

Shimpai Muyou: Confronting Child Suicides in Japan through a Serious Game & School-Based Intervention

Abstract

School bullying is responsible for a large number of child suicides in Japan. Serious games have proved to be effective and highly motivational educational tools capable of increasing awareness, changing behavior, reduce risk factors and even improving protective skills. This paper presents a novel approach of using both participatory design and gameplay to sensitize children (aged 7-12 years old) on bullying victimization. Action research strategy is used with intentions to improve the quality of school life in Japan through the use of a serious game called Shimpai Muyou. What makes it stand out from the rest of the crowd is that the entire intervention was design, developed and evaluated through partnering with children in a school setting. The research is largely qualitative and exploratory in nature, stemmed from interdisciplinary core ideas related to technology, education, psychology and interactive theatre. Findings from both formative and summative evaluations indicated that child-users empathically engaged with the synthetic characters, attributing a range of emotions to their actions e.g., empathy, compassion, sadness, anger etc., tackling ethical dilemmas and bullying situations with confidence. From these results, we can conclude that Shimpai Muyou is a useful and engaging school-based anti-bullying intervention.

Keywords: Serious Game; Participatory Design; Gameplay; Bullycide; Bullying Sensitization

1. Introduction

Suicide has become Japan's leading cause of death in school children aged 6-19 years (Statista Research Department 2022; Saori 2021; Jozuka 2021). The rate of child-suicide has increased every year since 2012, but it spiked dramatically from 2020 onwards; a record 514 children attending elementary, junior high and high schools in Japan died by suicide in 2022, topping the previous high of 499 seen in 2020 (see Fig. 1). School bullying is one of the major reasons that keeps youth suicide rate high in Japan (Goto, Okubo, & Skokauskas 2022; Lim 2017; Yukari 2019). Bullying (or *ijime* in Japanese) is defined as '*physical or psychological aggression on someone weaker, which is detrimental to them*' (Poole 2021). It is a complex and abusive form of violence that has potentially serious social and mental health consequences for those involved, whether as the students who bully, the students who were bullied, or the bystanders who see or know it is happening (Oyekoya et al., 2021).

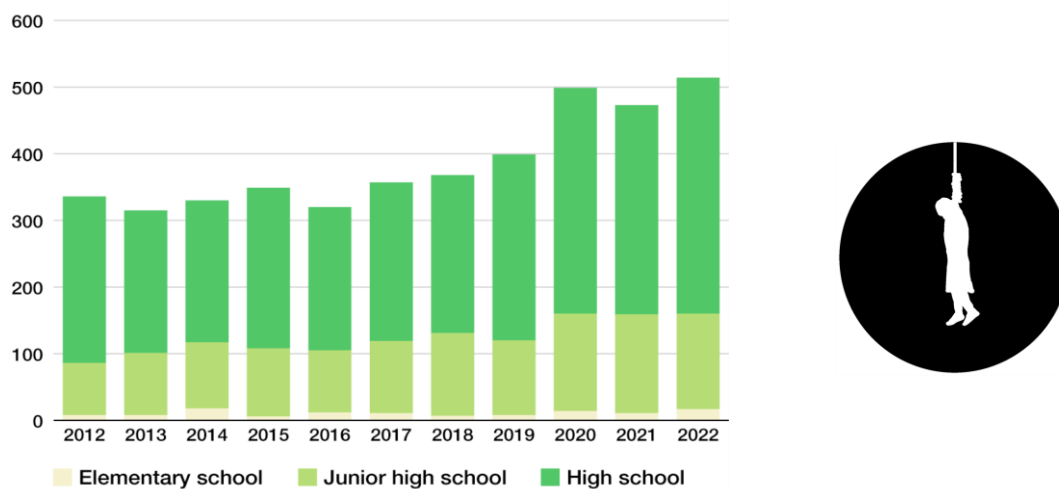


Fig. 1. Number of Child Suicides (2012-2022) in Japan based on data from National Police Agency and nippon.com

The most frequently reported devastating impact is “bullycide” and suicidal ideation. Bullycide occurs when incidents of bullying become so intolerable that the victim ultimately commits suicide by taking their own life (Langford 2022). Compared to the school bullying seen in the West, in Japan, it is linked with enormous child-suicides (Baseel 2020); predominantly a “with-in group” phenomenon (Stalter 2017); more relational than physical (Paracha, Hall & Shah 2021); and carried out by a large group of students (Okada 2015). Social conformity is imperative in the Japanese school environment and children can be assaulted or mocked for looking different.

Compelling evidence (Fernandes et al., 2022; Paracha, Hall & Shah 2021; Calvo-Morata et al., 2020; 2019; Nay & Zagal 2017; Mota, Botelho & Adamatti 2016) shows serious games can promote healthy behaviors, reduce risk factors, enhance protective factors through skill-building, and target prevention. However, the Japanese bullying sensitization programmes and policies (Kobayashi & Farrington 2020; Osuka et al., 2019; Horiguchi 2018) give more precedence to non-digital traditional anti-bullying interventions than considering the use of serious games as an effective prevention (Paracha, Hall & Shah 2021). In addition, the Japanese research related to the use of Participatory Design (PD) and gameplay on bullying sensitization seems to be sparse. Japanese schools and boards of education are focused more on improving academic skills of children (Paracha et al., 2020) than offering opportunities to explore personal, social and emotional issues, and related coping strategies in a virtual environment without involving any real-world risks (Paracha et al., 2019).

To address the knowledge gap, this paper showcases research on a serious game called Shimpai Muyou (Japanese term for “*Don’t be afraid!*”) that has used both PD and gameplay to sensitize Japanese children (aged 7-12 years old) on bullying. Sensitization is a learning process in which the learners are encouraged to reflect on past experiences to help facilitate envisioning future experiences (Paracha, Hall & Shah 2021; Paracha et al., 2019). Action

research strategy is taken to explore the overarching question: “*whether using participatory serious game design and gameplay could be an effective intervention against bullycides?*” with intentions to improve the quality of school life in Japan.

In the following, *Section 2* presents related work followed by *Section 3* that outlines the 4-phase research design and methodology adopted in this study. *Section 4* describes how bullying sensitization is achieved through PD including subsections on formative evaluation, key findings, innovations and contributions. Likewise, *Section 5* discusses how gameplay is employed on bullying sensitization, including subsections on summative evaluation, key findings, innovations and contributions. After describing research limitations in *Section 6* and significance of the work in *Section 7*, the paper finally concludes in *Section 8*.

2. Related Work

The term “*Serious Game*” is coined by Abt (1970) who described it as a video game genre that has an “*explicit and carefully thought-out educational purpose.*” These games are not developed for entertainment, but in a certain way to send a message, teach a lesson or offer a virtual experience (Yanti, Rosmansyah & Dabarsyah 2019). The use of serious games can enhance the learners’ conceptual understanding of learning materials and keep them motivated to learn and progress (Ravyse et al., 2017). The power of “immersive experiences” and “agency” are more engaging and motivating than standard approaches for training and education, and the evidence of this efficacy is growing in literature (Alvarado, Guerrero & Serón 2018). Hence, serious games are applied in a wide variety of contexts with diverse student populations such as science education (Ullah et al., 2022); language learning (Ishaq et al., 2022); project management (Miller & Núñez 2022); astronomy (Cecotti 2022); ecosystem (Zhang & Zwolinski 2017); computer programming (Miljanovic & Bradbury 2018) etc., are just a few examples that illustrate the breadth of their application.

