Effects of Board Game with Different Debriefing Preferences on Cyberbullying Prevention

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Abstract

The collaborative board game was predicted to be a potential game-based learning environment to improve students' knowledge of cyberbullying and prevent cyberbullying behaviors. The games with the debriefing method could enhance the quality of the learning environment for improving the cognitive domain. Scholars pointed out that the well-designed debriefing method has been less explored during cyberbullying-related game playing. This study examines students' cyberbullying knowledge and affection and the effects of debriefing preferences on the game. This study used a repeated measure quasi-experimental research method to explore 124 primary school students with different preferences of debriefing methods focusing on multimedia and non-multimedia functions. The two-way repeated measures ANOVA test was conducted to compare the knowledge and affection between groups of debriefing preferences. The findings of this study reveal that the students have slightly improved knowledge and affection. The collaborative multimedia debriefing group students showed the highest knowledge progression among the four groups. Meanwhile, students in the individual scaffolded debriefing group showed the most development of empathy and intention to defend. Students also had positive debriefing experiences with their methods and perceived that the learning environment helped them to improve their cyberbullying knowledge and encouraged their upstanding behaviors.

Keywords: debriefing methods, digital citizenship, game-based learning, life-long learning, quality education

Scholars have revealed the adverse effects of cyberbullying on youth's mental health and personality development (John et al., 2018; Kim et al., 2019; Kırcaburun et al., 2019; Lee et al., 2018; Okumu et al., 2020; Torres et al., 2020). According to UNICEF (2019), one-third of young people in thirty countries are accused of being a victim of online bullying. It has raised growing concern about children's cyber-wellbeing and demand for serious action to prevent bullying in online society. Due to the developmental factors and the necessity to access the Internet as a tool for learning and socializing, early adolescents and teens between 10–18 become the most vulnerable to engaging in inappropriate Internet behaviors (MacHimbarrena, 2021). Nevertheless, a previous study revealed that younger children (ages 9–12) tend to be more open-minded and responsive to adults' guidance in understanding cyberbullying (Ho et al., 2017). Hence, cyberbullying could be taught from a young age for youths to extend their cyberbullying coping knowledge and better develop decent long-term cyberbullying behaviors in the future. Therefore, scholars have suggested conducting well-designed instruction to promote students' knowledge and essential skills regarding cyberbullying (Mardianto et al., 2021; Tapingkae et al., 2020).

Using board games has been recognized as an effective supplement to in-class learning activities. Research across disciplines reveals that well-designed board game helps enhance learners' cognitive achievements through their abilities to motivate and engage students in the learning process across different age groups (Boghian et al., 2019; Cavalho et al., 2019; Lin & Cheng, 2022). It also helps practice appropriate behaviors, facilitates face-to-face interactions among people, decreases aggression, and increases empathy (Eriksson et al., 2021; Noda et al., 2019; Riggs & Young, 2016), especially when combined with effective debriefing. Debriefing has been recognized as a vital step in in-game and simulation-based learning. It can be described as a process where players reflect on their emotions and develop behavioral changes. It also connects in-game experiences and reality (Crookall, 2014; Fanning & Gaba, 2007; Kriz, 2003; Peters & Vissers, 2004). The debriefing session also includes reflecting on what players have experienced and resolving misconceptions (Van der Meij et al., 2013). Accordingly, a board game with a debriefing method has been practically used to support students in learning cyberbullying prevention since empathy plays an essential role in cyberbullying perpetration (Steffgen et al., 2011; Zych et al., 2019) and upstanding behavior (Sierksma et al., 2015).

Nevertheless, how the different debriefing methods influence primary school students' knowledge and affection of cyberbullying has not been well clarified in the digital citizenship/digital literacy field. This study draws on the above game with the debriefing method. Therefore, the current study developed and implemented a cyberbullying board game among the different debriefing methods with primary school students. That is to say, the novelty of this study is not only the development of cyberbullying board games but also empirical guidelines on the effective utilization of educational board games to enhance knowledge and desired affective behaviors, leading to sustainable cyberbullying prevention.

Related Work

Theoretical Background and Empirical Evidence of Board Game-Assisted Learning

The board game is a traditional type described as an activity in which players participate by moving or removing pieces on a board that utilizes a game format marked with patterns (Noda et al., 2019). The trend of board game-enhanced learning has risen from the growing attention of computer games in game-based learning research (Chang & Hwang, 2019) and other modern-day popular cultures (Bayeck, 2020). The board game does not require advanced technology, making it cost-effective and possible for novice designers. Moreover, it contains every core mechanism that fosters motivation and engagement, enabling learning and facilitating interactions between people (Plass et al., 2015; Poole et al., 2019; Zagal et al., 2006). Within the board game environment, the learners can experience, acquire, and try out their knowledge safely and enjoyably through simulations (DeKanter, 2005). Additionally, a board game can be played collaboratively, as a collaborative board game, in which the players coordinately overcome the challenges together. Collaboration in the game can reduce aggressiveness and increase empathy (Ewoldsen et al., 2012; Jerabeck & Ferguson, 2013). According to Greitemeyer and colleagues (2012), team playing increases feelings of cohesion as players assist each other in achieving a common goal. Plus, collaborative mechanisms can encourage the players to be concerned for the well-being of others.

Previous research showed the effectiveness of board games on students' learning achievements in science and technology education (Cardinot & Fairfield, 2019; Lin et al., 2019), as well as proven to be an effective tool in practicing good character and teaching social issue awareness (Anggraeni et al., 2022; Mostowfi et al., 2016). For example, Kuo and Hsu (2020) implemented an unplugged computational thinking board game called "Robot City" to teach seventh-grade students computational thinking and programming concepts. The results found that board games significantly helped students improve their learning achievements. In addition, the students who worked collaboratively gained higher scores than those who worked competitively against other groups. Zhang and colleagues (2021) created "CheMakers", the organic reaction mechanisms collaborative board game, to evoke undergraduate students' meaningful verbal interactions in organic chemistry class. The research results indicated that the board game successfully provided a meaningful learning experience for students and promoted their interest in the content subject. Cheng and colleagues (2019) developed an issue-situation-based board game named "Water Ark" to enhance the high school and above participants' knowledge, responsibility, empathy, and value of public benefits on climate change and water resource adaptation. The findings revealed that participants' behaviors regarding water resource adaption improved sustainably after playing the board game. Syahrial and colleagues (2022) implemented an Indonesian traditional board game with primary school students in classroom teaching to facilitate the development of students' good characteristics. The board game activity improved students' positive character values regarding love for the homeland, caring for the environment, and tolerance. However, less study investigates the potential of board games on the student's cognitive and affective impacts on the cyberbullying

topic. Therefore, it is worth showing the potential of well-designed board games to promote students' desired behaviors and prevent undesirable cyberbullying.

