SANITOPIA: DEVELOPING ROLE-PLAYING GAMES TO IMPROVE HYGIENE AND SANITATION AMONG INDONESIAN MIDDLE SCHOOL STUDENTS

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ABSTRACT

Middle school students in Indonesia often lack access to adequate sanitation facilities and possess limited knowledge of basic hygiene practices, making them highly vulnerable to health risks. This study addresses the urgent need for a health education medium that effectively engages students, particularly those prone to online gaming addiction, by providing an alternative method of learning that is both captivating and educational. To meet this need, a board game named Sanitopia was developed, incorporating elements from the popular role-playing game Dungeons and Dragons (D&D) to encourage interactive learning. Sanitopia promotes hygiene and health education through storytelling and decision-making, making the content more relatable and appealing to adolescents. The game has been validated by media and material experts and middle school educators, proving its efficacy as a tool for improving hygiene awareness among students. The research utilized the Borg and Gall model of research and development to guide the design and evaluation process. Results indicate that Sanitopia is a highly effective educational tool, demonstrating its potential as a strategic intervention to enhance hygiene education for middle school students in Indonesia.

Keywords: *hygiene, health, online game, board game*

1. Introduction

Everyone should have the right access to clean water and sanitation (SDG 6), and achieve good health and well-being (SDG 3). UNICEF has supported the Indonesian government in accelerating access to clean water, sanitation, and hygiene through its WASH Acts programs. The focus is on enhancing infrastructure, addressing funding gaps, and building capacity at the local level. High-level advocacy events, such as the World Water Forum 2024, and partnerships, like the collaboration with LIXIL to improve sanitation for 12.7 million people, are part of this broader effort to meet Sustainable Development Goal 6 (SDG 6). The recent quarterly WASH Acts reports highlight these achievements and challenges, along with strategies for climate-resilient WASH systems. [1] Indonesia has made significant progress, but the challenge remains to assist 28 million Indonesians who currently lack access to a stable and safe clean water supply, and approximately 56 million Indonesians who do not have proper and sustainable sanitation facilities. Furthermore, 25 million Indonesians still do not use toilets. [2] They defecate instead in fields, bushes, forests, ditches, streets, canals, or other open spaces. Open defecation is not only an affront to dignity, but it also poses huge risks to child and community health. Open defecation and untreated wastewater contaminate the water supply and facilitate the spread of diarrhoeal diseases such as cholera. [3] Based on Basic Health Research, the top 10 risk factors for school-age children aged 10-14 years are insufficient consumption of vegetables and fruit 93.6%, not brushing their teeth after breakfast 87.5%, consumption of flavored foods 75.7%, not brushing your teeth before going to bed at night by 71.3%, lack of physical activity by 66.9%, consumption of sweet foods by 63.1%, incorrect defecation behavior by 32.8%, consumption of salty foods by 0.9% [4] For middle school students, these issues are especially critical, as they are at a developmental stage where hygiene education and menstrual health management (MHM) are essential.

UNICEF's WASH in Schools (WinS) program has been actively targeting these age groups by integrating age-appropriate health education and facilities to ensure they can practice proper hygiene. Middle school students in Indonesia face significant hygiene and sanitation challenges that directly impact their health and learning environment. A World Bank study found that three-quarters of schools do not meet WHO standards for toilets, and many

schools lack basic amenities such as soap and water for handwashing. The situation is particularly critical in rural and low-income areas, where inadequate WASH facilities contribute to poor hygiene practices and higher absenteeism rates among students.

A report sourced from the National Basic Health Research or Riset Kesehatan Dasar (Riskesda) Nasional 2013 stated that health is affected by cleanliness appreciation behavior. Based on previous research, 33.3% of students suffer from tinea cruris, a condition caused by poor personal hygiene, leading to various skin problems such as itching, prickly heat, ringworm, body odor, and other skin diseases among children aged 12 to 15 years.[5] Adding to these hygiene-related issues is the growing trend of digital addiction among middle school students. With the rise of online gaming and reduced physical activity, many adolescents are spending prolonged hours engaged in sedentary behaviors, impacting their physical health and limiting their engagement in activities that promote proper hygiene and well-being.