Unlike well-defined science domains such as mathematics and science, ill-defined domains such as bullying sensitization, ethics and social issues lack well-defined models, clear answers and formal theories that can be operationalized. For this reason, ill-defined domains are often taught by human tutors. However, serious games have been postulated in recent years as an effective anti-bullying intervention (Kolić-Vehovec et al., 2020). For example, Raminhos et al., (2015) have performed user studies with the main purpose of inducing attitude changes as a way to prevent bullying among children. DeSmet et al., (2018), found positive effects of the Friendly Attack anti-bullying game on students’ perceived social skills, but no effect on their empathic skills. Kampf & Cuhadar (2015) consider perspective-taking a prerequisite for developing empathy in serious games— one of the most important aspects of social and emotional learning. For instance, Village Voices (Cheong et al., 2015) helps school children learn social and emotional skills. In this multiplayer game, each child plays the role of a villager and goes through a number of bullying quests that require social interaction, perspective-taking and resource management.

Preparing children to succeed in a multicultural, diverse, and interconnected world, parents, schools, communities, and societies from around the world agree that building social and emotional competencies is important (Weissberg 2019). Ferreira et al., (2022) argued that

serious game-based psychosocial interventions with profile-based social agents can encourage prosocial bystander behaviour in cyberbullying. For example, Lim-Fee, Woo, Lee (2016) have proposed a serious game to teach children how to relate to others positively and make responsible decisions. In this category, the ABV4Kids project (Olenik-Shemesh, Heiman & Rabin 2014) created a virtual village on school bullying, racism and xenophobia within OpenSim. Similarly, Fernandes et al., (2022) have developed a serious game intervention to prevent suicide among adolescents who misuse opioids.

However, most of the studies carried out in this space have ignored the effects of serious games on perceived social skills and empathy, as well as the role of potential users in game-design (Paracha, Hall & Shah 2021). For instance, Nocentini, Zambuto & Menesini (2015) yielded 13 intervention programs and data about their effectiveness, 7 of which were serious games, and only 4 programs showed some evidence of effectiveness in reducing bullying. Likewise, Pecorini, Nocentini & Menesini (2016) have analysed only six game-based anti-bullying programs, but did not report the effects of gaming on perceived social skills, empathy or compassion. Only, *Conectado* which is designed for teachers to spark anti-bullying discussions in classroom has been validated through several experiments in schools (Calvo-Morata et al., 2019, 2020; Alonso-Fernández 2020). Furthermore, Zayeni, Raynaud & Revet (2020) evaluated the effectiveness of serious games and commercially available games in the treatment and prevention of psychiatric disorders in children and adolescents. They found that serious games can be an effective trajectory for psychotherapy in child and adolescent psychiatry. However, there is a lack of longitudinal studies which assess the sustained effects of these games, and standards for proper evaluation of their effectiveness are missing.

Whilst, My Dream Theatre (Campos et al., 2013), UTAD (Rodrigues et. al., 2013) and Village Voices (Cheong et al., 2015) empower children to challenge bullying, Shimpai Muiyou creates moral dilemmas for learners allowing them to make right or wrong decisions and face the consequences. Furthermore, unlike these systems, Shimpai Muiyou intervenes through using participatory serious game design and gameplay in order to sensitize children on bullying victimization (Paracha et al., 2019; 2020). Although these games indicate some positive effects in terms of flow and immersion, the use of both PD and gameplay to sensitize children has not been sufficiently exploited (Paracha, Hall & Shah 2021; Paracha et al., 2020; 2019). What makes Shimpai Muiyou stand out from the rest of the crowd, is its design and gameplay capabilities for bullying sensitization, intelligent tutoring, emergent narrative, emotion-modelling, autobiographic memory, and formative and summative evaluations in school environment (see Table 1).

Table 1. Summary Table of Relevant Games

Game	Citation	Scripted Narrative	Emergent Narrative	Continuous Story	Learner Modelling	Pedagogical Agents	Evolving Agent	Evaluation
Shimpai Muyou	Paracha, Hall & Shah (2021)	✓	✓	✓	✓	✓	✓	✓
My Dream Theatre	Campos et al., (2013)	✓	✓	✓	--	--	✓	✓
ABV4Kids	Olenik-Shemesh, Heiman & Rabin (2014)	--	--	--	--	--	--	✓
Village Voices	Cheong et al., (2015)	✓	✓	✓	✓	--	--	✓
Cyberball3D+	Mavromihelaki et al., (2014)	✓	--	--	--	--	--	--
Autism Spectrum Condition Inclusion	Schuller et al., (2014)	✓	--	--	✓	✓	--	✓
Birthday Party	Gerling et al., (2014)	✓	--	--	--	--	--	✓
WUBeeS	Hughes (2014)	✓	--	--	--	--	--	✓
Social Clues	Social Clues. (2014)	--	✓	✓	--	--	--	--
JeStiMuIE	Serret et al., (2014)	✓	--	--	--	✓	--	✓
UTAD	Rodrigues et. al., (2013)	✓	--	--	--	✓	--	--

3. Research Design

With the overarching research question, “*whether using participatory serious game design and gameplay could be an effective intervention against bullycides?*”, this research sets the following objectives to: (1) explore the Japanese bullycide problem and possibilities of a dynamic game-based intervention, (2) engage users in serious game design, (3) develop game prototype through iterative enhancements, and (4) ascertain whether gameplay induces ethical reasoning & reflection in children on bullying victimization. Each objective represents the 4-phases of our serious game project, namely Conceptualization (Phase I), Participatory Design (Phase II), Iterative Development (Phase III) and Evaluation (Phase IV). Fig. 2 depicts the 4-phase research design with the outcomes of each phase influencing the process and application of subsequent phases.

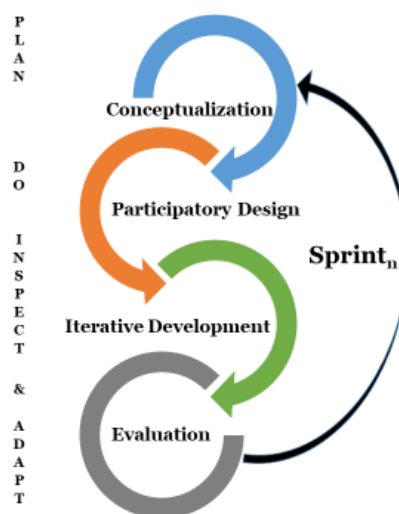


Fig. 2. Research Design

The research is largely qualitative and exploratory in nature. The choice of qualitative methods (see Table 2) is due to the uncertainty whether or not the intervention could positively influence children. Unlike quantitative research, qualitative research sets no hard rules for large sample sizes. Furthermore, [Chamberlain & Lyons \(2020\)](#) emphasized that qualitative approaches offer a critical consideration of behaviour change scholarship, yet an over-looked part of serious game design and development.

In *Conceptualization Phase I*, a qualitative meta-analysis of the literature (Koh 2020) is conducted to understand the nature of Japanese school bullying from a “*what we know, what we need to know and what we can do*” perspectives. Two PD workshops are conducted at Japanese schools in Kyushu region of Japan in the *Participatory Design Phase II* in which 60 school children aged 7-12 years old participated in multiple co-design activities such as Fictional Inquiry, Comicboarding (Moraveji et al., 2007), Digital Storyboarding (Paracha et al., 2019), Theatre of the Oppressed (Boals 1993) and Exposure to preliminary prototype (Paracha et al., 2020). The co-design activities with child participants not only contributed to bullying awareness, but also informed early stage design process; improved narrative, storyline, scenarios and refined child-computer interaction.