Theoretical Background and Empirical Evidence of Debriefing Methods

Debriefing is a systematic assessment process where learners make meaning of prior learning experiences by recalling, evaluating, and connecting those experiences to the real-world context (Fanning & Gaba, 2007; Kriz, 2003; Lederman, 1992; Peters & Vissers, 2004). It plays a crucial role in experiential learning, where actual learning occurs (Crookall, 2014; Reed et al., 2013). Regarding the experiential learning theory, knowledge is constructed via grasping and transforming experience (Kolb, 1984). Kolb and colleagues' (2014) model of the experiential learning cycle presents two modes of grasping experience: concrete experience and abstract conceptualization. Meanwhile, two modes of transforming experience are reflective observation and active experimentation. Concrete experience is gained through observations and reflections, which later assimilate into abstract concepts in which new inferences for action arise. These implications can be tested in real-world contexts and used as a guideline for creating new experiences. Kolb's experiential learning cycle expanded to various frameworks that provided debriefing stages with structured questions (Kriz, 2010; Lederman, 1992; Sims, 2002; Thiagarajan, 1994). Petranek's (1994) seven Es debriefing is one of the distinctive frameworks that cover all of Kolb's experiential phases. The model includes events, emotions, empathy, explanations, daily employment, and evaluation.

Debriefing is primarily provided in the learning activity as both formative and summative assessment depends on the purpose (Meguerdichian et al., 2019; Rudolph et al., 2008), as it makes misconceptions visible and often solved through the forms of guided discussion (Grund & Schelkle, 2020). Debriefing can be conducted as a team or individual (Tannenbaum & Cerasoli, 2012). Thus, grouping becomes another interesting factor studied in previous research. In a game-based learning context, scholars suggested that the effectiveness of debriefing based on group depends on how the game is played. Collaborative debriefing seems more efficient when gaming activity is undertaken as a team (Kriz, 2010). Individual debriefing might be enough if the gaming activity is designed to be played individually (Peters & Vissers, 2004). Nevertheless, both debriefing approaches yielded similar effects on learning in the previous research (Tannenbaum & Cerasoli, 2012). The other study found that individual debriefing increased students' knowledge more significantly than collaborative debriefing (Van der Meij et al., 2013), whereas team debriefing outperformed personal debriefing regarding self-efficacy and motivation (Bilgin et al., 2015). However, Verkuyl and colleagues (2019) conducted a study comparing the debriefing experience of nursing students after the clinical virtual gaming simulation whose work revealed that the students who debriefed by themselves had the least debriefing experiences compared to those who debriefed in groups. Hence, the effects of different debriefing methods on students' learning remain unclear in the existing literature, especially in game-based learning and cyberbullying education. Debriefing session in game-based primary teaching was often carried out through teacher-led discussions or interviews (Cheng et al., 2016; Piu et al., 2016), and some employed written or oral self-debriefing with scaffolded guidelines based on various debriefing models. For example, Bilgin

and colleagues (2015) provided the students with scaffolded questions of the EIAG experiential model, aiming to ignite their memories of past gameplay experiences through group discussion and individual writing, which helped them improve their game strategies.

However, Lennon (2010) discovered that the primary students largely responded to the oral debriefing in more detail than written debriefing. Moreover, few studies have highlighted the effects of different debriefing methods on primary school students' knowledge and affection of cyberbullying. Therefore, this study aims to cope with this shortcoming. The following research questions helped to frame this study:

> RQ1: Does the preference for debriefing methods influence primary school students' knowledge, attitude, empathy, and intention to defend themselves regarding cyberbullying behaviors?
>
> RQ2: Does the preference for debriefing methods influence primary school students' debriefing experiences?

The Current Development of Cyberbullying Board Game

In this study, the collaborative board game environment for fostering good behaviors and preventing cyberbullying was laid on by the above principles, as shown in Table 1.

Table 1

Principles and their Relationships of Cyberbullying Instructional Design of the Proposed Game Environment

Principle and definition	Characteristics of the proposed game environment
Board game: An activity in which players participate by moving or removing pieces on a board that utilizes a game format marked with patterns (Noda et al., 2019)	Utilizing game board, pieces movements, and game rules.
Collaborative learning: A learning approach where students work in a group of two or more and mutually seek knowledge or solutions through a joint problem-solving task by sharing information and learning goals, nevertheless completing the learning tasks individually (McInnerney & Roberts, 2009; Smith & Macgregor, 1992).	The students play the board game together in a group of 2 to 6, in which each player works on individual learning tasks to complete the game's main objective as a team by acquiring and sharing information and resources to solve the problems.
Collaborative board game: A board game activity in which the game conditions and mechanic	— The gameplay takes place on the game board (space).

Principle and definition	Characteristics of the proposed game environment
forces the players to work and communicate to win the game together by completing individual tasks. The collaborative game condition includes (Oksanen & Hämäläinen, 2014; Szewkis et al., 2011): — common goal — positive interdenpendence — coordination and communication — individual accountability — awareness — joint rewards Collaborative game mechanic includes (Schell, 2008): — space — objects, attributes, and states — actions — rules — skill — chance	— Rules of the game, such as consequences, constraints of action, and goal, were designed and implemented (rules). — Provides persistent game tasks, allowing players to practice appropriate behaviors connected to cyberbullying and empathy (skill). — The players play the game by manipulating game cards and pawns (objects, attributes, and states) to overcome problems and tasks (actions) or unforeseen and uncertain events in the game (chance). — The players work together toward the same goal and will win or lose the game as a team (common goal and positive interdependence). — The game board provides the players with a learning space for discussion and information sharing. The players must constantly communicate to plan strategies to complete the game tasks (coordination and communication).  — Each player plays a different role with different abilities, which can benefit the team in achieving shared goals. A player's actions in each turn can affect the other players' condition in the next turn and overall results. (Individual accountability). **Different roles of players**  — Each player holds a pawn and profile card indicating their current status (e.g., health, resources, location) and can be shown to the teammates (awareness).

Principle and definition	Characteristics of the proposed game environment
	 — The proposed board game contains group rewards or punishments to reinforce the sense of collaborativeness (joint rewards).

