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A Debriefing of a Student Created Malaria Board Game

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Introduction

Malaria continues to be a major global health problem. World malaria cases and deaths totaled 229 million and 409,000 cases respectively, in 2019. Despite declining incidence by 3% from the previous decade, malaria places nearly half the world's population at risk, with burdens on children and pregnant women (World Health Organization, 2020). Health educational strategies aid in facilitating awareness of the malaria problem. Health education games in electronic format demonstrated effectiveness in addressing health concerns in a review across multiple health issues to target not only health professionals, but also clients and the public. One hundred sixty-one game studies were evaluated. Thus, games positively impacted both knowledge and health related skills across 26 health related categories. (Sharifzadeh et al., 2020). Health educational games that address the problem of malaria were developed in the electronic format, such as the Nobel Prize's *Parasite Game and Mosquito Game* (Nobel Prize Outreach, 2021), and the *Life and Death in the Age of Malaria* game (Harjes and Baumann, 2012). Both the *Mosquito Game* and *Parasite Game*, 2D web games designed for youth sought to increase awareness about malaria transmission and prevention. The *Parasite Game* addressed the spread of malaria within the human body. (Nobel Prize Outreach). In the game, *Life and Death in the Age of Malaria* players traveled to various malaria endemic countries in this web-game. The game's objectives centered around the knowledge about prevention, and treatment of malaria. The game also provided a feedback mechanism. A study involving U.S. university students with the *Life and Death in the Age of Malaria* game demonstrated that the players significantly increased malaria-related knowledge, satisfaction and risk perceptions as a result of the play of the game (Hartjes & Baumann, 2012). However, the gap existed to create health educational material, especially in the student developed board game format for the topic of malaria.

Gauthier et al. (2019) reviewed 21 game studies in the randomized controlled trial format designed to address health issues. Three of these studies involved medical and dental students. Overall, the game studies demonstrated increased knowledge outcomes, and to a less extent, increased behavior outcomes. Abdulmajed, Park, & Tekian (2015) evaluated twenty-two non-video game studies among health professionals. Five tabletop game studies (including two board game studies) selected for systematic review involved nursing and medical students. Post-game response of the participants to game play indicated the following: a valuable experience, fun, awareness of facts, and learning engagements (Abdulmajed et al., 2015).

Facts for Life, a leading health communication source created by UNICEF with multiple United Nations collaborators was developed to address the major 14 health issues especially impacting families, particularly maternal and child health in the two-thirds world. Malaria is a prioritized topic in *Facts for Life*. The *Facts for Life* provides a framework for conveyance through a variety of health education and health behavior strategies. Educational games provide a potential means to address these *Facts for Life* malaria content (UNICEF, WHO, UNESCO et al., 2010). The board game format especially is useful in as a form of appropriate technology for multiple global settings such as Brazil (Martins et al., 2018), in the Philippines (Lennon & Coombs, 2007) and in Nigeria (Basse et al., 2020). Board games also demonstrated increased interactions between participants compared to digital formats (Fang, Chen & Huang, 2016).

An important strategy is to not only expose students to games, but also involve them in the development of games. From the elementary school level pupil involvement occurred in the development of games to address dengue fever, also a mosquito-borne disease such as malaria

(Lennon & Coombs, 2006). University faculty and students designed board games for improved learning and topic engagement (Corl, Ettinger, & Eisen, 2017; Zhang, Muktar, Ong, Lam & Fung, 2021). No known published university or professional student level board created game on the topic of malaria exists.

Crookall (2014) stressed the importance of debriefing in the educational game process as a means of engagement. Debriefing enables the participants to process the gaming experience. Debriefing allows for the expression of feelings, as well as thoughts. Debriefing culminates the gaming experience. In so doing, debriefing maximizes the learning and engagement experience. Thus, engagement and debriefing are connected. Van de Hoogen, Lo & Meijer (2016) further emphasize the value of post-game debriefing, especially as a means of reflection. Debriefing may occur in various ways: oral, written, or a combination of written and oral forms. Debriefing allows reflection to occur through steps or phases. A study of the Nobel Prize related malaria web-based games (UNICEF, WHO, UNESCO) demonstrated the use of oral debriefing (Lennon, 2006). A dengue fever game study demonstrated the usefulness of using a combined written and oral debriefing process after board-game play among students (Lennon, 2013). An understanding of debriefing will be essential for students, health educators, public health workers or anyone else who utilize games, especially board games to educate or provide awareness on health topics for other students or use in the community.