Based on the valuable inputs from the potential users, the software development process is simplified in the *Iterative Development Phase III* by breaking it down into smaller chunks and keeping the feedback loop opened for bring refinements. For example, formal analysis of gameplay is carried out in the beginning to study the aesthetics of games and derive design patterns (Myers 2010; Björk & Holopainen 2005). Additionally, planning formalisms are employed including (1) STRIPS representation to dynamically generate different stories at run time based on learner’s interventions (LaValle 2006), (2) Hybrid narrative generation mechanism to accommodate user agency & story progression (Hodhod, Cairns & Kudenko 2011), (3) Synthesis of agents’ emotions (Scherer’s Theory 1999; Ortony, Clore & Collins 1988), and (4) Model tracing & Knowledge tracing algorithms for the intelligent tutor component (Koedinger & Alevan 2007; Corbett & Anderson 1995).

Finally, in the *Evaluation Phase IV*, a user study is carried out to measure the overall success of our digital intervention. The usability experts and the child users interacted individually with Shimpai Muyou. Data collected through direct observation, user research-notes, and classroom discussion forums. Template and log analyses are used to document user behaviour, satisfaction, efficiency and effectiveness of the application.

Table 2. Overview of research methods applied in each phase

Phase	Objective	Method(s)
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Conceptualization	To explore the Japanese bullying problem & possibilities of a dynamic game-based intervention	Qualitative Meta-Analysis	Qualitative
Participatory Design	To engage users in serious game design	Two PD Workshops at schools Fictional Inquiry Theatre of the Oppressed Comicboarding Digital Storyboarding Exposure to initial Prototype Classroom Discussion Forums Template Analysis	Qualitative
Iterative Development	To develop game prototypes through iterative enhancements	Qualitative Formal Analysis STRIPS formalism Hybrid Narrative Generation Synthesis of Agents' Emotions Model Tracing & Knowledge Tracing Algorithms	Qualitative
Evaluation	To ascertain whether gameplay induces ethical reasoning & reflection in children on bullying victimization	Formative Evaluation Summative Evaluation Template Analysis Log Analysis	Qualitative

To establish the reliability and validity, Guba's (1981) criteria for assessment of trustworthiness has been applied (see Table 3), based on the identification of four aspects of trustworthiness that are relevant in qualitative studies: (a) credibility, (b) transferability, (c) dependability, and (d) confirmability.

Table 3. Summary of Strategies used in Shimpai Muyo Research to establish Trustworthiness

Strategies	Criteria
Credibility	- Prolonged and varied field experience - Time sampling - Reflexivity - Triangulation - Member checking - Peer examination - Focus Group/ interview technique - Establishing authority' of researcher - Structural coherence
Transferability	- Nominated sample - Comparison of sample to demographic data - Time sample - Dense description
Dependability	- Triangulation - Code-recode procedure - Dense description of research methods

	- Peer examination - Stepwise replication - Dependability audit
Confirmability	- Confirmability audit - Triangulation - Reflexivity

4. Bullying Sensitization through Game Design

Shimpai Muyou is one of the first game-based learning interventions on tackling bullycides in Japan— an almost completely neglected research area in the Japanese e-Learning literature. The research objective has been achieved through adopting a learner-centred approach (Paracha et al., 2019; 2020) taken in this study from the conception to delivery (see Fig. 3). Both design and gameplay have been used to empower children with ethical reasoning and reflection to challenge bullying.

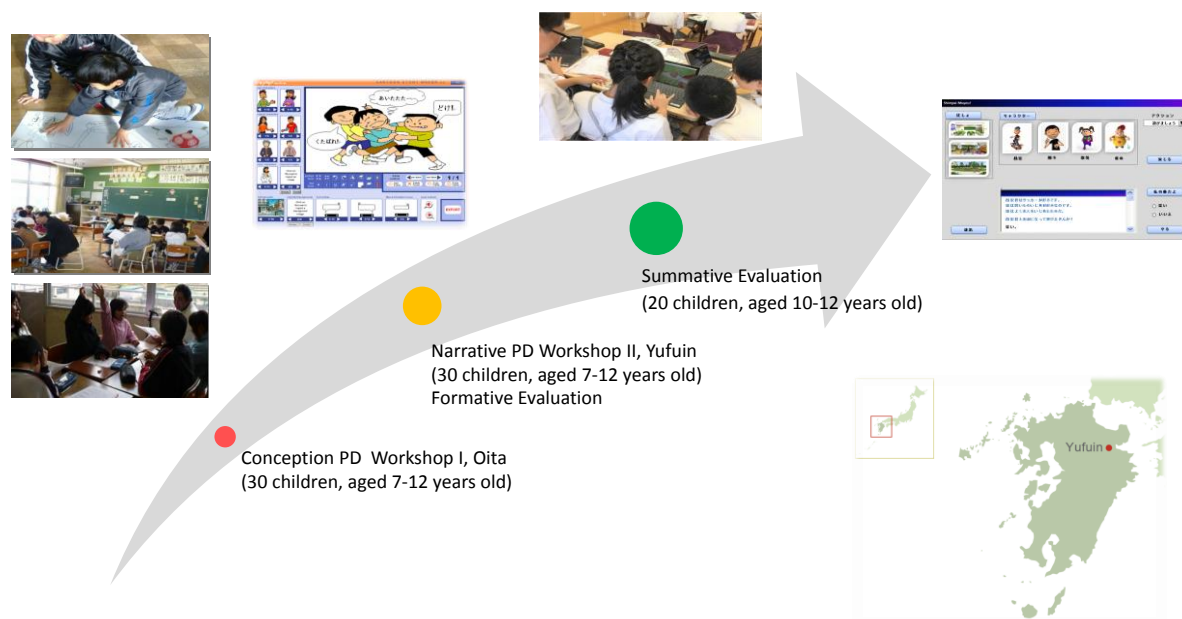


Fig. 3. Children's involvement in the Shimpai Muyou project

4.1. Participatory Design Workshops at Japanese Schools

Participatory Design (PD) is a form of collaborative working, by which groups of users can influence design decisions (Sim et al., 2016). PD sessions are generally used to capture design ideas in which the participants are the target user group, for instance, children designing interactive games on bullying awareness and related coping strategies (Paracha et al., 2019). Several studies (Sim et al., 2016; Khaled & Vasalou, 2014; Paracha & Yoshie, 2011; Hall et al., 2006; Read et al., 2002) have shown that PD— involving children in the serious game design – from inception to robust prototype can be beneficial. For instance, it increases the chances of the final product's acceptance by the end user. With the child operating as informant,

researchers and designers can identify a number of key areas e.g., character preference, attributes, storyline, conversation, interaction impact, empathy etc. Furthermore, PD offers sensitization opportunities to participants promoting ethical reasoning and reflection on difficult issues such as school bullying (Paracha, Hall & Shah 2021). PD—not being the norm in Japan— motivated the need to involve children in the design and development of Shimpai Muyou serious game (Paracha et al., 2020).

Table 4. Overview of methods used in Shimpai Muyou participatory design

Purpose	Experience and Participants	Method(s)
Informing early stage design	Conception Participatory Design Workshop I (30 children, aged 7-12 years old)	Fictional Inquiry Comic-boarding Classroom Discussion Forums
Initial Prototype produced		
Improving the scenarios and interactions	Narrative Participatory Design Workshop II Formative Evaluation Sessions involving end-user interaction with limited versions of the prototype (30 children, aged 7-12 years old)	Interactive Theatre-based Digital Storyboarding Interaction with SM Formatively evaluate the look and feel Improve design by creation of artefacts e.g. comic strips to improve characters / storyline Classroom Discussion Forums

Table 4 provides an overview, with the following sections briefly presenting our approach to involving child-learners in the Shimpai Muyou’s design and development processes. The discussion emphasizes how co-design and gameplay activities can empower children with ethical reasoning and reflection to challenge bullying in real life. For full details of our approach and activities for informing early stage design, please see Paracha et al., (2019); (2020); Paracha, Hall & Shah (2021). Here, we focus on how this participatory and child-centred approach not only provided design inputs, but also sparked bullying sensitization in the potential users.

