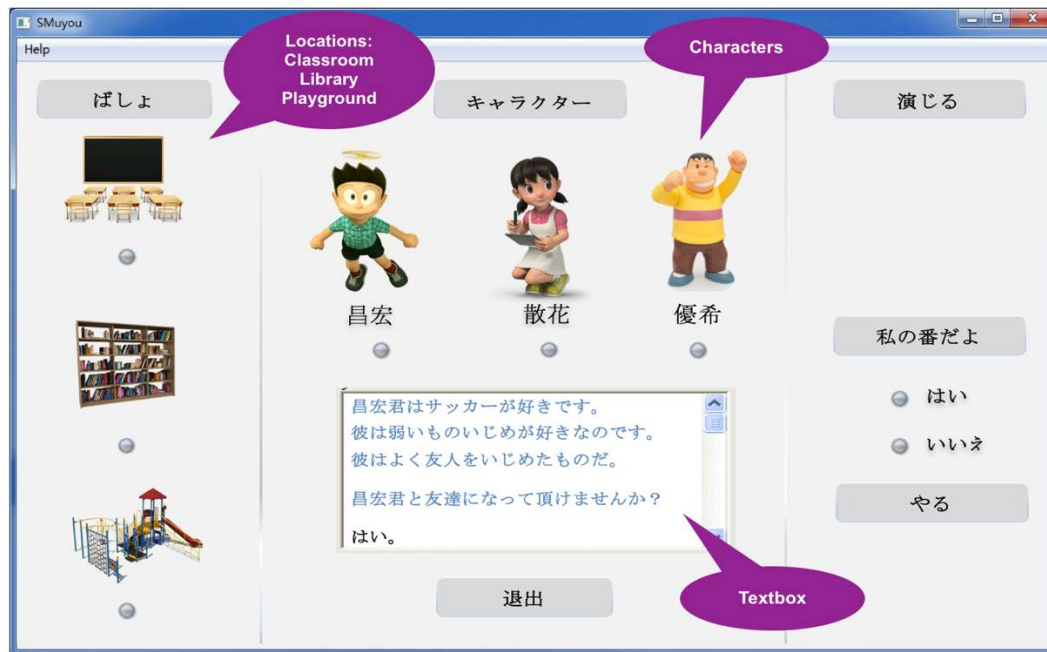

Fig 1. Interface

Engaging children in collaborative design activities such as comic-boarding, creating artefacts and narratives and engaging in classroom discussions provided significant input to the initial VLE design. Outputs contributed to the development of initial design ideas for the VLE, identifying outline, genre, requirements, and factors that would increase acceptance of VLE by Japanese children, as further detailed in Paracha, Khan & Yoshie (2008) and Paracha & Yoshie (2008)

Using partially fictional situations and narratives and developing comic strips allowed children to discuss and explore stories and everyday experiences of school emotions, empathy, bullying scenes and coping with bullying. However, in addition, the participatory design methods applied provided tools to teach and learn about values, perspective-taking, compassion, ethical reasoning, empathy, reflection and inclusive principles in the classroom and school community.

Children created scenarios and comic strips that reflected what happened in their daily school experience. This reflection allowed them to discuss incidents and issues that they were experiencing with the reflection achieved through the design exercises helping them to understand themselves better. The children were able to discuss and from that discussion create design artifacts that provided solutions to their personal experiences of feeling oppressed or victimized. In the CDFs, the children's discussion highlighted that the Participatory Design experience had made them feel empowered, that they felt they had a voice in the world. By rehearsing that voice in creating comics and scenarios in the classroom, they acquired a useful tool for exercising their voices outside of the classroom.

Improving Narrative and Story: Narrative Participatory Design Workshop

Shimpai Muyou's interaction provides children with bullying scenarios and it is critical that these are appropriate and engaging, providing compelling content. Shimpai Muyou was iteratively designed and developed, with an initial prototype providing short verbal and physical bullying scenarios with limited interaction functionalities developed to be used to support participatory narrative and content design. To achieve this a Narrative Participatory Design workshop was held, both to gain feedback in relation to the experience, narrative, plot and character motivations in the prototype, and to develop and extend dialogue and content for the narrative.

