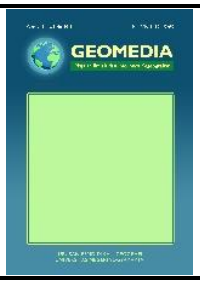

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Development and Application of Geography Board Games as Education Tools

Nurazila Atika Mohd[1], Sumayyah Aimi Mohd Najib [2*],

[a] Department of Geography and Environment, Faculty of Human Sciences, Universiti Pendidikan Sultan Idris
[1] m20221001803@siswa.upsi.edu.my, [2]sumayyah@fsk.upsi.edu.my*;

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A B S T R A K

Pendidikan geografi menjadi semakin mengkhawatirkan ketika mata pelajaran geografi menjadi mata pelajaran pilihan. Pendidikan geografi menjadi kurang diminati karena konten pembelajaran yang luas ditambah lagi, kurangnya bahan pembelajaran dan bahan yang lengkap seperti bahan ajar yang interaktif dan humanis sangat dibutuhkan agar pembelajaran lebih bermakna. Tujuan dari penelitian ini adalah untuk mengembangkan dan mengevaluasi permainan papan Geografi ("GeoBox") yang dirancang untuk meningkatkan pemahaman siswa tentang entitas geografis Malaysia dan mempromosikan keterlibatan dengan pendidikan geografi. Permainan ini secara khusus akan menargetkan siswa kelas 1-3, sesuai dengan kurikulum Geografi Malaysia (KSSM). Evaluasi akan menilai kegunaan dan kemampuan permainan. Pengembangan papan permainan ini menggunakan "Proses Pengembangan Sistem Gamifikasi". Pengembangan papan permainan ini terdiri dari dua tahap utama yaitu (1) pembuatan tujuan dan (2) desain interaktif. Oleh karena itu, pengembangan permainan papan berbasis Geografi dikembangkan sebagai alternatif untuk mengatasi masalah ini. Selain itu, hal ini bertujuan untuk memberikan edukasi terkait geografi kepada siswa, khususnya siswa kelas 1 hingga 3 SD. Metodologi yang digunakan dalam penelitian ini adalah kualitatif melalui observasi, wawancara, dan analisis data. Pengembangan dan produksi prototipe permainan papan "Geobox" yang mencakup subjek entitas Malaysia dalam buku teks Geografi kelas 1 sampai 3 yaitu topik saluran air dan badan air, bentang alam, flora dan fauna, transportasi, manusia, dan identifikasi Malaysia.

Keywords:
Development
Application
Geography education
Board games

A B S T R A C T

Geography education is becoming increasingly worrying when the subject of geography becomes an elective subject. Geography education is becoming less of interest is due to the extensive content of learning plus, the lack of learning materials and complete materials such as interactive and humanistic teaching materials are needed to make learning more meaningful. Objective of this study is to develop and evaluate a Geography board game ("GeoBox") designed to enhance students' understanding of Malaysian geographical entities and promote engagement with geography education. The game will specifically target students in grades 1-3, aligning with the Malaysian Geography curriculum (KSSM). The evaluation will assess the game's usability and playability. The development of this board game uses the "Gamified System Development Process". The development of this game board consists of

two main phases namely (1) goal building and (2) interactive design. As a result, the development of a Geography based board game was developed as an alternative to this problem. In addition, it aims to provide geography-related education to students, especially students from 1st to 3rd grades. The methodology used in this study is qualitative through observations, interviews and data analysis. Development and production of the prototype board game "Geobox" which covers the subject of Malaysian entity in the Geography textbook form1 to 3 namely the topic of drains and bodies of water, the landforms, flora and fauna, transportation, man and the identification of Malaysia.

Introduction

The Sustainable Development Goals are one of the major challenges facing all countries in the world. All parties must play a role towards human formation in ensuring a development that meets the needs of the present without compromising the capabilities of future generations. (Hauff, 1987). Education is one of the goals in the SDG's, namely goal number 4, Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Education belongs to a society that is the foundation of the people as well as human rights (Amanat Menteri Pendidikan, 2023). One of the missions of the Ministry of Education of Malaysia (locally known as KPM for Kementerian Pendidikan Malaysia) is to preserve a quality education system in order to develop the potential of individuals that meet the aspirations of the State (Doraiseriyan & Muhamad Damanhuri, 2021; KPM, 2017).