4.2. Informing Early Stage Design: Conception Participatory Design Workshop I

Conception Participatory Design Workshop I iss held in Oita, at a Japanese school. 30 children, aged 7-12 years old are recruited through the Parent-Teacher Association who gave their ethical approval for the children’s involvement in this research. Among them are 2 North American, 3 Hispanic children and the rest of the 25 pupils are of Japanese origin. The workshop aimed at providing inspiration and concepts for serious game narrative, characters and plot early in the early stage of our design process. After a brief introduction, the child participants are divided into 6 groups of five children and engaged in three Participatory Design activities:

- Fictional Inquiry (Dindler & Iversen, 2007) allowed designers to create partially fictional stories, artefacts, and narratives. This fiction is provided by children being asked to draw

scenes depicting different bullying situations using paper charts. The nature of the inquiry is 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 an understanding of the children's views on bullying, types, situations, characters and language involved in bullying situations.

- Comic-boarding (Moraveji et al., 2007) is used to gather narrative and content ideas. This approach is adopted as being age-appropriate for Japanese children who have considerable interest in reading comic books and anime (Ito, 2008). Children are asked to complete a partially completed comic strip. The children's comic-boards depicted bullying scenarios, language and gesture contents that could be used for the developing narrative for Shimpai Muyou virtual world.
- Classroom Discussion Forums (CDFs) is a normal classroom approach of "Table Time" (small group discussion) followed by "Circle Time" or "on the carpet" (Hall et al., 2006). To obtain verbal feedback from children, CDFs are used as a replacement for focus groups, because pupils are more familiar and comfortable with this method as an everyday school activity.

4.3. Improving the Scenarios and Interactions: Narrative Participatory Design Workshop II

The second PD workshop is held in Yufuin. Again, Parent-Teacher Association is contacted to get ethical approval for recruiting 30 children of 7-12 years old. Among them are 1 South American; 1 East European and the rest of the 28 pupils are of Japanese origin. These participants are divided into 6 groups (each group comprised of 5 children). The child-participants selected for the two workshops are not the same. Unlike the previous PD workshop, this design collaboration at Japanese school is carried out during slightly mature stages of game design. After a brief introduction, children worked collaboratively in six groups of five participating in:

- Interactive Theatre based on Friere (1997) and Boal (1993) framework that oppression can be overcome by progressive education and dialogue. Theatre of the Oppressed (see Fig. 4) is a form of interactive theatre in which the audience participates in the unfolding drama taking responsibility for actors on the stage, advising them and contributing to the narrative. The approach supports role and perspective-taking for conflict resolution. This role-playing activity is used to identify plot-points, character motivations and interaction. Children are supported by a drama facilitator with each group taking the perspective of one of the characters (e.g. the bully, victim, defender, bystander).

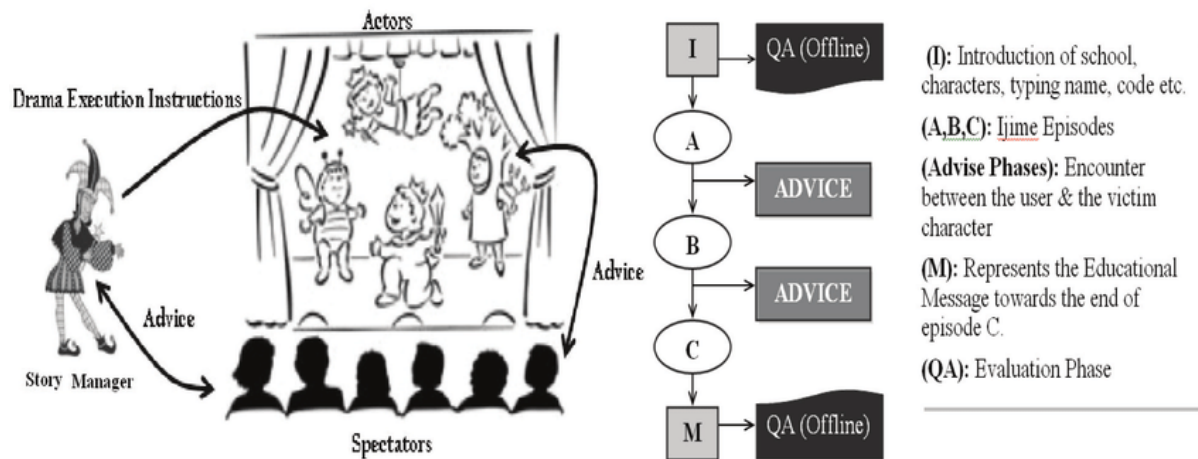


Fig. 4. Augusto Boal's Forum Theatre and Shimpai Muyou Interaction Sequence

- Digital Storyboarding (Paracha et al., 2019) is used with the children co-producing short narratives combining images, text bubbles, voiceover etc (see Fig. 5).



Fig. 5. Digital Storyboards created by children

- Children interaction with the prototype.
- Classroom Discussion Forums: After children interacted with Shimpai Muyou, CDFs are recorded for Template Analysis (Brooks et al., 2015). Template Analysis is a form of thematic analysis which emphasizes the use of hierarchical coding and central to the technique is the development of a coding template, usually on the basis of a subset of the data, which is then applied to further data by repeated revisions and refinements.

4.4. Formative Evaluation within the Prototyping Phase

In order to gain insight into the quality of tentative interventions and their design principles and to get revision decisions for developing the next improved prototypes, formative evaluation is a crucial feature of the development or prototyping phase (Nieveen & Folmer 2013). Results of the formative evaluation give ground for both outputs of a design research study: improving the prototype of the intervention towards a high-quality and completed intervention; and sharpening the underlying tentative design principles towards a final set of design principles. Shimpai Muyou is iteratively developed over several years with an ongoing PD process and incorporating formative evaluation. During each formative evaluation, after a brief introduction to the Shimpai Muyou project, participants are 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. The evaluations generated written and drawn artefacts along with recommendations and ideas gathered during CDFs.

The prototypes 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 (see Fig. 6).

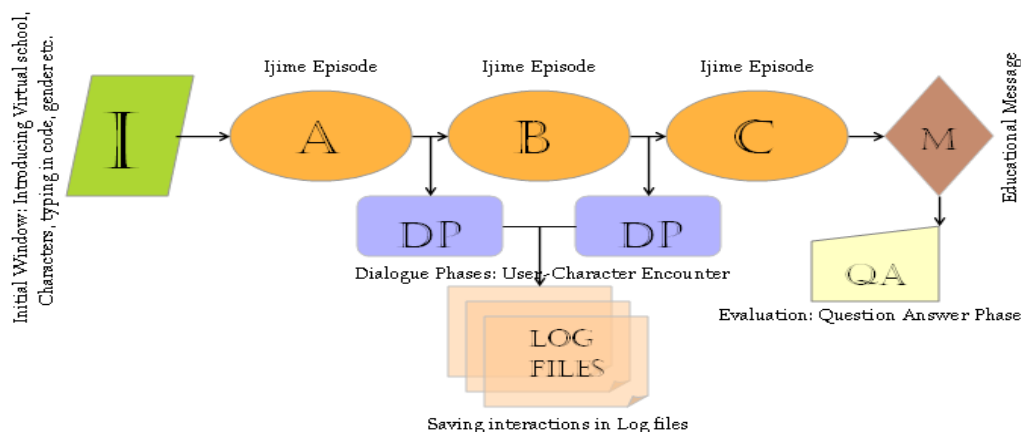


Fig. 6. Interaction Sequence in Shimpai Muyou

The objective of formative evaluation activities is to validate the prototype development at regular intervals in terms of usability. For instance:

- Verbal and physical bullying scenarios without any interaction functionalities are used to assess aesthetics, dialogue and narrative.
- Interactive experiences for partial and full scenarios, for example whether children liked the characters as depicted; whether they are able to empathize with the victim character; and whether the bullying scenarios are 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 serious game.
- 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 is limited.
- 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 advices to the victim.