The 1-day workshop was held in Yufuin with 30 children aged 7-12 years old. The Parent Teacher Association was contacted to obtain ethical approval for recruiting children. After a brief introduction, children worked collaboratively in 6 groups of five participating in:

- Interactive Theatre-based Participatory Design based on Freire's educational theory that oppression can be overcome by progressive education and practices (Friere 1997) and Boal's (1993) Theatre of the Oppressed, a form of interactive theatre that aims to bring to light systemic exploitation and oppression within common situations. In Theatre of the Oppressed, the audience participates in the drama taking responsibility for actors on the stage, advising them and contributing to the narrative. The approach supports role and perspective taking for challenging social and emotional situations, such as bullying. For the design of Shimpai Muyou this technique was extended into a Participatory Design activity to explore story arcs, character motivations and plot points. Children were supported by a drama facilitator with each group taking the perspective of one of the characters in the VLE (e.g. the bully, victim, defender, bystander), collaborating together to decide the character's actions. The character was provided by an actor, with the groups advising the actor when asked to by the drama facilitator during the narrative.
- Digital Storyboarding (Paracha & Yoshie 2011), see figure 2, was used via a storyboard software with the children co-producing short narratives combining images, text bubbles, voiceover and video on children's bullying experiences.
- Shimpai Muyou experience: children interacted with the prototype and were asked for their views on characters, storyline, as well as acceptability of the look and feel of interface.
- Classroom Discussion Forums: throughout the day, CDFs were held to discuss the activities, outputs and experience.

The Narrative Participatory Design Workshop was video recorded. Template analysis was used to provide priori themes which then evolved during the coding. For example, the importance of verbal, relational and physical abuse in relation to the bullying topic being researched was so well-established that the researchers safely expected them to arise in the data as priori themes, given their prominence in the literature. The main benefit of using a priori themes was that they helped to accelerate the initial coding phase of analysis.

Key Innovations, Findings & Contributions

The workshop, with its focus on the characters in Shimpai Muyou in both the Theatre of the Oppressed and the Digital Storyboarding provided rich information on children's views, perspectives and expectations of key-roles in bullying situations, character profiles, coping strategies, storyline design and progression. The output was highly creative with children contributing 156 unique design ideas during the workshop. Key contributions to the narrative included that almost all of the children's storyboards indicated a happy ending e.g., hatred turning into friendship, peace and conflict resolution. Based on this

the Shimpai Muyou design team incorporated that happy ending segment in all of the virtual bullying experiences.

Children identified that bullying at Japanese schools was often one against many and mostly relational e.g., ignoring, verbal abuse, boycott etc. This is a major difference to bullying experiences in countries such as the UK and the US, where one on one (or small group) physical bullying is often seen, particularly amongst boys. In response the design team included more relational and verbal bullying scenarios than physical ones and incorporated the many to one bullying prevalent in Japanese schools.

Shimpai Muyou focuses on empathic engagement between the child and the victim, with Theatre of the Oppressed and Digital Storyboarding generating appropriate dialogue for the bullying scenarios and for engagement with the victim. Digital Storyboards (Figure 2) directly captured language content, gestures and coping strategies that children used to dealing with bullying, character impressions, emotions and empathy.

Fig. 2. Digital Storyboards created by children depicting bullying scenarios at school

Exposure to the Prototype focused primarily on the aesthetics and interaction, with data collected on character appearances, storyline, empathy and gender preferences. During the CDF children offered different views on characters, storyline, empathy and gender, as well as identifying characteristics that would increase acceptability of the look and feel of the interface. CDFs offered opportunities for children to verbalize their views on bullying, bullying scenarios, speech acts, coping strategies, bully/victim's impression, role of empathy and values, favorite characters and their overall impression of the VLE.

The Participatory Design activities supported the children in ethical reflection throughout the workshop, with plentiful discussion exploring views of reducing and ending bullying at school. Using Participatory Design based on Boal's Theatre of the Oppressed was highly effective with Japanese children. Children experimented with different choices in bullying scenarios in a safe environment, and were able to see immediate (although safe) consequences as performed by the actors. These activities enthused the children with the strategies identified offering potential to increase self-confidence and self-esteem outside the classroom. During CDFs children stated that they felt empowered by voicing their ideas and having them heard.

Using interactive theatre techniques and digital storyboarding, coupled with experiencing a prototype virtual environment, children were able to create scenarios and dialogues that reflected their world. But further, such reflection helped them understand themselves better. Children were able to discuss and act out solutions to problems when they felt oppressed or victimized. Interactive drama, digital storyboarding, and classroom discussions provided an approach that enabled children to voice their views and empowered them with ethical reasoning, reflection and empathy in order to reduce bullying victimization.