This context led to the creation of *Sanitopia*, an educational board game designed to merge the engaging aspects of online games with hygiene education. By integrating elements from popular role-playing games, *Sanitopia* aims to bridge the gap between students' interest in gaming and their need for health awareness, making hygiene education accessible, relatable, and impactful for this age group. The game not only addresses the critical need for improved personal hygiene but also serves as an alternative to reduce the negative effects of excessive online gaming by promoting healthier behaviors through fun, interactive learning.

Our primary objective for this research is to contribute to achieving the SDGs while addressing hygiene and sanitation issues in Indonesia. Additionally, our research aims to introduce an alternative form of entertainment to counter the rising issue of online game addiction among adolescents. Online game addiction is often linked to poor sleep patterns, lack of physical activity, and reduced attention to daily routines such as personal hygiene. Gamers who spend extended hours playing tend to experience emotional disturbances and health problems, and neglect basic needs like bathing or self-care [6]. Our survey and interviews with Labschool Cirendeu Middle School students revealed that both gamers and non-gamers exhibit similar hygiene and sanitation issues. All respondents agreed that their peer groups continue to engage in unhygienic practices: 50% forget to wash their hands before eating, 30% eat food that has fallen on the floor, 10% do not wash their hands after

using the toilet, and 10% tend to forget to wash their faces after school. Moreover, 20% reported having friends who suffer from health issues such as diabetes, which are linked to poor hygiene and dietary habits. Competencies related to personal hygiene have been taught to children from grade 1 to grade 6, covering topics such as nail and skin health, oral hygiene, hair, nose, ears, eyes, and reproductive organs. However, in reality, many school-age children are still unable to maintain their hygiene, particularly in areas such as nail cleanliness, oral hygiene, hair hygiene, and clothing cleanliness.[7] There is an urgent need for a certain media whose appeal would grasp the attention of children and would easily teach hygienic protocols and basic health education to youth without being uninteresting and monotonous. From that, we chose to invent a game that develops awareness and knowledge of children about basic health attitudes that they can implement daily, which we got inspired from the Dungeons and Dragons board game.

Dungeons & Dragons is simply interactive storytelling. Players gather together in one room to take part in an imaginary adventure that often involves exploring a castle or dungeon, defeating monsters, and discovering treasure. One player takes on the role of narrator and rulekeeper, or "Dungeon Master." He or she describes to the others what they're seeing or hearing during the game. D&D players begin a game by creating their unique characters. Players choose a "race," such as a human, elf, or dwarf, and an occupation, or "class," such as fighter or rogue. Players then roll a series of dice to determine other attributes, such as intelligence, strength, and appearance. Once a party of characters is formed, the Dungeon Master leads the group through the storyline, usually over a series of sessions. As characters journey through various lands, they search for hidden treasures while battling menacing monsters with their own brains and brawn. Players can respond to challenges individually or as a group, but most often they confront and solve problems together using strategic thinking and teamwork.

The difference between traditional Dungeons and Dragons and Sanitopia lies in the way the characters are developed and the nature of the enemies faced. While in standard Dungeons and Dragons, players use their imagination to create characters, define their strengths, and choose names, in Sanitopia, this information is already provided to the players to streamline the gameplay and enhance its efficiency. Additionally, in typical Dungeons and Dragons,

players combat fictional characters like monsters and dragons, whereas in Sanitopia, players face real-life threats such as bacteria and harmful viruses, while simultaneously learning relevant information about these pathogens. Lastly, Sanitopia includes two unique types of cards: *information cards* and *question cards*. Information cards are awarded when players successfully defeat bacteria or viruses and serve as resources for answering the final question. Question cards are placed strategically along the board's track, and players can earn points by correctly answering them. These points are then used to unlock access to dungeons, where players can continue battling more bacteria and viruses. The ultimate goal is to conquer all the dungeons, and the player who accomplishes this first is declared the winner.