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, while adding content for the bullying episode in the scenario children suggested many different forms of non-verbal threatening gestures for the bully that are incorporated into character scripts e.g., giving a stare, fighting, hitting, pinching, spitting, tripping, pushing, feeling angry, frightened and powerless.

4.5. Key Innovations, Findings & Contributions

As mentioned earlier, PD especially children's involvement is not a norm in the Japanese top-down design ecosystem, as such Shimpai Muyou happens to be one of the first serious game projects that introduced a design culture, which recognizes the creativity of children in the search for new solutions of emotionally sensitive issues at school. Opening up the innovation process for children in Japan, implies moving away from the dominating technocratic view of innovation to a democratic or bottom-up design where differences and controversies are allowed to exist, questions are raised and possibilities explored. A learner-centred approach is adopted to sustain a culture of innovation (Paracha et al., 2019; 2020).

Similarly, novel design tools and methods have been used including Digital Storyboarding, Theatre of the Oppressed and CDF, that allowed children to become active co-creators and design partners. Likewise, sensitization training on bullying, as seen in Western schools, is also not seen before the inception of Shimpai Muyou project. The PD sessions, thus, provided novel tools to stimulate perspective-taking, ethical reasoning, reflection and empathy in children on bullying victimization.

Children's input on bullying types, roles, gestures and language content brought improvements to the interface, storyline, character profiles and coping strategies according

to their needs and preferences. For instance, children suggested different forms of non-verbal threatening gestures e.g., giving a stare, fighting, hitting, pinching, spitting, tripping, pushing feeling angry, frightened and powerless.

Key findings from the first PD workshop include: (1) brainstorming fictional inquiry provided an understanding of children's views on bullying, types, situations, characters and language involved, (2) comic-boarding offered useful information on daily life at school, emotions, empathy, bullying scenes and language content, (3) CDFs helped children verbalize their opinion on bullying, coping strategies, bully/victim's impression, role of empathy and values, (4) sensitization training through PD is, thus, a crucial step to creating a safe environment for all children at school.

Some children often face bullying and lack of acceptance from fellow pupils as well as from school teachers. Engaging students in co-design activities through comic-boarding and classroom discussions provided needed tools to teach values, perspective-taking, compassion, ethical reasoning, empathy, reflection and inclusive principles to pupils in the classroom and the community.

Similarly, the second PD workshop offered a more clear picture of key characters and roles in bullying situations, character profiles, coping strategies, empathic engagements with victim character, ethical reflection, storyline design and progression and correct language configuration for the bullying scenarios. Key findings from the second PD workshop included: (1) Theatre of the Oppressed supported the creation of the bullying scenarios, types of bullying & characters, coping strategies and provided context and storyline progression. Children experimented with different choices in bullying scenarios in a safe environment. They felt empowered by voicing their ideas and having them heard. Ultimately, these activities can lead to self-confidence and self-esteem outside the classroom, (2) Digital Storyboards offered language content, gestures, coping strategies that children used to dealing with bullying, character impressions, emotions and empathy, (3) Exposure to the Prototype offered different views on characters, storyline, empathy and gender, as well as acceptability of the look and feel of interface, (4) 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, and (5) this also served as a sensitization training opportunity to teach pupils about the role of compassion, perspective-taking and empathy in counteracting bullying.

In the first PD workshop, fictional inquiry, comicboarding and CDFs yielded outputs that are novel and of quality e.g., types of bullying situations at school, emotions, empathy, language and gestures of bully or victims. This greatly contributed to the development of initial ideas about the serious game, outline, genre, requirements, and acceptance of serious game by potential users. Similarly, in the second PD workshop, the results of 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 CDFs are used in both workshops to capture qualitative data from children on bullying situations at school, language content, role of empathy, emotions toward bully/victim, coping mechanisms, favorite characters and their overall impression of serious game.

The different expertise of the participants led to differences in the types and strengths of ideas produced at the end. Children in the second PD workshop have a high degree of game literacy as compared to the previous PD session. As a result, they are able to contribute 156 unique design ideas as compared to the previous 43 design ideas (see Table 5). While some of their ideas did not align with our objectives, most of their ideas were very helpful. Of all the instruments and methods developed, the Digital Storyboarding and Interactive Theatre are the most useful methods in terms of guiding the design and development processes of Shimpai Muyou serious game. Both methods offered an up-to-date 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.

Table 5. Children's design ideas

Design ideas	Count
Animations, colours, graphics	22
Background scene	13
Main characters, avatar	15
Age/gender user choices	6
Interactions	20
Sound, text, voice	25
Navigation	21
Likes, dislikes, experience	11
Input	14
Help functions	9
TOTAL	156

Feedback from teachers also indicated that co-design activities are viewed as a pleasant learning experience by all particularly, Theatre of the Oppressed and Digital Storyboarding are admired by the Japanese board of education. The interactive role-playing and the use of storyboarding served as sensitization training to children by making them aware of the harms of bullying, role of empathy, perspective-taking and moral anchor in what works best to create safe school for all. The use of digital storyboards and interactive theatre techniques, children are able to create scene work that reflected their world. Such reflection helped them understand themselves better. Further, children are able to discuss and act out solutions to problems when they felt oppressed or victimized. By engaging children in inclusion activities through role-playing drama, digital storyboarding, and classroom discussions provided needed tools to empower children with ethical reasoning, reflection and empathy to reduce bullying victimization.

The Japanese children felt empowered to know that they have 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, empowered children to make a greater difference in communities, nations, countries, and the world. The PD sessions with children served as a powerful way of reflection, ethical reasoning, empathy and perspective-taking to challenge bullying, violence, sexting, harassment, discrimination and abuse.

In addition, the design collaboration at Japanese schools contributed to a new research paradigm of 21st century that of “research *with* rather than *on* children”. The two workshops brought forward many interesting issues related to PD with children. Japanese game designers should be able to incorporate PD best practices and be able to plan continuous feedback loops in their design processes including conceptual, elaboration, construction, validation and tuning. This would help the Japanese nascent serious gaming community to mature more rapidly, engaging in a more ambitious work on PD.

5. Bullying Sensitization through Gameplay

5.1. Summative Evaluation

According to Rouse (2016) gameplay is a term used to define the way players interact with a certain video or computer game. It is further characterized as the way the game is played, including the rules, the plot, the objectives and how to conquer them, as well as a player’s overall experience. Nieveen & Folmer (2013) describe that a summative evaluation is carried out at the very end of a design research study to determine the actual effectiveness of the complete intervention (which has resulted from the development or prototyping phase). The focus is on the extent to which implementation of the intervention leads to the desired outcomes. These desired outcomes are related to the intended outcomes of the study. Summative evaluation of Shimpai Muyou (see Fig. 7) took place within the evaluation phase with a group of 20 school children (aged 10 to 12 years) in a classroom environment. These children are different from the ones recruited for the PD workshops as discussed in *Section 4*. The participants are recruited through purposive sampling based on the naturalistic observation of their classroom conduct (i.e. bully, victim, bully-victim, and bystander). Ethical approvals for visual data is obtained from Parent-Teacher Association with assurance that the data would be strictly used for research purposes only.



Fig. 7. Interface

Appendix Section presents a typical scenario the learner may have while interacting with Shimpai Muyou; presenting the role of different characters; functionalities of various modules along with some typical learning moments. The system interaction is depicted in normal font. While learner’s actions are shown in bold, comments and illustrations are italicized.