Involving Children in Iterative Development: Participatory Design through Formative Evaluation

Shimpai Muyou was iteratively developed over several years with an ongoing participatory design process incorporating formative evaluation accompanying prototype development. Using Participatory Design approaches the children engaged as informants, focused on specific issues, with results feeding back into improving the experience. During each formative evaluation, after a brief introduction to the Shimpai Muyou project, participants were involved in individual or small group interactions with the current prototype and then design activities, such as annotating screens and dialogue, discussing and improving characters, plot and storylines were conducted. The evaluations generated written and drawn artefacts along with recommendations and ideas gathered during Classroom Discussion Forums.

The prototypes of Shimpai Muyou provided part of all of the scenarios with the basic structure of the experience being that the child meets the victim and then watches a scenario in which the victim is bullied with In-Episode-Interaction providing navigation. After the bullying episode, the child then engages in Out-of-Scenario Interaction, a dialogue with the character in order to help them with their situation. After the scenario has ended, the *End-Interaction* functionality is activated, and the child can then review the scenario and their interactions.

Prototypes and workshops during the iterative development included:
- Verbal and physical bullying scenarios without any interaction functionalities were used to assess aesthetics, dialogue and narrative.
- Interactive experiences for partial and full scenarios, for example as detailed in (Paracha & Yoshie 2011). A workshop was held to determine whether children liked the characters as depicted; whether they were able to empathize with the victim character; and whether the bullying scenarios were intuitive.
- Perspectives and views of the aesthetics of the characters and surroundings, determining if the children preferred 2D or 3D characters, realistic or cartoon style graphics and 2D or 3D environments. This enabled validation of potential scenarios for the VLE.
- Dialogue and interaction, with the victim and user interaction approaches focusing on the Out-of-Scenario Interaction in which the player acted as an advisor to a character. In-Episode-Interaction was limited for this prototype.
- In-Episode-Interaction, with the prototype providing navigation and orientation functionality enabling the user to explore and navigate in a scenario by following the character.
- End-interaction prototype providing functionalities enabling the child to watch snapshots of the key moments during interaction to support them in reflecting on their decisions and advice to the victim.

Key Innovations, Findings & Contributions

Children's input throughout the iterative development of Shimpai Muyou made a significant contribution to the design of the scenarios and interaction with the system. Discussing design issues and developing a credible, interesting scenario including considering bullying types, roles, gestures and language content brought improvements to the interface, storyline, character profiles and coping strategies. For example, in adding content for the bullying episode in the scenario children suggested many different forms of non-verbal threatening gestures for the bully that were incorporated into character scripts e.g., giving a stare, fighting, hitting, pinching, spitting, tripping, pushing, feeling angry, frightened and powerless.

However, not only did the participatory design and formative evaluation provide valuable design input, they also provided a mechanism to stimulate perspective-taking, ethical reasoning, reflection and empathy

in children on bullying victimization. For example, children's discussion of non-verbal threatening gestures resulted in the children addressing their own lived experiences of bullying, responses and strategies to cope with threatening non-verbal behavior. Through active participation in the co-production of serious-game and game-environment components, there was evidence of student-centered autonomous learning, enhanced reflection, and positive student experience.

The children were highly positive about being included in the development of Shimpai Muyou feeling it gave them a voice. Becoming active participants in the iterative development process become intrinsically motivating, with the process of evaluation and offering feedback a learning activity that was in itself a positive reward. Malone & Lepper (1987) proposed that intrinsically motivated learning is more likely to be successful than extrinsically motivated learning, providing a taxonomy of intrinsic motivators which includes control, cooperation, and recognition. Ryan & Deci (2000) support this stating that if an individual finds activity engaging and carries it out without conditioning, then learning is more fruitful. Children engaging with the formative evaluation and participatory design of Shimpai Muyou had control, cooperation and recognition, with their voice and experiences incorporated. The formative evaluation offered children an atypical experience where their views, beliefs and ideas were seen as being critical. Children had control in shaping development, and cooperated both together and with researchers in order to achieve this.

The objective of the ongoing formative evaluation activities was to validate the prototype development at regular intervals in terms of usability. The final phase of user involvement in Shimpai Muyou's development was a summative usability evaluation.