The *Facts for Life* (UNICEF, WHO, UNESCO) material present as a potentially valuable template for creating educational strategies for awareness of various health topics around the world, *Facts for Life* messages have already been translated in over 100 languages and dialects. A game designed that encompasses *Facts for Life* messages and related materials may be advantageous. The use of a game together with post-game debriefing may provide for an enhanced engagement with the game's content. Therefore, it is valuable for public health-health promotion students as well as health promoters to be exposed to the use of the strategy of health educational games and educational debriefing. Consequently, this current study sought to explore the utility of a combination of written and oral debriefing after the play of a student designed board game on malaria based on *Facts for Life* messages and related materials. The overall aim of this study was to expose students to the non-formal methodology of game play on the malaria topic, as well as the experience of post-game debriefing. The primary purpose of this study was to demonstrate the utility of debriefing as a form of player-student engagement. The secondary purpose of this study was to demonstrate the use of *Facts for Life* material in game form to promote engagement on the health issue of malaria.

Materials and Methods

Design

This study utilized a qualitative descriptive approach through the play of a board game on the topic of malaria. Post-experience debriefing of the participants occurred through a written format followed by an oral format.

Recruitment and Sampling

Fifteen undergraduate health promotion students volunteered to participate in this study at a university in Virginia, U.S.A. The composition of the sample comprised 3 Africans, 2 Asians, 1

Hispanic, and 9 North American Caucasians. Nine of the participants were female, while three were male. All participant recruitment was from an Introduction to Public and Community Health Course. Public health-health promotion students were chosen as they especially need to have awareness of various health education strategies, including educational games and game debriefing. During the course of their degree these public health-health promotion students not only do community service in the U.S.A. but some also in global settings. All participants signed active written informed consent forms prior to study enrollment. All participants received a baseline lecture on malaria two months prior to the beginning of the study. No other exposure to malaria material, or educational games occurred in class prior to the play of the game of the study.

Game

The *Stop Malaria* (Edsen, 2012) game used in this study was designed by Grace Edsen, a student in the Health Promotion Methods in Global Settings course. None of the study participants were enrolled in this course at the time of the study. The game's designer permitted the use of the game for the study. The *Stop Malaria* (Edsen, 2012) game centers on malaria content derived from *Facts for Life*, an international health communications book that addresses the major material and children health problems around the world. Each *Facts for Life* chapter, such as the topic chapter of malaria contains key messages, which are generally health behaviors or practices to change, and respective content material, called supporting information (UNICEF, WHO, UNESCO). The 26 game board spaces and 27 interactive questions and answer cards contained information derived from all four malaria related *Facts for Life* key messages and supportive information (UNICEF, WHO, UNESCO). The question-and-answer cards also included four malaria related cards based on Health belief model constructs (Diptyanusa, Kasumasari, Satoto, 2020). All participants received 10 "mosquitoes" at the beginning of the game. The objective of the game was to lose all mosquitoes by successfully encircling the game board, and correctly answering the questions on the cards related to malaria.

Debriefing

The debriefing employed the same sequence of questions used in the *Immune System Defender* game debriefing (Lennon, 2010) except for the exclusion of item number 8 (see Appendix). This debriefing was also like the debriefing question sequence used in the malaria games study (Lennon, 2006) and the same sequence of questions in the dengue debriefing study (Lennon, 2013). The themes of these question steps were as follows: Experience recall, feelings, enjoyment, importance, new information learned, new information to learn, and improvement suggestions. The debriefing steps were also variations of themes expressed by Thiagarajan, 2019. For this study, the accomplishment of individual debriefing first was by written debriefing. Group oral debriefing followed the written debriefing. The oral debriefing utilized the same debriefing items from the individual debriefing (see Appendix).