A two-pronged approach is used to achieve evaluation purposes: (1) incorporating modifications of traditional evaluations for children, and (2) development of new observational and focus groups approaches for children. The framework called for a qualitative approach due to its importance in behavior change research in relation to serious games (Thompson 2014). The potential benefits include a more targeted game designed with considering the needs, interests, perspectives, and preferences of the intended participant. Direct observations are made through videotaping the upper torso and face of the child using a small digital camera. Logging aggregator is used to capture child-user interactions with the system supplemented with CDFs. A logging aggregator collects and combines the logging data into a joint single file. It captures all meaningful player actions such as visiting a virtual school location, meeting a bully, asking help from friends, opening a coping resource room etc. System responses are recorded and all actions go with a timestamp. User satisfaction is measured through the use of CDFs. The CDFs focused on exploring the ease of use, likeability of characters/environment, difficulties with the application, emotional reactions and empathy vis-à-vis synthetic characters and virtual bullying scenarios. The CDFs are analyzed, using template analysis of expressed emotions and video-taped face expression, and occurrences of right or wrong choices through log files (see Table 6).

Table 6. Summary of methods applied in Summative Evaluation

Method	Characteristics
Application	The child users interacted individually with Shimpai Muyou
Direct Observation	– users' emotional reactions to virtual bullying and empathic engagements with the agents – videotaping and logging software
Script	Type of questions: open-ended, non-leading or more directive (e.g., "Tell me how much you liked the characters")
Focus Groups/CDFs	– explored the ease of use, likes and dislikes, emotional reactions and difficulties with the application. – 3 groups based on same age/ grades/ mixed gender – each group led by a researcher – 65-70 minutes until theoretical saturation had been attained – digitally recorded sessions to ensure veracity of transcription and explain discrepant data during analyses – NVivo transcripts with the recordings, notes & comments to ensure accuracy
Template Analysis	– Template style analysis based on a subset of transcripts – Log analysis followed by interviews to understand user behavior

5.2. Key Innovations, Findings and Contributions

The results revealed that Shimpai Muyou design is conducive to empower children with moral self-reflection and empathy to challenge school bullying:

1) Increased children knowledge about bullying & related coping strategies

Often, children are left confused and bewildered in bullying situations, not knowing exactly what truth is or what they personally believed. Increased awareness on bullying issue has been observed during child interaction with synthetic characters. As for instance some children stated: *"Bullying is wrong and everyone must speak up about it to stop it"* (K5G). *"Before when there was a fight, I meddled, but now I'd speak calmly"*. (R8B) *"Bullying is wrong and everyone must speak up about it to stop it"*. (S7G) *"But, now no matter how tempting it is, I'll not stoop to their level and always seek for help from an adult."* (S3B)

2) Empowering Anti-bullying Morality

For children, bullying is a moral issue common to their age group. Empowering children with the best tools to combat the scourge of bullying — integrity, self-empowerment, compassion and respect for self and for others — is the core mission carried out by Shimpai Muyou!. The evaluation team also looked at whether it can empower anti-bullying morality or whether it had any impact on what is known as Moral Disengagement. This is the state of mind that allows someone to carry out a horrible act against another person. It involves for example blaming and dehumanizing the victim, and disregarding or distorting the impact of what the perpetrator does. Emotional responses including guilt, shame and moral dilemmas are triggered when child-users realized that they have violated a moral standard e.g., *"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"*. (K5G)

3) Ease of Use

No halting or faltering in exposure to the technical equipment i.e. mouse, tracker pad, and keyboard could be noticed, even though the typing speed was generally slow. The children had previous experience with computers, mainly from the recreational games and the internet usage. Thus, children showed a clear enthusiasm in the use of these technologies. Children favoured point and click and the use of text. For instance, *"yes, easy to use simply point to indicate your wishes on the screen and then press this button."* (M5B) *"it was very easy for me to ignore bully in the computer than here at school"*. (S3B) *"It is very interesting how this game works"*. (M3G)

4) Appeal & Perceived Usefulness

CDFs also indicated that children liked the interface, and the role of the main characters in the game. The scenario comprehension and believability of characters are higher and true to

life. Children were seen transposing their own feelings onto the characters in the process of understanding bullying victimization. For example: *"interesting, fun, better than comic books."* (E1G) *"quite different from DS & PSP, but amazing."* (I7B) *"It is cool! Everything we do is useful"*. (S7G)

5) Effectiveness on Conflict Resolution

The most important contextual consideration is the creation of spaces for dialogue, conflict resolution and reflection to induce deeper thoughts and change in attitudes. The ethical dilemmas and Socratic interventions 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. Children realized that *"conflicts are okay and that they can be resolved with help."* (J2G)

6) Immersion & Social Empathic Engagement with Characters

Empathic engagements with synthetic characters is apparent. For instance, the victim character Haruto is favoured the most, while the bully Masahiro is disliked by many, particularly by girls. Similarly, the victim-character evoked empathy, whereas, the bully-character triggered anger. For instance: *"we'll allow Haruto to play with us."* (K5G) *"It was really nice solving my friends' problems."* (A4G) *"I felt as I'm in the real world, because this happens all the time at our school."* (C6G) *"Yes, it was fun with so many friends"*. (I7B)

7) Urge to Replay

Some children got the urge to dive back in immediately after their first playthrough e.g., *"I had a lot of fun using Shimpai Muyou and would like to play again."* (E1G) *"Interesting! I'll try again."* (C6G) They believed that the characters "listened to them" and "took their advice." Some children expressed their desire to further use the application "for multiple stories" as well as for knowing more about the characters' future relationships. Children have found the text input system easy to use, but they typed very slowly which led to short text inputs. Furthermore, they took far more time than expected to select a strategy and provide an explanation for it. This also indicates that the participants have carefully considered any coping strategy.

Unlike the Japanese lab-based evaluations, the summative evaluation is carried out for the first-time in a classroom or school environment to test a serious game on bullying for different criterion including technical infrastructure, functionalities, immersion, appeal, ease of use, satisfaction and learning outcomes. Results from the summative evaluation accounted for the quality, reliability and validity of self-developed instruments including qualitative analysis of the data collected within the evaluation process. The evaluation tools have been found appropriate, easy to apply and covered a wide range of input from experts, children and teachers, assuring the validity of the evaluation process.

Traditional usability techniques are slightly modified to achieve software evaluation with children for instance: (1) direct observation using videotaping and logging is supplemented with focus groups and the think-aloud protocol, (2) videotaping the upper torso and face of

the child to capture children's emotional reactions, in certain crucial situations, using a small digital camera, (3) template analysis of qualitative data, and (4) logging software to capture all of the child's interactions with the characters and the environment.

Shimpai Muyou project took the challenge of producing a viable computational model on an ill-defined domain of school bullying, for instance: (1) developing feasible strategies for search and inference in an open-ended domain, (2) offering provision of feedback when the problem-solving model is not definitive, (3) structuring learning experiences in the absence of a clear problem or answer, (4) learner modelling that accommodated the uncertainty of an ill-defined domain, (5) designing user interface in an ill-defined domain where usually the learners need to be creative, but the system still analyse them, (6) using ethical dilemmas and Socratic persuasions to foster empathy, ethical reasoning and reflection in players, (7) creating intuitive characters for social interaction, (8) bridging the real identity to the virtual identity allowed players to project their values and beliefs through in-game persona and discover their limitations and strategies for dealing with conflict, and (9) validating game design vis-à-vis game-specific, domain-specific, education-specific, and interface-specific functions.