The board game used in this study was designed and developed to cover cyberbullying, including cyberbullying concepts, elements, types, impacts, coping strategies, and empathy. According to the mechanism, we utilized collaborative gaming conditions (Oksanen & Hämäläinen, 2014; Schell, 2008; Szewkis et al., 2011) to optimize team cohesion and interactions between the team players. Moreover, the game design also implemented role-playing, non-playable characters (NPCs), and storytelling strategies to foster the students' perspective-taking and empathy. In the end, "Dysturbia" is a serious 2–6 multiplayer board game for students aged ten years and older. The game duration is around 30–40 minutes.

The game story occurs in a fantasy world where the main villain intends to invade the world with cyberbullies. The players play the role of six characters with different perks and special abilities. Each player is required to go through other situational challenges based on luck or decisions while working together to collect the treasure cards and resources to complete the game. Each player must randomly select the character to play to start the game. They will receive a character card and inventory card matching their selected character, which states their profile, special abilities, mental health status, and experience level. Before starting the game, the players determine their playing orders and play the game turn by turn, respectively. The game board is defined as the gaming space that the players can explore, whereas the explorable tiles have different levels of challenges. The players can call to challenge the situation on the tile they step on and draw a card from the situation card deck. Through this process, the players will learn about cyberbullying characteristics, types of cyberbullying, and coping strategies by interacting with the situations presented in the situation cards. Situation cards contain examples of cyberbullying situations that the players must read aloud to their teammates. It requires coping strategies to win the situations, making decisions (whether to help or ignore), and seeing the consequences of their decisions (getting rewards or points if they helped, or losing health or points if they ignored). To deal with in-game situations, the players must successfully stand up to the cyberbully and help a victim by matching forms of cyberbullying with the correct

defense card as it represents the appropriate coping strategies. Every successful challenge will activate a bystander symbolized by a blue cube token. Bystanders can combine into an upstander represented by blue column tokens, marking that tile as a safe zone from bullies. On the contrary, if the player fails the challenge, a black cube token representing a cyberbully will be added to the tile. It would cause the players who step on the tile to lose their health. This mechanic introduced the cyberbullying system and the roles of bullies, victims, bystanders, and upstanders.

In addition, with collaborative game mechanisms, "Dysturbia" allows the players to work as a team and share the same goal as they win or lose the game together. The players can help their teammates by healing, sharing resources, using their special abilities for their friends' sake, or equipping a power card designed to enhance the sense of empathy in the game. The players have to corporately plan, discuss gaming strategies, and actively contribute helpful information as they apply the content they have learned to advance problem-solving methods. The game was created with an interactive how-to-play video and handbook explaining the game rules to assist the students in playing the game or when a problem occurs.

Research Methodology

Participants

The participants in this study were 124 11–12-year-old students in four classrooms of a primary school in Thailand. They all enrolled in a science and technology course that included digital awareness topics based on Thailand's basic education core curriculum standard. All experimental procedures in this study involving human participants followed the ethical standards of the Institutional Review Board, Institute for Population and Social Research, Mahidol University (IPSR-IRB), Thailand (COA. No. 2020/12-431). Students who participated in this study were initially recruited based on the school administration board agreement. Informed consent forms were obtained from the student's parents or caregivers. All students were allowed to withdraw their participation during the experimental process. The participants comprised 55 boys (44.40%) and 69 girls (55.60%).

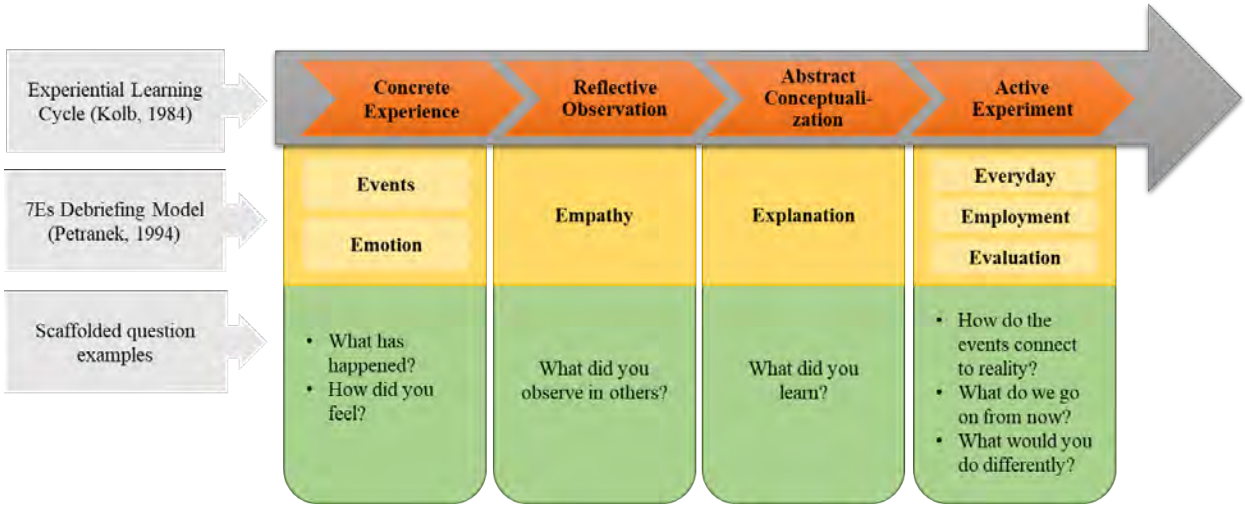
On the other hand, the inconsistent outcomes of the debriefing methods in the game-based learning literature suggest that more studies should be conducted to demonstrate which method properly improves learning regarding cognitive and affective domains, especially when used in collaborative board game environments. Therefore, in this study, the participants were asked for preferences for the debriefing method (DM) as follows:

> DM1: The collaborative scaffolded debriefing method was designed based on Kolb's (1984) experiential learning cycle and Petranek's (1994) seven Es of the debriefing model to provide the students with guidelines to reflect their thoughts with scaffolded open-ended questions (See Figure 1). In the concrete experience phase, the students were prompted to recall the situations and their feelings during the game. Next, the students observed and reflected upon the experience themselves and others in the

reflective observation phase. Through active reflections, the students constructed the new concepts of what they had just learned, called abstract conceptualization. Lastly, in the active experiment phase, the students were encouraged with questions to connect how the newly learned concepts can be transferred to the real world and test their knowledge in other hypothetical scenarios before summarizing and suggesting the proper future actions. Therefore, the students were asked to discuss in their group the experiences they faced in the game after finishing playing the collaborative board game. Then, they identified their learning and answered the scaffolded debriefing questions by writing them down on the paper.