The accomplishment of written and oral debriefing came through questions. Response categories were not pre-arranged, but rather developed from the responses (Hsieh & Shannon, 2005; McKenna, Brooks & Vanderheide, 2017). Each response was initially read, then reread twice to select the key word or key phrases for each response. The responses were then arranged and tabulated. The counts of written debriefing responses were then listed by theme. The listings of oral debriefing major themes were without counts.

Approval and Consent

The university's institutional review board (IRB) first approved the study. The study received an exemption approval for full IRB review. Active written consent formed the permission of the study.

Procedures

Health promotion students in the Introduction to Public and Community Health course had the opportunity to enroll in the research study. Only students who had completed signed informed consent forms, participated in the study. On the designated day students enrolled in the study gathered in a classroom to play the *Stop Malaria* (Esden, 2012) game. Initial game instructions and rules to the participants lasted for about 3-4 minutes. The division of participants was by three groups of four players. The participants all continued to play for 30 minutes. After the play of the game, the students spent 10 minutes of individual written debriefing by filling out the debriefing form (see Appendix). After the individual debriefing, the students had about 10 additional minutes of oral debriefing in one large group setting. The written and oral debriefing sessions employed the same debriefing questions (see Appendix). Participants had the opportunity to rephrase or expand on their responses.

Findings: Details of Responses

The details of the response themes are according to their respective debriefing questionnaire item.

Experience Recall

Written Debriefing

Experience Recall totaled 29 responses, among nine categories. The greatest number of response themes focused on how to prevent malaria. However, the responses covered a wide range of malaria related categories, seen in the game. See Table 1 for the response summary to Experience Recall.

Table 1.
Experience Recall Responses - Written

Responses Item Category	Total
a. Game was about malaria-general response	6
b. How to prevent malaria	9
c. Risks of malaria	2
d. Effects of malaria	3
e. Mosquito connection with malaria	3
f. Signs of malaria	1
g. Causes of malaria	2
h. Contracting malaria	2
i. Learning about malaria in a fun way	1
Total	29*

*11 Students had multiple responses.

Oral Debriefing

The responses indicated that the game was “all about malaria.” The students did not elaborate further, unlike the multiple themes extracted from the written debriefing to Experience Recall.

Feelings

Written Debriefing

Feelings totaled 20 responses among seven categories. The division of these themes were along positive and negative lines. The students gave multiple responses. The greatest number of response themes focused on felt educated or informed about malaria. Many of the themes were positive responses. See Table 2 for the response summary to Feelings.

Table 2.

Feelings Responses – Written

Response Item Category	Total
a. Positive responses	
i. Felt educated, or informed about malaria	9
ii. Felt good, happy, or enjoyed the game	5
iii. Felt like a “winner”	1
b. Negative responses	
i. Felt sad	2
ii. Felt frustrated	1
iii. Recognized need to learn more about malaria	1
iv. Felt like a “loser”	1
Total	20*

*5 students had multiple responses

Oral Debriefing

Overall, the students stated a feeling of relief, a sense of completion of an activity.

Enjoyment

Written Debriefing

Enjoyment totaled 25 responses, among 11 categories. Eight students gave multiple responses. The further division of these themes were between those who liked the game and those who did not like the game. Themes for liking the game focused on the students’ perceptions of learning new information, and the fun aspects of the game. Themes for not liking the game focused on game mechanics. See Table 3 for the response summary to Enjoyment.

Table 3.
Enjoyment Responses – Written

Response Item Category	Total
a. Liked the game	
i. Learned new malaria information	8
ii. The game was fun	7
iii. Enjoyed the game	2
iv. The game was simple	1
v. The game was interactive	1
vi. The game was insightful	1
vii. The game was well thought out	1
viii. The game was interesting	1
ix. Visited Africa	1
b. Did not like the game	
i. It took too long to rid mosquitoes repetitive play	1
ii. The rules needed clearer explanations	1
Total	25*

*8 students had multiple responses

Oral Debriefing

The group was that the students liked the game. No one expressed concerns nor dissatisfaction with the game.