2. Methods and Experimental Details

In this context, applying R&D to develop Role-Playing Games (RPGs) for promoting hygiene and sanitation among Indonesian middle school students would involve several stages. [8] The Borg & Gall R&D model consists of several stages: gathering initial research, planning the development process, creating a preliminary product prototype, conducting preliminary field testing, revising the product, conducting main field testing, refining the product further, and finally, operational field testing. After these iterations, the final product is disseminated and implemented in broader educational settings.

Specifically for the questionnaire result, we used the Likert Scale shown below.

Percentage	Interpretation
0% - 25%	Not Very Good
26% - 50%	Not Good
51% - 75%	Good
76% - 100%	Excellent

Table 1 :Likert Scale

Borg and Gall's research and development model involved 10 steps as mentioned. However, to increase it's effectiveness and efficiency we simplified it to only 8 steps.

Step 1: Research and Information Gathering

The initial stage of implementing the Borg & Gall model for developing the RPG *Sanitopia* by gathering information through surveys and interviews with students.

Step 2: Planning

Following the research, the planning phase focuses on transforming the research findings into a structured design, utilizing the engaging mechanics of *Dungeons & Dragons* while tailoring it to address hygiene and sanitation topics.

Step 3: Preliminary Product Development

In this stage, the initial version of *Sanitopia* is created. The game includes a detailed game board representing *Sanitopia*, character cards, information cards, question cards, dice, and guidebooks for both players and the Game Master.

Step 4: Preliminary Field Testing

The preliminary version of *Sanitopia* is tested with experts to evaluate its engagement and educational impact. During this phase, surveys and interviews are conducted participating

their teachers to help identify which aspects of the game were most engaging and which areas need improvement.

Step 5: Main Product Revision

Based on the feedback and data collected during preliminary testing, the game undergoes a comprehensive revision to address identified issues and enhance its educational effectiveness.

Step 6: Main Field Testing

The revised version of *Sanitopia* is then implemented in a group of middle school students.

Step 7: Final Product Revision

A final product is developed, incorporating all feedback and data from previous testing stages.

Step 8: Dissemination and Implementation
In the final stage, *Sanitopia* is disseminated to schools.

3. Results and Discussion

The development of Sanitopia began with a needs analysis, followed by brainstorming sessions to design the initial product draft, eventually leading to the creation of the preliminary version. This preliminary version differs from the final product, whose components are outlined below.



Figure 1: Sanitopia board

Shown above is our final version of the Sanitopia board, which is the result of the final product revision stage.



Figure 2: Character card

We have five character cards, this is the result of the final product revision.



Figure 3: Information card and question card

For the preliminary field testing of Sanitopia, we sought feedback from material and media experts to ensure the game effectively conveyed concepts of hygiene and sanitation. We began by explaining the gameplay procedures and presenting different components such as the board design and information cards. The material experts we consulted were individuals with in-depth knowledge of visual art and biology teachers. As part of this, we interviewed middle school teachers, to assess how well the game elements engaged students and communicated hygiene and sanitation concepts.



Figure 4 : Interview with media expert

Our questionnaire included 8 statements, and respondents were asked to rate each one by selecting a box of percentages ranging from 0% to 100% based on their level of interpretation. 0%-25% indicated not very good, 26%-50% indicated not good, 51%-75% indicated good and 76%-100% indicated very good.