6. Limitations

Despite the interesting results, we must consider the limitations of this study. Researching sensitive topics such as bullying, bullycides, school violence and child-abuse pose not only difficult technical problems, but also include wider issues regarding the ethics and politics of research. Bullying is normally downplayed at Japanese schools and the Japanese education boards and school are infamous for a culture of concealments and cover-ups (Kawano 2021). Resultantly, the original plan of fielding a large-scale study on bullying, involving all big schools in the Oita prefecture is not materialized due to the apprehension of target schools of "Bullying Stigmatization". Serious gaming, is relatively a new phenomenon in Japan and the general perception of school management and parents on educational value of video games is negative. The unclear benefit of serious games is one of the main factors negatively influencing its diffusion in the educational sector.

Likewise, children involvement through PD activities posed a number of ethical challenges. There are several coping strategies, but we implemented only two to three to avoid making things difficult for child users. A resource room is provided to the players in case they did not know what to choose in dealing with the ethical dilemmas. Traditional modes of data collection as commonly with adult participants are modified for children to generate data e.g., focus groups to CDFs and so on. Despite these challenges, the coded data remained a valuable source of naturalistic information about children involvement for the first-time in the design and development of a serious game in a naturalistic school environment in Japan that represented an important step beyond relying on self-reports and secondary data.

Shimpai Muyou will be released soon after some revisions. The HCI and game experts, during Heuristic Evaluation (Nielsen 1994), pointed out that whilst the storyline received positive responses from the users, much of the immersion depended on character rendering, AI and graphical quality of the game. Moreover, the game engine did not meet with the lower specification computers available in the Japanese schools. This compounded the issue of

reduced performance, not only to scale-down the application, but also to be stable enough to run across different configurations of low specification machines. Consequently, it was decided to carry out some revisions before the final release, adding a few more virtual bullying scenarios and locations.

7. Significance

This study takes a qualitative and exploratory approach in investigating how PD and gameplay of a serious game could be used as an effective prevention against bullycides with multiple perspectives and suggestions of how children would use it to respond to bullying situations. These sessions with children approved the design from potential users and determined that future system should contain more bullying scenarios and actions that resonate with the young Japanese audience in order to provide interactivity and engagement. Shimpai Muyou is potentially capable of tackling a wide range of school issues, with minor modifications, it can be used on a variety of prevention or behavior change programmes e.g., sexting, drug-abuse, cyber-bullying, stereotyping, school shootings and extremism.

By engaging with children in design, development and evaluation activities, not only are they introduced to scientific and design thinking in relation to new technologies, but further they are actively engaged in learning about coping with difficult life issues. Carefully planning the engagement of learners to provide integrated learning should become standard for serious game development with developers needing to consider the potential of integrating innovative subject-related learning experiences within PD, and thus adding direct value to the experience for learners. Learner-centred 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 (Paracha et al., 2020).

The results also suggest factors that serious game researchers or developers should consider when building future digital interventions to prevent bullying. For instance, serious game researchers specifically seeking to create a richer learning experience for children should consider focusing on role-playing, customization of the characters, environments, scenarios and reward system. The theoretical relevance of this study falls on the integrated approach with which it framed values education and social and emotional learning of children in school bullying contexts. The serious game reported in this study included elements from a moral, social and emotional identity approach as a framework in particular, Piagetian epistemology (Piaget 1973), Stages of Moral Development (Kohlberg 1981), Zone of Proximal Development (Vygotsky 1978), Principles of Instruction (Gagné, Briggs & Wager 1992), Taxonomy of Educational Objectives (Bloom 1956) and ARCS Model of Motivational Design (Keller 1987) for developing a serious game with social agents. Here, Friere's Pedagogy of the Oppressed (Friere 1997) and Boal's Theatre for the Oppressed (Boal's 1993) have guided us in terms of interaction with the participants. Additionally, Socrates' Questioning has been used to empower adolescents to engage in the regulation of behavior as bystanders. The assistance of these digital resources enhanced bystanders' prosocial potential, as children are seen increasingly empathetic towards the victim characters.

Social cognitive theory (Bandura 1986) postulates that computer games promote aggressive tendencies. In contrast, the PD activities demonstrated that Shimpai Muyou equally fits in the

category of Value Sensitive Design (Friedman & Hendry 2019) which is a theoretically grounded approach to designing technology that promote human values e.g., peace, equality, empathy and tolerance.

Contrary to the Blue Whale game that encourages self-harm and suicide (Khasawneh et al., 2020), Shimpai Muyou promotes positive youth development. The practical implications of this theoretical contribution may be a step forward to a child-computer partnership to reach various milestones in designing serious games for preventing bullycides. Findings present a tangible evidence that the serious game is not only a drill and practice activity, but it also offers a creative thinking platform for learners. Teachers also indicated that children's creative and critical thinking skills improved due to PD sessions as for instance, their communication skills especially with their classmates, and their ability to use different objects and things for different purposes are enhanced. We hope this research will present a recipe to the Japanese teachers and parents to design learner-centred activities to enhance children engagement and interest.

8. Conclusion

Shimpai Muyou research reminds us of what Martin Luther King advocated in 1947: *"Intelligence plus Character – that is the true goal of education"*. School bullying and resulting child-suicides means collapse of moral code and a symptom of the passing of everyday values such as co-existence, kindness, compassion, tolerance etc. Given all the grave problems our children now face at schools – from stereotyping and harassment, to discrimination and exclusion, to internet abuse and sexting, to derision and violence – we must ask ourselves, *"what is schooling for?"*

Educating children on emotionally sensitive issues and encouraging them to intervene as bystanders in bullying situations is crucial for bullycide prevention. Serious game design and gameplay both can be used to sensitize children morally, socially and emotionally, which may evoke bystander intervention behaviour. This research is novel in that it presents both design and gameplay activities as an effective learning strategy on tackling complex issues such as bullying. The study is beneficial for schools and practitioners, as it provides insight into how digital technologies evoke moral engagement, perspective-taking and empathetic feelings for victims of bullying at school. Shimpai Muyou serious game is potentially capable of tackling a wide range of school issues, with minor modification in the system architecture, it can be used on school shootings, gun violence, sexting, drug-abuse, cyber- bullying, stereotyping and religious extremism.

Additionally, the study is useful for those interested in digital game design and development, because it offers insight on how best to construct a simulation that elicit empathetic feelings and influence the morals, attitude and behaviour of a player. Our results stem directly from a bottom-up approach with the potential users. This helps us to better orient the design of future serious games towards genres and concepts identified by users themselves—which they like to play, and which they like to use while projecting their personal life experiences. The medium of serious games has only just begun to scratch the surface in Japan and we wonder what other mechanisms we can develop to foster ethical thinking, social and

emotional competence in users. In what other ways can we use serious games to help users explore socially sensitive issues? We are looking forward to continue exploring such topics.

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Selection and Participation

Children participating in design and development studies is highly rewarding, but comes with ethical responsibilities which are critical. In Japan, work involving children should be cleared through a very strict ethics review process, involving Parent-Teacher Association (PTA), board of education officials and school management. The PTA is a panel of parents and teachers at Japanese schools who ensure the safety of child subjects and who make sure that rights of children are protected. The researchers involved were asked to explain what information would be given to parents and children ahead of, and during, the study. Researchers met with the board of education officials, PTA, vice-principals and principals of different schools to explain: Why we wanted to design a serious game as an anti-bullying intervention? What type of methods would be used? Why was it important to involve school children in this project? What consent processes would be followed? How children would be treated? The researchers would typically begin every session (often, design, usability and evaluation studies) by telling pupils that they needed their feedback for developing a serious game on school bullying to enable them to contribute meaningfully. They were told that if they did the work might be used but their names would not be used. To protect the confidentiality and anonymity of participants, researchers did not share information and adhered to the procedures in place. No personal identifying information was attached to the individual data records. All data collected were stored electronically for statistical analysis. Data collected during this project was used for academic and research purposes.