Summative Evaluation with Children

Usability is defined by ISO 9241-11 (1998) as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction". From a software perspective Lindgaard (1994) described usability as the ease of learning and using computer systems from the experienced and inexperienced user's point of view, something children as digital natives intuitively take for granted. Usability requires design principles aimed at children that adapt to, and consider their needs (Masooda and Thigambaramb 2015). This adaption means that usability in the context of Shimpai Muyou focused on the degree to which children were able to learn about bullying and to control, understand and enjoy the environment. The summative user evaluation for Shimpai Muyou took a mixed methods approach and focused on:

- Learning effectiveness with the evaluation seeking to explore if interacting with Shimpai Muyou did support learners in understanding, responding to and coping with bullying.
- Control and Interaction with the evaluation aiming to identify if children could easily navigate and interact with Shimpai Muyou.
- Engagement with Shimpai Muyou investigating if the user experience was interesting and enjoyable.

Emotional and sensitive issues are complex and difficult to discuss with children. Using a mixed methods approach provides diverse ways to understand user's viewpoints and experiences. 20 children aged 10 to 12 years participated in the evaluation. Participants were selected through purposive sampling based on the naturalistic observation of their classroom conduct (i.e. bully, victim, bully-victim, and bystander) and in consultation with their teachers. Ethical approval was obtained from the Parent Teacher Association with assurance that the data would be strictly used for research purposes only.

The summative evaluation began with a brief introduction to Shimpai Muyou and explanation that the children would be taking part in an evaluation. Children interacted with the prototype with researchers observing the children and engaging them in talking and thinking aloud about their interaction. After the interaction children completed a short questionnaire and participated in the Classroom Discussion Forum. Quantitative data was collected through questionnaires which focused on Shimpai Muyou's usability. This included whether participants felt they had had an effective experience and that they had learned about coping with bullying; whether participants were able to navigate, use and interact with Shimpai Muyou; participants response to the characters and preferred character; and whether the scenario and experience was useful, interesting and realistic. All of the child's interactions with the agents and the environment were logged, with a logging aggregator providing collected and aggregated log file data from different sessions and sources in a single combined data sheet. Logs captured all meaningful player actions such as visiting a virtual school location, meeting a bully, asking help from friends, opening a coping resource room etc. and were interpreted using log file analysis (Cocea & Weibelzahl 2009).

Qualitative methods included think-aloud user testing (Desurvire, Caplan & Toth 2004) with the children talking through their interaction decisions whilst engaging with Shimpai Muyou. Observational methods (Moreno-Ger et al., 2012) included recording the upper torso and face of the child during interaction in order to capture children's emotional reactions. Recordings of the peer-interactions were also captured, with facial expression analysis used as one of the measures to indicate satisfaction. Classroom Discussion Forums (CDFs) (Hall et al., 2006) were used to explore ease of use, satisfaction with the Shimpai Muyou experience, likeability of characters/environment, difficulties with the application, emotional reactions and empathy vis-à-vis synthetic characters and virtual bullying scenarios. The CDFs were recorded and subsequently analyzed, using template analysis of expressed emotions and video-taped facial expressions, and occurrences of right or wrong choices through log files.

Key Innovations, Findings and Contributions

The results from summative evaluation, as presented in Paracha & Yoshie (2013), Paracha, Jehanzeb & Yoshie, (2013), and summarized in table 2, identified that children had enjoyed interacting with Shimpai Muyou and had increased their knowledge and understanding of bullying. Providing an ecologically valid evidence-based intervention targeting bullying in the classroom generated results that revealed pupils have a good level of understanding on bullying victimization after interacting with the characters in different virtual bullying scenarios. Shimpai Muyou stimulated discussion both in the classroom and across the whole school, with an improvement in school culture and sensitization to bullying informally reported by teachers and children in the month after the Shimpai Muyou evaluation. The children clearly understood the basic design of the VLE, the scenario and the role of the main characters. Child learners favored point and click and the use of texting for interaction. Whilst children were positive about the aesthetic, they wanted a more game-like experience, preferring to have more control over the interaction pace, which they considered to be too slow.

The scenario comprehension and believability of characters was considered to be high with children reporting that the bullying scenarios depicted real-life in Japanese schools. Children responded positively to the characters, appreciated the aesthetic and were seen transposing their own feelings onto the characters in the process of understanding bullying victimization. Empathic engagements with the characters were apparent. For instance, the victim character *Haruto* was favored the most, while the bully *Masahiro* was disliked by many, particularly by girls, with the victim-character evoking empathy, whereas the bully-character triggered anger.