Statement	Percentage	Interpretation
The graphic elements and icons are clear and contribute to gameplay understanding	85%	Very Good
Has an eye catching design accordance with the colors and fonts	90%	Very Good
Good image quality (not blurry)	95%	Very Good
The overall color palette is engaging and interesting.	87.5%	Very Good
The board's layout is simple and players can quickly understand the steps.	87.5%	Very Good
The font style and size are easy to read and match the game's theme.	90%	Very Good
The game's marketing materials, such as the box art and promotional media, accurately represent the game experience.	70%	Good
The card visuals and colors are appealing and interesting	87.5%	Very Good
Average	86.5%	Very Good

Table 2 : Media Expert Questionnaire Result

The questionnaire for the media expert resulted in a total average of 86.5% (Very Good).

Statement	Percentage	Intercepretation
The topic is relevant to basic hygiene and sanitation processes	100%	Very Good
The game is in accordance with the biology curriculum in middle school.	85%	Very Good
The information about the organs in the card is appropriate (not too much not too little)	90%	Very Good
This game is relevant for teachers as a teaching material.	80%	Very Good
There is a balance between the game components and the hygiene and sanitation information.	100%	Very Good
The language and scientific terminology used are appropriate	100%	Very Good
This is an effective and educative learning materials	95%	VeryGood
Hygiene and sanitation are important aspects that students lack and need to understand better.	100%	Very Good
Average	93.75%	Very Good

Table 3 : Material Expert Questionnaire Result

The validation rate from the material expert resulted in an overall average score of 93.75%, indicating a "Very Good" rating.

Key approvals from the media expert include: “Good image quality” which received a 95%% approval rating from the visual art teacher. Additionally, the statements “the design is eye-catching” and “the font style and size are easy to read and match the game theme” received a 90% approval rating. This indicates that the design of Sanitopia successfully meets its target audience's visual and readability expectations, making it both engaging and accessible for middle school students. The high approval ratings from educators suggest that the game’s visual elements are not only appealing but also effectively contribute to maintaining students' interest and understanding of the content.

The key points of agreement from the biology teacher as a material expert were: “The topic is relevant”, “Balance between the game component and information” and “The language and the scientific terminology used are appropriate” receiving a 100% approval rating. Additionally. “This is an effective and educative learning material” received a 95% approval rating.

These ratings reflect scores from both experts’ questionnaires. The findings indicate that despite being a board game rather than a traditional textbook, Sanitopia effectively addresses topics on hygiene and sanitation, making it suitable as a learning resource for middle school students.

We revised the main product based on the feedback provided during the questionnaire session and product presentation. The initial draft received a range of recommendations from the experts, which included adjustments to the game's marketing materials and the relevancy of teaching material. Specifically, the material experts suggested making the game is accordance with the biology curriculum in middle school and relevant for teachers as a teaching material.

After completing the main product revision, operational field testing was conducted at SMP Labschool Cirendeu, where a questionnaire was distributed to teachers during a gameplay demonstration. The revised version of Sanitopia was also tested with middle school students to assess its effectiveness. The questionnaire consisted of 8 questions tailored to evaluate the game's relevance to middle school students. The feedback from teachers yielded an average validation score of 90.62%, indicating strong approval of the game's suitability and educational value.

Statement	Percentage	Interpretation
The game effectively gives information about hygiene and health practices.	100%	Very Good
The game adopts a positive learning environment where students stay engaged.	85%	Very Good
The graphics, font, and information are suitable and relevant for middle school students.	90%	Very Good
Players have meaningful opportunities to interact and collaborate during gameplay.	85%	Very Good
Uses language that can be understood by everyone and memorable.	90%	Very Good
The game encourages students to participate actively and understand the material more.	100%	Very Good
It can be understood and played by every grade level in middle school.	90%	VeryGood
The game develops players' thinking and problem-solving skills	85%	Very Good
Average	90.62%	Very Good

Table 5 : Middle School Teacher Questionnaire Result

Based on the survey results, several key aspects of the Sanitopia game have been rated very positively. Notably, the statements "The game effectively gives information about hygiene and health practices" and "The game encourages students to participate actively and understand the material more" both received a 100% approval rating, indicating strong support for the educational value and engagement provided by the game. Meanwhile, the average approval rate across all statements stands at 90.62%, demonstrating that the game is highly effective overall in achieving its learning objectives, providing meaningful interaction opportunities, and using language that is easy to understand for middle school students.