Importance

Written Debriefing

Importance totaled 20 responses among 11 total categories. Five students gave multiple responses. The division of themes were by those who agreed to the importance of the game's topics and as well as those who disagreed. Ten of fifteen respondents agreed to the game's important topic. Among these affirmative responses, the division of theme categories were between health- related themes and geographic related themes. Among those who disagreed with game importance, four out of five respondents gave no reason. See Table 4 for the response summary to Importance.

Table 4.

Importance Responses – Written

<u>Response Item Category</u>	<u>Total</u>
a. Yes	
i. Health related themes	
ia. Malaria causes	2
ib. Malaria prevention	4
ic. Malaria symptoms	2
id. How to care for children with malaria	1
ie. How to care for pregnant women with malaria	1
if. Risks of pregnancy with malaria	1
ii. Geographic related reason theme	
iia. Lived in an area with malaria	2
iib. Plan to work overseas	1
iic. Plan to travel	1
b. No	
i. Not worried about malaria	1
ii. No reason given	4
<u>Total</u>	<u>20*</u>

*5 students had multiple responses

Oral Debriefing

- Key Themes presented in the oral debriefing were the following:
- Learned about malaria transmitting mosquito biting in the evening
- Now, the participants will cover themselves in the evening if they go to mosquito prone areas.

No discussion of disagreement of game importance was stated.

New Information LearnedWritten Debriefing

New Information Learned totaled 18 response themes among 10 categories. Three students gave multiple responses. The analysis further divided these themes between those who indicated learning something new and those who did not learn something new. Thirteen of the fifteen students indicated learning something new about malaria. The most frequent theme among those who learned something new was “malaria affects pregnancy (such as miscarriage).” Among those students who indicated not learning anything new, only one student indicated learning material from another course. See Table 5 for the response summary to New Information Learned.

Table 5.
New Information Learned Responses – Written

Response Item Category	Total
a. Yes	
i. Malaria affects pregnancy (such as miscarriage)	5
ii. Malaria can cause anemia	2
iii. Malaria prevention	2
iv. Coils do not kill mosquitoes	3
v. Most effective to repel mosquitoes	1
vi. Reduce risk by bed nets and clothing	1
vii. Malaria information (not specific)	1
viii. Most information was new	1
b. No	
i. Visited Africa	1
ii. Did not like the game	1
Total	18*

*3 students had multiple responses

Oral Debriefing

Key themes presented in the oral debriefing related to learning something new were the following:

- Participants were unaware of preventive methods
- Mosquito coil use
- Use of insecticide spraying on walls
- Bring a child to a clinic with high fever right away, instead of waiting for days.

The students gave no discussion concerning themes related to why students did not learn new material.

New Information to Learn

Written Debriefing

New Information to Learn totaled 16 responses among 13 categories. The division of these themes were further among those who would like to know more information about malaria compared to those who would not like to know more about malaria. Eight students indicated nine themes related to more information they would like to know about malaria. These themes covered a wide range of malaria topics. Among the seven that did not wish to learn more about the malaria topic, four responses were not specific for the rationale, while the others appeared satisfied with their knowledge obtained from the game. See Table 6 for the response summary to New Information to Learn.

Table 6.
New Information to Learn Responses – Written

Response Item Category	Total
a. Yes	
i. Strategies to prevent malaria	1
ii. Signs and symptoms	1
iii. Side effects	1
iv. Pregnancy	1
v. Transmission	1
vi. Mosquito life cycle	1
vii. Treatment	1
viii. Organizations involved in malaria	1
ix. Its geographic locations	1
b. No	
i. Not specific	4
ii. Know a lot about the topic	1
iii. The game already covered good material	1
iv. The game “covered everything”	1
Total	16*

*1 students had multiple responses

Oral Debriefing

Key themes presented in oral debriefing related to topics that the students would like to know more information include:

- More content on malaria treatment
- Life cycle of the mosquito that transmits malaria
- Hydration of a person with malaria.

The students gave no further discussion as to why students do not wish to learn new material about malaria.