Figure 1

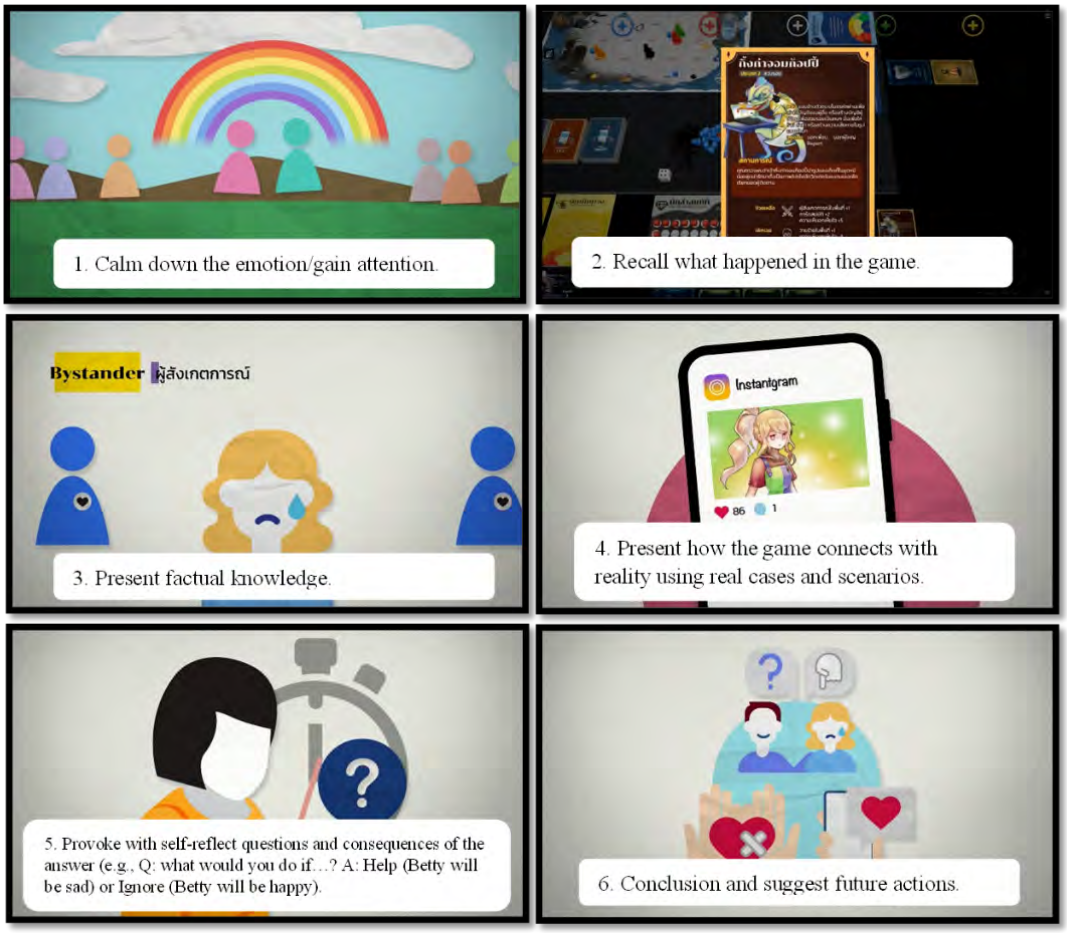
Debriefing Phases and Scaffolded Debriefing Questions



DM2: The collaborative multimedia debriefing method in which the video presentation of the in-game content summary was designed based on the same sequence of Kolb's (1984) experiential learning cycle and Petranek's (1994) seven Es of the debriefing model. The flow of the multimedia debriefing video is presented in Figure 2. The students in the experimental group with the collaborative multimedia debriefing were asked to watch the multimedia video after playing the collaborative board game and then discuss in their groups what they had just learned from the video and write down their conclusion on a paper.

Figure 2

The Flow of Debriefing Stages in the Multimedia Debriefing Video



DM3: The mixed debriefing method integrates the collaborative scaffolded and multimedia methods. After finishing the collaborative board game, the students received the multimedia debriefing first. Later, they were asked to collaboratively discuss their gaming experiences in their groups and summarize the answers to the provided scaffolded debriefing questions by writing on the paper.

DM4: The individual scaffolded debriefing method is laid on a self-debriefing procedure. The students played the collaborative board game as a team, but they were debriefed separately as individuals. The students reflected on themselves, guided by scaffolded debriefing questions of Kolb's (1984) experiential learning cycle and Petranek's (1994) seven Es of the debriefing model. Afterward, the students wrote down the answers to the scaffolded questions on the paper.