Shimpai Muyou aimed to create spaces for dialogue, collaboration and reflection in order to induce deeper thoughts and a change in attitudes. The ethical dilemmas of the bullying scenarios elicited values-driven decisions from children e.g., defending victims, taking sides with victims, informing and seeking

help from adults, comforting victims and trying to stop bullies. Think aloud, observations and CDFs helped to establish Shimpai Muyou's potential for tackling emotionally sensitive issues, both through recording and analyzing emotional reactions, but particularly through children talking about their own experiences and perceptions whilst discussing their interaction. Interacting with Shimpai Muyou was found to empower children with moral self-reflection and empathy to challenge bullying (Table 2). Emotional responses including guilt, shame and moral dilemmas were triggered when the players realized that they had violated a moral standard. Increased awareness of bullying was observed, specifically intuitive interaction with characters that significantly decreased children's level of moral disengagement on bullying victimization

Table 2. Shimpai Muyou Summative Evaluation

Category	Indicative Comments	Specific observation
Increased children knowledge about bullying & related coping strategies	**R8B:** *"before when there was a fight, I would meddle, but now I will speak calmly".* **S7G:** *"Bullying is wrong and everyone must speak up about it to stop it".* **S3B:** *"But, now no matter how tempting it is, I'll not stoop to their level and always seek for help from an adult."*	- Use of ethical dilemmas and Socratic persuasions brought about positive changes in children's violent behavior. - Teachers confirmed that they noticed an increased awareness of the bullying issue in the participating child-learners as compared to those who did not participate in the interactive session with Shimpai Muyou.
Empowering anti-bullying Morality Effectiveness on Conflict Resolution	**K5G:** *"it made sense because people will see several things such as not to throw trash on others, learn how to have good manners and not to call bad names".*	- weakened the association between moral disengagement and bullying. - No noticeable improvement in their conflict resolution skills, with a longer intervention required to assess this
Technical Infrastructure/ Ease of Use	**M3G:** *"It is very interesting how this VLE works".* **M5B:** *"It is very easy to use, requiring that you simply point to indicate your wishes on the screen and then press this button."* **S3B:** *"it was very easy for me to ignore bully in the computer than here at school".* **T4B:** *"...I like 3D characters and objects."* **C8G:** *"I'd like to face bully in a 3D school."* **Y9B:** *"what should I do?"*	- No hesitation in using technical equipment - Queries concerning "Send" button - Excitement, enthusiasm, & desire to participate - Boys less apprehensive - Balance in learner's freedom and learning
Appeal & Perceived Usefulness	**E1G:** *"interesting, fun, better than comic books."* **I7B, J2G, M3G, D1B & R2B:** *"quite different from DS & PSP, but amazing."* **S7G:** *"It is cool; everything we do is useful".*	- Children clearly empathized with the bullying victim - acknowledged bullying awareness - dilemmas required hard decision making - Confusion concerning the textual references
Immersion & Social Empathic Engagement with Characters	**M6B** & **K5G:** *"we'll allow Haruto to play with us."* **A4G:** *"It was really nice solving my friends' problems."* **C6G:** *"I felt as I'm in the real world, because this happens all the time at our school."* **I7B:** *"Yes, it was a fun experience with a lot of friends".*	- The virtual characters elicited appropriate emotional responses from learners ranging from "*sad for Haruto*" to "*angry with Masahiro*". - Positive emotional engagements led to immersion
Urge to Replay	**E1G:** *"I had a lot of fun using Shimpai Muyou and would like to play again."* **C6G:** *"interesting will try"* **Y9B, T4B** & **A4G:** *"I'd prefer playing PSP or DS.*	- Desire to further use the application "*for multiple stories*" - more about the characters' future relationships - Children found characters believable as they "*listened to them*"

DISCUSSION

The UN's Resolution on Protecting Children from Bullying (9 November 2018) highlights the occurrence of bullying in all parts of the world and the fact that children who are victimized by such practices may be at heightened risk of compromising their health, emotional well-being and academic work and for a wide

range of emotional and/or physical problems, as well as potential long-term effects on the individual's ability to realize his or her own potential. Providing approaches to coping with bullying and supporting Personal, Social and Emotional learning in schools and classrooms is essential. VLEs and Serious Games clearly offer an approach that is effective, however, there is still a lack of uptake and limited use of VLEs in the school classroom.

The advantages of gamification of learning, including serious games, have been widely cited and discussed from both empirical and pedagogical perspectives. When appropriately designed, such environments can encourage specific user behavior (learning, progression, accomplishment) with high levels of confidence (O'Donovan et al., 2013) and can facilitate personalized, intrinsically motivated learning that is participatory in nature. The act of game play itself can become a positive award (Seaborn, 2015). Furthermore, the potential of Serious Games to enable personal, user centric learning is significant. Constructionist theorists purport that learning through personally meaningful projects is more effective than passive learning (Pink, 2010).