Improvement Suggestions

Written Debriefing

Improvement Suggestions totaled 18 responses among nine categories. Eleven students gave 14 responses related to suggestions for game improvement. Four other students either gave no opinion to improve the game or left the response item blank. See Table 7 for the response summary to Improvement Suggestions.

Table 7.
Improvement Suggestions Responses – Written

Response Item Category	Total
a. Yes	
i. More questions	4
ii. Clearer instructions	3
iii. Increase time of play	2
iv. Indicate more directly the direction where a piece should go	2
v. More information treatment	1
vi. Explanation why some answers were false	1
vii. Less “lose a turn” spaces	1
b. No	
i. No reason given	3
c. Left Blank	
i. No reason given	1
Total	18*

*3 students had multiple responses

Oral Debriefing

Key themes presented in oral debriefing to improve the game included:

- Add a start question
- Improve directional arrows
- Involve tactical treachery against an opponent during game play.

The students gave no further discussion as to why there should not be further improvements to the game.

Discussion

In response to Experience Recall, the students grasped that the malaria-related game emphasized prevention as a key theme. However, students failed to mention the anti-malaria treatment component of the game in their responses. These responses were unlike students who included treatment as part of an overview when debriefed about the first question after the play of a dengue-related game (Lennon, 2013).

In response to Feelings the students overall expressed positive sentiments about the game in the written debriefing, though a few expressed sadness. Through oral debriefing, there was an overarching sentiment of relief or recovery from the intensity of the play of the game. The written responses to item number two paralleled positive feelings related to the play of the game, as also observed in debriefing after the play of a dengue fever-related game (Lennon, 2013). Responses from play of electronic malaria related games ranged from positive feelings to those of fatigue (Lennon, 2006).

Much of the response for Enjoyment in the written debriefing indicated that the game was fun or enjoyable. While there were two themes for “not liking” the game from the written debriefing, no participant expressed negative feelings about the game in the oral debriefing. In the written

debriefing, item three response themes centered on the enjoyment of the game. The interactivity of the game and the educational components both perceived as “fun” by the students. Some students however expressed displeasure with the time it took to rid the mosquitoes, a key objective to win the game. The oral debriefing component affirmed the students’ expressions of their views that the game was fun, and that they enjoyed the game.

Importance responses addressed the participants’ learning high value or critical themes. Broad themes covered in the written debriefing were malaria causes, prevention, and symptoms. Yet, the participants addressed detailed themes on the topic of malaria in pregnant women. In addition, some geographic related themes were in the listing. The oral debriefing follow-up responses addressed aspects of malaria in relation to mosquitoes. Unlike oral debriefing responses in Enjoyment, which were affirmatives of the written responses, the responses Importance addresses specific details of key concern, such as protecting oneself from evening mosquito bites.

The written responses to New Information Learned focused on new content learned about prevention and pregnancy in relation to malaria. Specific content also addressed mosquito coils. The oral debriefing reinforced the use of mosquito coils. Other preventive measures indicated were the practice of spraying walls with insecticide, bed nets, and clothing. The identification of the use of mosquito coils, a specific topic occurred in both written and oral debriefing. Oral debriefing also identified the importance of high fever identification as an important sign as rationale to visit a clinic for early malaria diagnosis and possible treatment.

The students gave multiple theme responses for New Information to Learn written debriefing, in their desire for more information. Themes such as malaria prevention, signs and symptoms, treatment reflected basic topics that the game addressed. However, written debriefing covered topics related to the severity of malaria. The oral debriefing focused on a new topic not previously addressed, such as hydration as part of the malaria treatment. Themes related to the mosquito life cycle and malaria treatment were in both the written debriefing, and the oral debriefing. Slightly less than one-half of the students indicated that they did not want to know more about the topic of malaria based on written debriefing. No responses in the oral debriefing related to why students did not want to know more about malaria.

Improvement Suggestions yielded suggestions for game improvement. These responses in written debriefing addressed the increase in the number of game questions, as well as instruction improvement. The increase in card number, as well as interest in providing explanations for false cards reflected the students’ possible interest to learn more about the topic of malaria. In both written, as well as oral debriefing students suggested improvement of directionality instructions. The oral debriefing suggested the theme of game tactics, which the written debriefing did not address.