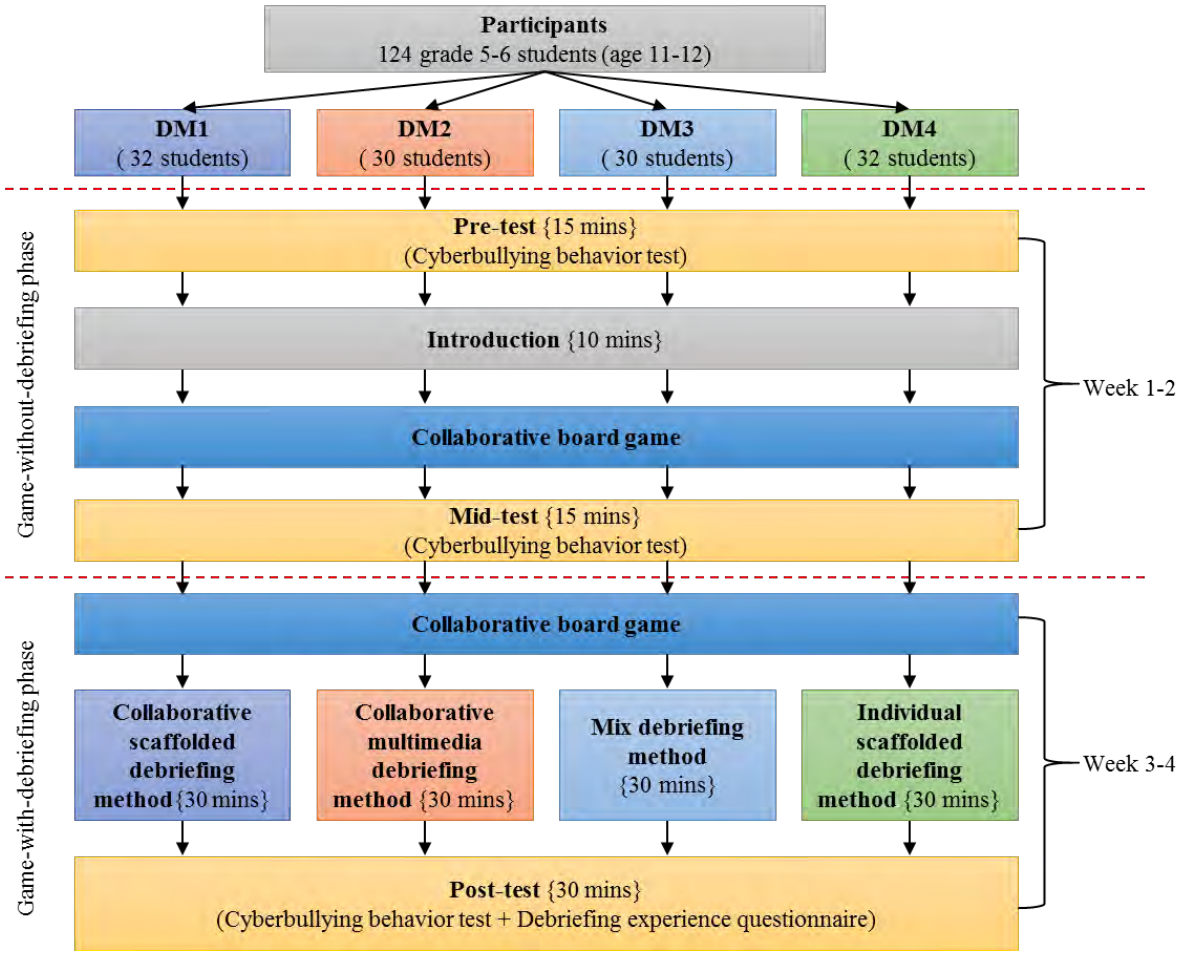
Experimental Design

At the beginning of the activity, students were required to take the pre-test to evaluate their prior knowledge of cyberbullying behavior. After that, the researcher explained how to play

the collaborative board game for 10 minutes. The participants were then divided into 5 to 6 players based on their preferences to play the game, as the researcher monitored the process and ensured that the students followed the rules. The activity duration lasted for four weeks, 60 minutes per week. The data collection of mid-test scores was collected at the end of the second week using the same cyberbullying behaviors questionnaire. At the end of week 4, after playing the collaborative board game for 20 minutes, the debriefing sessions were conducted. That is to say, this study could divide the students based on their preferences into four groups: 32 DM1, 30 DM2, 30 DM3, and 32 DM4 students. Figure 3 presents the experimental process of this study.

Figure 3

The Research Design of the Repeated Measure Experiment



Right after the debriefing activities, all participants responded to the evaluation of cyberbullying behaviors as a post-test and the debriefing experience scale questionnaire in week 4. To observe the improvement of the students in within-group and between-group, the students' cyberbullying behaviors pre-test, mid-test, and post-test scores were collected for two-way repeated measures ANOVA analysis. Meanwhile, students' debriefing experience scores were compared among four groups.

Measurement Tools

A cyberbullying behaviors questionnaire was applied to measure students' learning outcomes to answer RQ1. The items were adopted from the bullying assessment tool (Nieh & Wu, 2018) and modified to fit the cyberbullying context, as shown in Appendix A. The questionnaire consists of 50 items covering cyberbullying behaviors in four aspects included with 20 items for cyberbullying knowledge aimed to evaluate students' understandings in terms of cyberbullying concepts using yes or no questions (e.g., cyberbullies are more likely lack of empathy) with Cronbach's α=0.73, 10 items in the aspect of attitude focused on exploring students' feelings toward cyberbullying using 5-point Likert scale range from 1 (strongly disagree) to 5 (strongly agree) (e.g., standing up to help the cyberbullied victim will get yourself into trouble) with Cronbach's α=0.66, 10 items aimed to assess empathy for victims using 5-point Likert scale items range from 1 (not at all uncomfortable) to 5 (very uncomfortable) (e.g., seeing someone was ridiculed on the Internet) with Cronbach's α=0.92, and 10 items on the aspect of intention to defend measuring students' degree of willingness to stand up for those who were cyberbullied using 5-point Likert scale items range from 1 (totally unwilling) to 5 (totally willing) (e.g., how willing are you to find a way to help a cyberbullied victim) with Cronbach's α=0.91. The Cronbach's alpha of the overall questionnaire was 0.88.

The students' debriefing experience questionnaire was modified from the Debriefing Experience Scale (DES) (Verkuyl et al., 2019) to answer RQ2. It was translated to Thai by the researchers and performed back translation by domain experts regarding content validity, as shown in Appendix B. The scale consists of 15 five-point Likert scale items describing the students' experience during the debriefing process, and the importance of those experiences from students' perspectives ranges from 1 (strongly disagree) to 5 (strongly agree) (e.g., debriefing helped me to analyze my thoughts). The scale's reliability in this current version was calculated with Cronbach's alpha of 0.92.

Results

Comparisons of Students' Scores Based on the Debriefing Preferences

To determine whether the students' cyberbullying behaviors of each group changed during and after the learning activity, the participants' cyberbullying pretest, mid-test, and post-test scores were compared using repeated-measures ANOVA. In this process, the negative reverse scoring items were reversed, and the normality of the data was tested to ensure there was no violation of the statistic assumptions. The mean scores of students' cyberbullying behaviors in terms of knowledge, attitude toward cyberbullying, empathy for victims, and intention to defend the victims, including the *F*-values and effect sizes of each dimension, are presented in Table 2.