Our experience of involving children in the iterative design and development of Shimpai Muyou highlights that design-of-gamification can act as a learning enabler. Shimpai Muyou was designed and evaluated in a classroom setting. Researching with rather than on children identified the learning benefits possible from participating in the design of a VLE for bullying. The workshops brought forward many important and interesting design issues with Japanese children. Shimpai Muyou introduced a design culture which organizes the creativity of children in search for new solutions and includes the configuration of the problem to be solved. Knowing that engaging in the design of a virtual environment can in itself provide the learning experience could encourage schools and stakeholders to considering investing in such innovative technology, and opens research avenues in relation to the development of pedagogical models for learning-through-design of technology.

According to Thompson (2014) qualitative research experiences should provide an important aspect of behavior change research. During the design, development and evaluation of the VLE, the participation of children in collaborations was seen to have an impact on their learning and behavior. Using Participatory Design approaches, particularly interactive theatre and digital storyboarding informed meaningful emotional and ethically notable scenario design, while at the same time provided children with opportunities to reflect and change their negative behavior. The Participatory design offered current information from children perspectives on realistic bullying scenarios, storyline, speech acts, creating new scenes, coping strategies, bully or victim impressions, role of empathy, friendship and values. But more, the workshop's activities of collaboratively directing actors in an interactive drama; creating digital comic strips; interacting with a prototype of Shimpai Muyou; and discussing views and experiences of bullying served as a sensitization training opportunity to teach pupils about the role of compassion, perspective-taking and empathy in counteracting bullying. Sensitization training through Participatory Design offered an approach to creating a safe environment for all children at school, with findings from workshops highlighting how participatory design and conflict resolution enrich and complement each other. Conflict resolution researchers have not yet given sufficient attention to participatory design as a learning approach, however, as this paper identifies, designing moral and values-based experiences directly supports children's reflection and learning related to sensitive emotional issues.

With Shimpai Muyou our goal was to create a VLE on values education that support children's personal, social and emotional learning in relation to bullying. In engaging children in the development of a VLE for personal, social and emotional learning, such as bullying, as this paper has highlighted, we also supported value education teaching and learning. Japanese children felt empowered to know that they had a voice in the world. By rehearsing that voice in digital space, they acquired confidence to stand up to bullying. Believing that they could make a difference in their lives, should empower children to make a greater difference in their lives and communities. Participatory Design with children served as a powerful

way of reflection, ethical reasoning, empathy and perspective-taking. The proposed methodology and pedagogical model are potentially capable to address similar other challenges such as hate crimes, vandalism, drug and alcohol abuse, sexual bullying, gang membership and gang violence, truancy, and excessive absenteeism.

Shimpai Muyou was one of the first technology-enhanced learning interventions on school bullying in Japan. As such the project sought to increase the quality of ICT applications in the Japanese education system. The Shimpai Muyou project developed a novel approach to address ethical and emotional aspects in the learning process. The focus on bullying represents a problem of relevance to the country's school system, with Participatory Design activites as well as interaction in a Virtual Environment providing an approach to engaging with bullying providing individual personalized learning strategies as well as providing a focus point to support and underpin whole-school approaches to tackle bullying.

CONCLUSION

Learner involvement is a widely accepted principle in development of VLE, yet there are few attempts to relate learner participation in design and development to learning of the domain the virtual environment provides. There is a lack of discussion of the impact of participating in a VLE's design and development on participants. This study is amongst the few that considers how learner involvement in design, development and evaluation can provide learning opportunities.

Shimpai Muyou served as a practice space for Japanese children to develop moral, social and emotional competencies in order to challenge school bullying. However, this practice space was not only provided by the completed virtual environment, but also in the activities experienced through participating in design. Shimpai Muyou's development identifies that Virtual Environments can offer learning not only in experiencing the intervention as learner, but also through designing the intervention as participant.

By engaging with children in design, development and evaluation activities, not only were they introduced to scientific and design thinking in relation to new technologies, but further they were actively engaged in learning about coping with bullying. Carefully planning the engagement of learners to provide integrated learning should become standard for virtual environment development with developers needing to consider the potential of integrating innovative subject-related learning experiences within participatory design, and thus adding direct value to the experience for learners. Learner-centered design needs to become more than a set of techniques for design, instead it must be viewed as an innovative learning opportunity with real benefits for learners.

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