Limitations

The study’s various limitations centered on the sample, method, and data collection. This study employed a purposive sample. This study used only one class. Future research may use multiple classes in a randomized design. Future studies may employ lower educational levels for the study population. In addition, future studies may involve other settings such as the community, and global populations. While this was a qualitative study, future research may utilize a quantitative

research design. The oral debriefing could employ a taping instead of relying on notes. The classroom setting placed time limitations for the game play and debriefing. However, one study accomplished post-simulation debriefing in less than five minutes (Clapper, 2016). Nevertheless, other settings out of class could provide more time for play and debriefing.

Summary

This study demonstrated the successful use of *Facts for Life* (UNICEF, WHO, UNESCO, et. al.) material for game design. In addition, a student created game was effective in conveying malaria content to other student-participants in a relatively short length of time. For the greatest number of new themes, students identified learning themes related to malaria and pregnancy, as well as malaria related prevention themes. This study also supported the complementary activities of both written and oral debriefing within the same study. The oral debriefing highlighted new informational themes, as well as a reinforcement of previous themes from the written debriefing.

Recommendations

The following are recommendations based on observations related to this study:

- Health related games may be used in the classroom to increase awareness and discussion of topics for health promotion and other public health students.
- Health educational games such as the *Stop Malaria* (Esden, 2012) game ought to be played in a variety of non-formal settings.
- The *Facts for Life* (UNICEF, WHO, UNESCO et al.) material are valuable resources for health information, especially to for use in global settings. Various game strategies may be utilized through *Facts for Life* messages on other health topics.
- Debriefing is essential to maximize the educational game experience. It should be included in any health education post-game experience.
- A combination of written debriefing and follow-up oral debriefing provides effective post-experience reflection and analysis for games played within group settings.
- Future research should include studies utilizing quantitative research on the play of the *Stop Malaria* game among U.S. health professional students, as well as selected populations in global settings.
- Future research should include the impact of the play of the game without post-game debriefing compared to the play of the game with debriefing.

References

- Abdulmajed, H., Park, Y. S., & Tekian, A. (2015). Assessment of educational games for health professions: A systematic review of trends and outcomes. *Medical Teacher, 37 Suppl 1*, S27-S32. <https://doi.org/10.3109/0142159x.2015.1006609>
- Bassey, D. B., Mogaji, H. O., Dedeke, G. A., Akeredolu-Ale, B. I., Abe, E. M., Oluwole, A. S., Adeniran, A. A., Agboola, O. A., Mafiana, C. F. & Ekpo, U.F. (2020). The impact of Worms and Ladders, an innovative health educational board game on Soil-Transmitted Helminthiasis control in Abeokuta, Southwest Nigeria. *PLoS Neglected Tropical Diseases, 14*(9), e0008486–. <https://doi.org/10.1371/journal.pntd.0008486>
- Clapper, T. C. (2016). Proposing a new debrief checklist for TeamsSTEPPS® to improve documentation and clinical debriefing. *Simulation & Gaming, 47*(6),710-719. doi:10.1177/1046878116667812
- Corl, D. A., Ettinger, C. L., & Eisen, J. A. (2017). Gut Check: The evolution of an educational board game. *PLoS Biology, 15*(4): e2001984. <https://doi.org/10.1371/journal.pbio.2001984>
- Crookall, D. (2014). Engaging (in) gameplay and (in) debriefing. *Simulation & Gaming, 45*(5), 4-5, 416-427.
- Diptyanusa, A., Kusumasari, R. A., & Satoto, T. B. T. (2020). Health belief model of persistent dengue transmission in Klaten, Indonesia. *American Journal of Health Behavior, 44*(2), 188-199. doi:10.5993/AJHB.44.2.7
- Esden, G. (2012) *Stop Malaria, np*.
- Fang, Y-M., Chen, K-M., & Huang, Y-J. (2016). Emotional reactions of different formats: Comparing digital and traditional board games. *Advances in Mechanical Engineering, 8*(3), 1-8. doi:10.1177/16878/4016641902
- Gauthier, A., Kato, P. M., Bul, K., Dunwell, I., Walker-Clarke, A. & Lameris, P. (2019). Board games for health: A systematic literature. Review and meta-analysis. *Games for Health Journal, 8*(2), 85-100. <https://doi.org/10.1089/g4h.2018.0017>
- Hartjes, L. B., & Baumann, L. C. (2012). Evaluation of a web-based malaria risk reduction game for study abroad students. *Journal of American College Health, 60*(5), 403-414. doi:10.1080/07448481.2012.557464
- Hsieh, H.- F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277-1288, <http://doi.org/10.1177/1049732305276687>
- Lennon, J. L. (2006). Debriefings of web-based malaria games. *Simulation & Gaming, 37*(3),350-356.
- Lennon, J. L. (2010). Debriefing a health-related educational game: A case study. *Simulation & Gaming, 41*(3), 390-399. doi:10:1177/1046878109332810