Table 2

Comparison of Students' Cyberbullying Behaviors Mean Scores among Pre-, Mid-, and Post-Test

Term of Cyberbullying behaviors	Group	N	Pre-test M (SD)	Mid-test M (SD)	Post-test M (SD)	*F*	Partial Eta Squared	Pairwise comparison
Knowledge	DM1	32	9.56 (3.56)	11.13 (3.81)	12.31 (3.68)	6.70*	.18	Pre < Post
	DM2	30	10.27 (3.05)	12.10 (3.48)	13.58 (3.43)	9.17*	.24	Pre < Post
	DM3	30	11.18 (4.30)	12.20 (3.62)	14.12 (4.72)	5.09*	.15	Pre < Post
	DM4	32	10.97 (3.04)	10.56 (2.54)	11.49 (4.41)	0.99	.03	
Attitude	DM1	32	36.03 (4.12)	35.53 (5.39)	36.37 (5.09)	0.39	.01	
	DM2	30	36.43 (3.58)	37.70 (3.86)	37.24 (5.59)	0.76	.03	
	DM3	30	37.20 (5.02)	37.41 (3.93)	38.84 (4.62)	1.58	.05	
	DM4	32	34.13 (4.90)	34.62 (4.67)	36.39 (5.99)	2.28	.07	
Empathy	DM1	32	31.12 (8.32)	31.69 (6.88)	34.62 (9.27)	2.16	.07	
	DM2	30	29.47 (8.76)	28.37 (7.53)	31.21 (10.19)	1.02	.03	
	DM3	30	28.63 (8.64)	28.20 (8.18)	31.79 (11.02)	1.37	.05	
	DM4	32	24.25 (6.15)	27.81 (7.44)	32.35 (9.57)	17.15*	.36	Pre < Mid < Post
Intention to defend	DM1	32	35.16 (7.51)	32.28 (8.67)	35.10 (8.87)	2.11	.06	
	DM2	30	32.50 (8.28)	33.43 (7.41)	33.99 (8.11)	0.42	.01	
	DM3	30	31.73 (8.85)	30.93 (7.43)	36.68 (8.85)	5.07*	.15	Pre < Post; Mid < Post
	DM4	32	27.84 (8.40)	30.59 (6.73)	33.72 (9.27)	7.82*	.20	Pre < Mid; Pre < Post

*$p < .05$.

As shown in Table 2, regarding the aspect of cyberbullying knowledge, a significant improvement was found across the pre-, mid-, and post-test data in DM1 (F=6.70, p<0.05, ES=.18), DM2 (F=9.17, p<0.05, ES=.24), and DM3 (F=5.09, p<0.05, ES=.15). It indicates the small to medium magnitude of the improvement from pre-test to post-test of the three groups. The affective aspects include attitude toward cyberbullying, empathy, and intention to defend despite no significant differences between pre-, mid-, and post-test scores regarding students' attitudes. Students' empathy scores of DM4 showed significant differences among pre-, mid-, and post-test scores (F=17.15, p<0.05, ES=.36). A pairwise comparison further determined that the students' empathy significantly raised after the mid-test, then later continued to improve

after the debriefing session. The partial eta squared value was 0.36, suggesting a medium magnitude of empathy improvement.

The repeated measures analysis further revealed the significant changes in the students' intention to defend over pre-, mid-, and post-test scores in DM3 (F=5.07, p<0.05, ES=.15) and DM4 (F=7.82, p<0.05, ES=.20). A post hoc test unveiled that the post-test scores in DM3 were significantly higher than pre- and mid-test scores, indicating a significant increase in students' intention to defend after the collaborative mixed-method debriefing session. Meanwhile, the DM4 students' mid-test scores of intention to defend were significantly higher than the pre-test after students participated in the learning activities for two weeks. The intention to defend post-test scores also remained higher than the pre-test scores in the DM4 students, meaning they developed their intention to defend the cyberbullying victims significantly more than before the learning intervention.

Moreover, the two-way repeated-measures ANOVA was performed to compare the students' pre-, mid-, and post-test scores among four preferences (i.e., DM1, DM2, DM3, DM4). The groups were compared and explored the overtime changes and between-group differences of the four debriefing methods from pre-, mid-, and post-test. Regarding the term of knowledge, the main effect of time shows a small effect size regarding the students' cyberbullying knowledge ($F_{(2,240)}$=18.62, p<0.05, ES=.13). However, there was no significant effect on students' scores among the four debriefing methods ($F_{(3,120)}$=1.65, p>0.05, ES=.06). There was also no significant interaction between the gains of the four debriefing methods among the cyberbullying knowledge pre-, mid-, and post-test ($F_{(6,240)}$=1.53, p>0.05, ES=.04). These results suggest that the four groups had similarly progressed their knowledge about cyberbullying as time went on, all debriefing methods were similarly effective on the collaborative board game. There were also significant effects of the debriefing methods on students' attitude ($F_{(3,120)}$=3.90, p<0.05, ES=.09). However, there was no significant main effects on time on students' attitude scores ($F_{(2,240)}$=3.17, p>0.05, ES=.03), as well as no significant interaction among students' pre-, mid-, post-test scores at different time points ($F_{(6,240)}$=0.70, p>0.05, ES=.02). That is to say, the method students were debriefed after learning about cyberbullying made a small difference in their attitudes, but as time went on, their attitudes did not change much, regardless of the debriefing method used. The interaction between the method and the time was also not significant, indicating that no particular combination of method and timing was notably effective in changing attitudes. Similarly, it indicates a significant main effect of time ($F_{(2,240)}$=10.81, p<0.05, ES=.08) and four preference groups on students' empathy scores ($F_{(3,120)}$=2.92, p<0.05, ES=.07). It confirmed that the students' empathy gains overtime were comparable among the four methods. Moreover, time had a significant main effect on the student's intention to defend. The students of four groups manifested a significant change of intention to defend overtime ($F_{(3,360)}$=6.31, p<0.05, ES=.05). However, there was no significant interaction among the four groups and the students' pre-, mid-, and post- intention to defend scores ($F_{(3,360)}$=2.41, p>0.05, ES=.09). These results indicates that the students generally became more empathetic over time. This increase was similar no matter which group they were in. The methods used in the four groups affected empathy, but the difference was small. It also revealed that the student's willingness to

intervene in defense of others increased over time, but this increase was not significantly different among the four groups, nor did it depend on the combination of group and time. In summary, there are different results among the four groups on knowledge, attitudes, empathy, and intention to defend against cyberbullying, as shown in Table 3. The mean scores of the four groups increased over time (i.e., pre-, mid-, and post-test). It is highlighted that even though the four groups have shown a homogeneous development of overall cyberbullying behaviors, the groups who received the debriefing methods with collaborative elements (i.e., DM1, DM2, DM3) manifested a significant development of cyberbullying knowledge in which collaborative multimedia debriefing outperformed the other debriefing methods. Meanwhile, the individual scaffolded debriefing (DM4) exhibited outstanding results regarding empathy and intention to defend scores. The similar results among the four groups are attitude changes, empathy, and intention to defend improvement in the collaborative debriefing groups.