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Appendix

At the very beginning the learner enters his or her name and selects a character to represent him or her in the virtual world. After that the system greets learner which is followed by a brief introduction of the virtual school and different characters.

Hi Toshi!

This is ABC School. You have three places to go: the classroom, the playground, and the library. There are two characters from whom you can make friends. You have a list of actions to choose. You are free to act, but you will encounter some situations during interaction.

It's time to choose your friends.....

The system introduces the characters. The user has to choose a typical yes/no answer, as no free text is possible in the current prototype.

Masahiro Kun likes soccer very much. He loves soccer, but he mocks at people. Do you want to be his friend?

Yes

You agreed

Haruto Kun is an intelligent boy. He loves comic books. He is popular, but he is shy. Do you want to be his friend?

Yes

You agreed

The learner module is initialized as soon the learner selects a friendly character ('¬' denotes negation of):

```
current_learner(toshi)
playing_char(yuki)
SHIMPAIMUYOU_believes(learner_aware(teasing))
SHIMPAIMUYOU_believes(learner_aware(mocking))
SHIMPAIMUYOU_believes(¬learner_aware(shyness))
SHIMPAIMUYOU_believes(¬learner_aware(calling_names))
SHIMPAIMUYOU_believes(¬learner_aware(spread_rumors))
```

The learner module infers new facts according to the above information and the domain model, as follows:

```
SHIMPAIMUYOU_believes(¬learner_aware(mocking))
& is prereq(mocking, verbal_bullying)) ->
SHIMPAIMUYOU_believes(¬learner_aware(verbal_bullying))
SHIMPAIMUYOU_believes(¬learner_aware(verbal_bullying)) & is prereq
(verbal_bullying, bullying)) -> SHIMPAIMUYOU_believes(¬learner_aware
(bullying))
```

The learner module is updated by adding the new drawn facts.

Based on the current learner module, the pedagogical module chooses a learning moment:

```
IF not(acquired_value('be_humble'))
and IF not(acquired_value('treat_people_with_kindness'))
THEN suggested_LM('dilemma', 'physical_bullying')

IF not(acquired_value('be_respectful'))
and IF acquired_value('treat_people_with_courtesy')
Then suggested_LM('dilemma', 'verbal_bullying')

Trigger: Learning Moment LM1 has not been presented
and Learning Moment LM2 has not been presented
and be_humble value has not been held yet
Action: set priority to Learning Moment LM1
```

As already mentioned above that every learning moment has two kinds of preconditions: educational and narrative. The educational preconditions have been satisfied from the above rules enabling the pedagogical module to choose the Learning Moment (LM₁) to be present.

It is now time to satisfy the narrative preconditions that allows the learning moment to be presented as a part of the continuous story.

The pedagogical module sends the LM ID to the story generator that brings the narrative preconditions for the required dilemma. The preconditions can be stated as follows:

```
at_the_playground('learner')
and_at_the_playground(char(masahiro))
and_at_the_playground(char(haruto))
and_friend('learner', char(masahiro))
and_friend('learner', char(masahiro))
and_char_personality(char(masahiro),
not(value_hold('be_respectful'))))
and_friend('learner', char(haruto))
and_char_personality(char(haruto), value_hold('be_respectful'))
```

The story generator considers these prerequisites as the current goals and generates a plan that allows the story to unfold from the current world state to the goals state.

Now Shimpai Muyou! asks the learner to either act or allow Shimpai Muyou! to act.

Please choose an action or press done for the system's turn.

The learner chooses to allow Shimpai Muyou! to act (this is done by pressing the done button.)

Haruto Kun is at the playground. Haruto Kun wants to play soccer with you. Haruto Kun invites you to play soccer. The system now asks the user to choose "Yes" or "No" and then press the "carry my action button". The learner chooses to play soccer (this is done by clicking on "Yes" button.)

You chose to play soccer.

As it is Shimpai Muyou! turn to act, the STRIPS-like planner executes the first action in the previously generated plan. Since Haruto Kun is already involved in the story and exhibits the required properties required by the narrative prerequisites, the story world introduces new characters at this stage.

Masahiro Kun enters the playground and also wants to play soccer. Do you allow him to play soccer with you?

The system now asks the user to choose "Yes" or "No" and then press the "carry my action button". The learner agrees to play soccer with him (by clicking "Yes" button.)

Masahiro Kun moves to the playground.

Shimpai Muyou! asks the learner to either act or allow ShimpaiMuyou! to act.

Now choose another action or press done for the system's turn.

The narrative preconditions of the learning moment have now been met, the learner as well as all characters are in playground.

Since the preconditions and actions are represented by variables, it allows different characters to join the learner in the future. The learning moment starts as follows:

Masahiro Kun and Haruto Kun, and Yuki Kun are playing soccer in the playground.

Masahiro Kun starts insulting Haruto Kun.

Haruto Kun is upset. Haruto Kun wants to stop him. Do you help Haruto Kun?

No

You refused to help.

Shimpai Muyou! reflects on the learner's action by stressing on his chosen action.

Yuki Kun refused to help Haruto Kun.

Haruto Kun is disappointed because Masahiro is getting nasty.

Haruto Kun is looking for your help.

Haruto Kun thinks that he needs a lesson.

Haruto Kun decides to leave the game and asks Yuki Kun to quit playing with him.

Do you quit playing with Masahiro Kun for the sake of Haruto Kun?

No

You refused.

ShimpaiMuyou! reflects on the learner's action by stressing on his chosen action.

Yuki Kun refused to quit playing with Masahiro Kun.

ShimpaiMuyou! recognizes that the learner's attitude is not a desirable one. Therefore, it starts Socratic questioning to help learner to consider his action.

Haruto Kun quit playing, but Yuki Kun decided to continue playing with Masahiro Kun. Now, Masahiro Kun starts bullying Yuki Kun. Haruto Kun is not there to help Yuki Kun. Do you think Haruto Kun was right to quit playing with Masahiro Kun?

Yes

You admitted

ShimpaiMuyou! reflects on the learner's action by stressing on his chosen action.

Does Yuki Kon also quit playing with masahiro Kun?

Yes

You agreed

Yuki Kun quits playing with Masahiro Kun.

The learning moment unfolds as per the learner's answers. The system will follow the Socratic questioning and will raise the ante when necessary as follows:

Yuki Kun and Haruto Kun decide to stop playing with Masahiro Kun.

Yuki Kun warns Masahiro Kun that they would play soccer with him unless he behaves.

Masahiro Kun is worried about losing good friends.

Masahiro Kun says sorry to Haruto Kun.

Masahiro Kun promises that he will stop mocking at others.

Yuki Kun, Haruto Kon and Masahiro Kun are happy now and decide to continue the game.

The learning moment ends at this point and the pedagogical module has done its assessment of learner's actions in the following way:

```
IF action('LM2', 'refuse_to_support_the_victim')
and IF action('LM2', 'insist_on_refuse_to_support_the_victim')
and IF ¬action('LM2', 'agree_to_support_the_victim')
and IF ¬action('LM2', 'stand_up_for_the_right')
THEN skill('courage', 'acquired', 0.2)
```

The value 0.2 is the system's confidence of the gained skill, which is lower than a pre-specified threshold in this example. Based on this information the pedagogical module updates the learner module by asserting the following rule(s):

```
skill('courage', 'not_acquired', 0.8)
```

According to the updated learner module, the learner lacks understanding of verbal bullying and courage to stand up for the oppressed value. Based on this information the pedagogical model can choose either a learning moment that deals with the courage value.

ShimpaiMuyou! continues interacting with the learner based on the facts asserted in the learner module.