- Lennon, J. L. (2013). Dengue game debriefing by health promotion students. *Dengue Bulletin*, 37,203-210.
- Lennon, J. L., & Coombs, D. W. (2006). Child-invested health education games: A case study for dengue fever. *Simulation and Gaming*, 37(1), 88-97.
- Lennon, J. L., & Coombs, D. W. (2007). The utility of a board game for dengue haemorrhagic fever health education. *Health Education*, 107(3),290-306.
- Martins, F. D. P., Leal, L. P., Linhares, F. M. P., Santos, A. H. da S., Leite, G. de O., & Pontes, C. M. (2018). Effect of the board game as educational technology on schoolchildren's knowledge on breastfeeding. *Revista Latino-Americana de Enfermagem*, 26, e3049–e3049. <https://doi.org/10.1590/1518-8345.2316.3049>
- McKenna, L., Brooks, I., & Vanderheide, R. (2017). Graduate entry nurses' virtual perspectives on nursing: Content analysis of open-ended survey questions. *Nurse Education Today*, 49, 22-26.
- Nobel Prize Outreach AB. (2021). *Malaria*, <http://educationalgames.nobelprize.org/educational/medicine/malaria>
- Sharifzadeh, N., Kharrai, H., Nazari, E., Tabesh, H., Maryam, E. K., Heidari, S., & Mahmood, T. (2020). Health Education Serious Games Targeting Health Care Providers, Patients, and Public Health Users: Scoping Review, *JMIR serious games*, 8(1) <http://dx.doi.org/10.2196/13459>
- Thiagarajan, S. (1992). Using games for debriefing. *Simulation & Gaming*, 23(2), 161-173.
- UNICEF, WHO, UNESCO, UNFPA, UNDP, UNAIDS, WFP and the World Bank. (2010). *Facts for Life.4th ed. New York: UNICEF, WHO, UNESCO, UNFPA, UNDP, UNAIDS, WFP and the World Bank.* pp. 194. [Factsforlife.org/00/text.html](https://www.factsforlife.org/00/text.html)
- Van de Hoogen, J., Lo, J. & Meijer, S. (2016). Debriefing research games: Context, substance, and method. *Simulation & Gaming*, 47(3), 368-388.
- World Health Organization. (2020). World Malaria Report 2020. World Health Organization, Geneva, pp. 18-37.
- Zhang, Z., Muktar, P., Ong, C. I. W., Lam, Y., & Fung, F. (2021). CheMakers: Playing a collaborative board game to understand organic chemistry. *Journal of Chemical Education*, 98(2), 530-534. <https://doi.org/10.1021/acs.jchemed.0c01116>

Appendix

Debriefing Questionnaire

1. As review in your own words, what was the game activity all about? (Experience Recall)
2. How did you feel after the game? (Feelings)
3. Did you like the game? Why or why not? (Enjoyment)
4. Did the game cover anything about the game's topic that is important to you? If so, please explain. (Importance)
5. Did you learn some new things about the game's topic? If so, please explain. (New Information Learned)
6. Are there some more things you would like to know about the game's topic? (New Information to Learn)
7. Is there anything you can suggest to make the game better? (Improvement Suggestions)