Figure 5 : Student Playing Sanitopia

Playing the Sanitopia game with middle school students at Labschool Cirendeu was both entertaining and more engaging compared to traditional educational media used in schools, such as textbooks and worksheets. To demonstrate its effectiveness, we conducted a brief pre-test on hygiene and sanitation with all participating students before the game session. After playing Sanitopia, we administered the same questions as a post-test to assess the improvement in their understanding. The results showed an average post-test accuracy of 67.5%, reflecting a significant increase compared to the pre-test scores, as outlined in our research background. This proves that Sanitopia effectively enhances middle school student's knowledge of hygiene and sanitation through interactive and engaging gameplay.

The final product revision for Sanitopia was based on feedback from middle school teachers at Labschool Cirendeu, gathered during the operational field testing. The adjustments made by our team included revising the grammar and wording in the Sanitopia Guidebook to ensure that all instructions are clear and easy for middle school students to follow. After completing these revisions, we moved on to the dissemination and implementation phase, promoting, presenting, and playing Sanitopia with a broader group of middle school students at Labschool Cirendeu to reinforce hygiene and sanitation education.

4. Conclusion and Suggestion

After a thorough research process involving questionnaires targeting material and media experts and middle school teachers, as well as observing the results of playing Sanitopia with students at Labschool Cirendeu, it can be concluded that Sanitopia, a role-playing game-based educational tool, meets the criteria for being an effective, engaging, and visually

appealing learning media. It successfully educates middle school students on hygiene and sanitation protocols. This effectiveness is evident from the increase in students' knowledge, as demonstrated by the average post-test score improvement from 50% to 67.5%, marking a 17.5% increase after playing Sanitopia.

This result highlights the strong potential of Sanitopia, a role-playing game inspired by Dungeons & Dragons, as an effective tool for teaching middle school students proper hygiene and sanitation practices. It promotes active, hands-on participation, making learning engaging and enhancing retention, thereby helping students better understand and apply the concepts in their daily lives. Additionally, Sanitopia serves as a constructive alternative to reduce excessive online gaming by providing an educational yet entertaining experience for students.

Sanitopia has the potential to be adapted into different levels, such as Sanitopia Junior for younger students and Sanitopia Pro for senior high school. However, the initial version is versatile enough to be enjoyed by all age groups, making it a valuable tool for teaching hygiene and sanitation across various educational levels.

5. Acknowledgments

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6. References

www.unicef.org/indonesia/reports/wash-acts-2024-edition: accessed 21.51, 30 Sept 24.

www.unicef.org/indonesia/press-releases/hygiene-education-and-behaviour-change-programme-worth-idr-47-miliar-launched: accessed 21.30, 30 Sept 24.

www.unicef.org/indonesia/water-sanitation-and-hygiene: accessed 21.44, 30 Sept 24

"Faktor Risiko Kesehatan pada Anak Sekolah Dasar," BIKK, Aug 23, 2022. [Online]. https://journal.iistr.org/index.ph p/BIKK/article/view/40. Accessed 22.01, 30 Sept 24

http://altifani.org/index.php/altifani/article/view/140/23 : accessed 22.40, 30 Sept 24

https://capmh.biomedcentral.com/articles/10.1186/s13034-022-00502-w

Peran Mata Pelajaran Olahraga terhadap Pengetahuan Anak Usia Sekolah Tentang Kebersihan Diri di Desa Belo Kabupaten Bima.

A. Muhardi, et al. Learning Model Development Using Moodle E-Learning Software By Implementing Borg And Gall Method.2017.