Table 3

Summary of Cyberbullying Behaviors for the Four Groups over Time

Term of cyberbullying behavior	*F*-value						
	Within group				Between groups		
	DM1	DM2	DM3	DM4	Pre-test	Mid-test	Post-test
Knowledge	6.70*	9.17*	5.09*	0.99	1.37	1.68	2.65
Attitudes	0.39	0.76	1.58	2.28	2.71*	3.33*	1.44
Empathy	2.16	1.02	1.37	17.15*	4.28*	1.82	0.56
Intention to defend	2.11	0.42	5.07*	7.82*	4.28*	0.90	0.71

*$p < .05$.

Comparisons of Students' Debriefing Experience Scores

To investigate the students' debriefing experience, students' debriefing experience data were analyzed and presented by descriptive statistics. It was found that the DM1 students rated their debriefing experience slightly higher than the other groups (M=3.72, SD=0.56), followed by the DM3 students (M=3.57, SD=0.77), and the DM2 students (M=3.56, SD=0.72) respectively. Meanwhile, the DM4 students showed only neutral agreement toward the debriefing method (M=3.38, SD=0.50). However, the ANOVA results yielded no significant difference among the debriefing experiences of the students in the four different groups ($F_{(3,123)}$=1.52, p>0.05). That is to say, four debriefing methods were definitively rated better or worse than the others by the students. The students manifested high to medium agreement, meaning that each debriefing method helped them understand more about the cyberbullying content from the game and make a connection to the real-life context. Interestingly, the groups with collaborative debriefing elements (i.e., DM1, DM2, DM3) rated the overall debriefing experience high.

Discussions and Conclusions

The present study investigated the effects of a collaborative board game with different debriefing methods on students' behavioral changes in knowledge, attitudes toward cyberbullying, empathy for cyberbullying victims, and intention to defend. Moreover, we

examined the debriefing experiences of the students who participated in the learning intervention.

To answer and discuss RQ1, the repeated measures experimental results revealed that the students who preferred the collaborative debriefing features showed significant improvement in cyberbullying knowledge scores after the debriefing session with a large effect size. This result indicates that the collaboratively structured debriefing supported students in developing their cyberbullying knowledge. That is because knowledge acquisition is supported through discussion in a collaborative debriefing environment. Instead of reflecting on the newly learned knowledge and trying to make sense of it alone, the groups can learn from reflecting on their experiences and emotions while observing others and comparing those of others with their own, leading to the justification of knowledge and a better understanding of the information being shared (Dillenbourg & Schneider, 1995). Moreover, the collaborative multimedia debriefing group (DM2) showed a high progression of knowledge with the largest effect size among the four groups. In addition, in terms of the affective aspects, the utmost development of behaviors such as empathy and intention to defend was seen in the individual scaffolded debriefing group (Table 1). This finding conversed with our hypothesis from previous research (Kriz, 2010; Verkuyl et al., 2019). The reason could be that affective behaviors are internal feelings that require an individual's emotional regulation and judgment (Gerdes & Segal, 2009). Consequently, such cognitive processing could be fostered more effectively when the learners have an appropriate time and space to independently reflect on the learning experiences. Consistent with the finding of Van der Meij et al. (2013) that with individual debriefing, the students were not distracted by the opinions of others and could be more focused on reflecting on their feelings and understanding of the game features.

Therefore, this study answers RQ1 that the preference for debriefing methods influenced students' knowledge, attitude, empathy, and intention to defend regarding cyberbullying behaviors. That is to say, DM3 using multimedia elements in presenting the learning content based on the structured scaffolding phases of Kolb (1984) and Petranek (1994) outstandingly helped support the students' knowledge gains about cyberbullying. The previous research backed up this, uncovering that the use of multiple media, such as text, audio, video, and animation, could facilitate students' cognitive information processing, relieve the cognitive loads, and enhance learning rather than a static medium (Altinpulluk et al., 2020; Mayer, 2007). Bainbridge and colleagues (2022) also supported that animated learning materials can improve students' meaningful and transferable learning.

Regarding RQ2, the preference for debriefing methods influenced students' debriefing experiences. That is to say, the students who learned with the cyberbullying collaborative board game and different debriefing preferences had positive debriefing experiences. The high level of agreement toward each item reflected that most students considered the debriefing sessions a helpful tool that helped them better comprehend the game's meaning and connect the in-game content and reality. That is because debriefing is the purposeful reflection to reflect, evaluate, and discuss the different perspectives of players' emotions and behaviors during the game and relate in-game experiences to the real-world context (Crookall, 2014; Fanning & Gaba, 2007;

Kriz, 2010; Peters & Vissers, 2004). After the gaming experience, the students need a way to help them consider the meaning behind those experiences more deeply, making in-game content more understandable and transferable. In this current study, we apply structured self-debriefing methods to prompt the students to organize their feelings and systematically reflect on their learning after the gaming experience. Moreover, the students who were debriefing with the collaborative debriefing methods expressed higher acceptance of the debriefing session than those who were debriefed individually. It conforms to the research conducted by Verkuyl and colleagues (2019), who started the idea that collaborative debriefing should be more beneficial in supporting the learners with opportunities to exchange and get a deeper understanding through discussion and better their performance by learning from other members' experiences than those who learn by individual debriefing.

As mentioned above, this study highlighted that using multimedia materials and scaffolding questions provided the adequacy of resources that enhanced the convenience of the learner-centered learning process and reduced the complexity of board game mechanics and complicated rules. Equipping the students with only self-directed learning resources without any clear directions and guidance on how to debrief themselves, the students will be more likely to depend on their own individual learning experiences and reflection skills alone (Fanning & Gaba, 2007; Lapum et al., 2019; Verkuyl et al., 2019). The quality of debriefing could differ based on students' self-reflective abilities. To assure the best possible learning outcome from game-based learning, this study suggests that a well-structured debriefing principle should be delivered together with well-designed learning material that facilitates the students to recall and reflect on their learning through game experiences. Furthermore, combining collaborative and individual debriefing in the gaming learning activity may convey greater learning benefits.

Contributions

Cyberbullying is a crucial worldwide issue. This research designed a cyberbullying board game based on collaborative game mechanics and developed debriefing materials to assist students' self-debriefing experiences. Moreover, we investigated the different effects of debriefing methods to bridge the gaps in the existing literature and gain further insight into students' good behavior development and how they perceive their improvement throughout learning activities. The study's findings provided a valuable guideline in the design and practice for educational game designers, teachers, and educators in fostering social issue knowledge and awareness that leads to sustainable solutions. Even though the results revealed the insignificant effects of debriefing methods over others, this study helped clarify the pros and cons of each method for future practice. Most importantly, it paves the path to more study effective debriefing methods within a game-based environment. This study provided empirical validation of the game-based learning approach to teaching cyberbullying. It proposed the integration of game-based learning and a collaborative gaming approach in designing a cyberbullying board game with effective self-debriefing strategies that can be used instead of the skilled debriefers if the debriefers are unavailable. Collaborative scaffolded debriefing in parallel with multimedia debriefing video can help stimulate students' discussions, and the combination was considered

the most effective debriefing method for knowledge improvement. For the improvement of attitudes, empathy, and intention to defend, individual scaffolded debriefing was considered the most effective one. However, the individual debriefing group students showed the lowest debriefing experiences. To ensure the debriefing quality and good experience, this study suggests that the students should be allowed to discuss with peers, together with enough time to reflect on the knowledge they learned.

Limitations and Suggestions for Future Research

Although the recent study has uncovered the uninvestigated area regarding debriefing methods for learning about cyberbullying with board games, some aspects have not yet been explored. According to the outstanding outcome of the individual scaffolded debriefing in developing students' affective behaviors, multimedia material combined with scaffolded debriefing questions should be further studied to support students' reflective process. The factors that may interfere with game-based learning performance should be identified and included in the study (e.g., gender, gaming experiences, and learning motivations). In practical application, collaborative board game mechanics may take a long time to learn and comprehend in a classroom setting. Therefore, the game's complexity must be simplified and optimized to suit students of different ages and classroom contexts. Finally, the data collection of this study was obtained and interpreted from only self-reported ratings. Hence, alternative ways of data collection, such as peer-reported or teacher-reported surveys, learning logs, and behavioral learning pattern analysis, could be used to deepen the understanding of students' learning behaviors.

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Appendix A

The cyberbullying behaviors questionnaire items

Aspects	Items
Knowledge (20 items) (Cronbach's α=0.73)	1. People who cyberbully others are not malicious but just for fun. 2. Cyberbullies are more likely to lack empathy. 3. Being cyberbullied makes a person stronger. 4. Most people feel uncomfortable seeing cyberbullying. 5. Sharing or commenting on cyberbullying messages is considered encouraging cyberbullying. 6. Cyberbullying can affect people's lives. 7. Cyberbullying prevention will be the most effective if everyone ignores and works together to solve the problem. 8. Typing sarcastic messages online for fun and making the targeted person uncomfortable is considered cyberbullying. 9. Cyberbullies can be changed. 10. Cyberbullying is not as serious as face-to-face bullying, so there is no need to stop it specifically. 11. Being cyberbullied can affect us psychologically. 12. The cyberbullied person because they are too sensitive or overthinks. 13. Everyone has the possibility of being cyberbullied. 14. Passive bystanders can make cyberbullying worse. 15. As long as you are willing to lend a helping hand, you have the opportunity to stop cyberbullying. 16. The victim must find a way to save themselves instead of asking for help. 17. Deliberately preventing/blocking a specific person from a chatroom to make them feel uncomfortable is a kind of bullying. 18. Cyberbullying incidents can be prevented. 19. Criticising others maliciously on the internet is also cyberbullying. 20. Cyberbullying incidents affect bullies, victims, and bystanders.
Attitude (10 items) (Cronbach's α=0.66)	1. Standing up to help the victim will get you into trouble. 2. These cyberbullying incidents are just rants between classmates. 3. After a cyberbullying incident occurs, it is more beneficial for the students to deal with it by themselves than the teacher or parents. 4. If someone is cyberbullied, you should find a way to help the victim. 5. Everyone is equal; no one should be cyberbullied. 6. The cyberbullying incident will increase the cohesion among students. 7. Not informing teachers or parents after a cyberbullying incident is best. 8. Cyberbullies are usually very powerful. 9. The person being cyberbullied has problems. 10. Cyberbullying incidents are bound to happen.

Empathy (10 items) (Cronbach's α=0.92)	1. Seeing someone was ridiculed on the internet. 2. Seeing someone posting a sad status online. 3. Seeing an actor was begrudged nicknames on the internet. 4. Seeing someone was intentionally blocked from an open chatroom or an online game. 5. Seeing someone say bad things about them behind their back in the online community. 6. Seeing someone's photo was posted online without the owner's permission. 7. Seeing someone was scolded on the internet. 8. Seeing a friend being teased on social media. 9. Seeing the news of someone trying to commit suicide due to being cyberbullied. 10. Seeing someone was impersonated online.
Intention to defend (10 items) (Cronbach's α=0.91)	1. How willing are you to find a way to help a cyberbullied victim? 2. How willing are you to stop the bullies from cyberbullying people? 3. How willing are you to report cyberbullying? 4. How willing are you to be a peacemaker and try to mediate a cyberbullying situation? 5. How willing are you to accompany the victim? 6. How willing are you to comfort the victim? 7. How willing are you to find a trusted adult to help the victim? 8. How willing are you to tell people not to join cyberbullying others? 9. How willing are you to seek help if you were cyberbullied? 10. How willing are you to tell teachers or trusted adults if you were cyberbullied?

Appendix B

Debriefing Experience Scale (DES)

Item
1. Debriefing helped me to analyze my thoughts.
2. Debriefing confirmed the decisions I made in the game.
3. The debriefing environment was physically comfortable.
4. Unsettled feelings from the game were resolved by debriefing.
5. Debriefing helped me to make connections in my learning.
6. Debriefing helped make sense of the game.
7. Debriefing provided me with a learning opportunity.
8. Debriefing helped me to find meaning in the game.
9. My questions from the game were answered by debriefing.
10. Debriefing helped me to become more aware of helping cyberbullying victims.
11. Debriefing helped me to become more aware of not cyberbullying others.
12. Debriefing helped me to clarify problems.
13. Debriefing helped me to make connections between theory and practice.
14. There was sufficient guidance during the debriefing session.
15. Debriefing allowed me to reflect on my actions during the game.
16. I had enough time to debrief thoroughly.