By 2010, gamification became a flexible learning medium. The element of a serious game involving two things namely games that enhance the involvement and motivation of players and behavior (Deterding *et al.*, 2011) and this gamification involves several areas including education, economics, health care and the environment (AlMarshedi et al., 2015). The main objective of the game is to give knowledge of geography to the general public, especially primary school students, high school students and Malaysians in general. Mostowfi et al. (2016) explained that the use of fun learning tools such as board games in learning activities has a significant impact on student learning outcomes. In addition, Zhi Feng and Chen (2013) showed that the majority of students accept learning methods using games. The title of this study is based on the geography subjects related to the sub-topics of water resources, transportation, demography, flora and fauna and the form of the earth in Malaysia. This choice of title is supported by Douglas and Brauer's study (2021) of the use of gamification in sustainability education such as reducing energy use, transportation, air quality, waste management and water recovery to prevent climate change. In addition, Dove (2016) explains that geography learning based on games has a big impact compared to geography textbooks. The emphasis applied in the game is the advancement of transportation enhancing adventure in cities as well as exploration of resources such as mining, factories, ancient and natural monuments.

Based on the findings of the Doraiseriyan & Muhamad Damanhuri study (2021) showed that the use of game approaches was very significantly used among students, namely 47.4% of teachers agreed rather than making exercises, experiments, projects, quizzes and discussions. This is because, game approach is one of the methods that can attract individual interest, give room for learning in groups and trigger creative thinking (Ad Norazli, 2014). In addition, the use of a game board can enhance critical and creative thinking by using elements of the game tool such as notes, rewards, quizzes, fines and so on (Wong, 2018).

In this regard, the Sustainable Gamification Impact (SGI) affects responses in gamification Nicholson (2012) stated that the context involving gamification tends to be fun and motivated. This relationship is based on three important concepts namely motivation, flow and engagement. Motivation is the main concept in gamification that relates to autonomy, pleasure, competence and mastery of something field (Deterding, 2011). Effective gamification involves

effective game flow to improve player skills and efficiency (Csikszentmihalyi, 1990). He also stated that intrinsic motivation will develop player skills through rewards.

Gamification Design

The design is a guide in building and developing the game board. The conceptual framework of this study was developed based on a board-based learning methodology, the use of the Geography board creates a learning that can enhance public understanding of the identification of Malaysian entities. The design's six main components are goal setting, research, identification of behavioral targets, determination of KPI, design cycles and analysis. Gamified System Development Process or GSDP has a spatial cycle process (Nisa et al., 2017; Gilbert, 2016). This is because the GSDP has a cycle of improvement for each circuit that is neutral (Bannan, Cook, & Pachler, 2015; Fullerton & Zimmerman, 2014; Gilbert, 2016; Kapp et al., 2014; Marczewski, 2015). Even within the GSDP there is a "define KPIs" indicator that will determine the achievement of the set objectives (Nisa et al., 2017). See Fig 1.

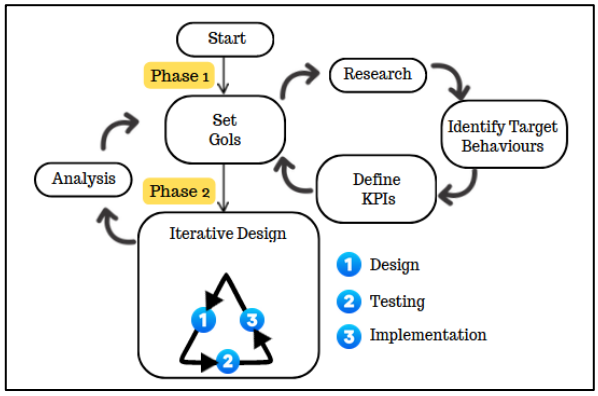

Figure 1: "Gamified System Development Process"
Source: Modified by Nisa et al. (2017); Gilbert (2016)

The diagram above shows the conceptual framework for this study process being carried out. The process consists of two main phases: (1) goal setting and (2) interactive design. At the first phase of the procedure consisted of investigation, identification of behavior and also determination (KPI) of the game board developed. The development of the Geography board will analyze the problems that exist among societies in the field of Geography. In the research section there are two sources of research: the primary source and the secondary source. (Nisa et al., 2017). Both of these resources are important to guide the development of the game board. According to Gilbert (2016) the primary source is to obtain information from an experienced party and the second source is obtaining information and information from articles, journals and data-found studies related to gamification. Results of analysis through field observations at schools have identified that most students at the lower or higher institutional levels have difficulty implying knowledge in the identification of a state or country in particular about geographical entities consisting of topics such as water resources, transportation, flora and fauna, humans and landforms.

In addition to the results of previous studies, Douglas & Brauer (2021) also found that there is much exposure to geography through games based on "sustainable development" or sustainable development abroad. This reinforces when there is a problem where the understanding of sustainability in pedagogy through ESD is simply insufficient because it needs to be implemented with involvement, experience, human skills and critical thinking among students (Ibrahim et. al., 2022). This problem forms the basis for the construction of the Geography entity's game board using the concept of sustainable development based on the game board. This is because this game-based learning stimulates the student's pleasure in studying with a group mate resulting in increased environmental awareness (Min & Mapa, 2021).

The third part of the GSDP is the "identification of behavior" that identifies a player's behavioral changes while using the Geography game board. The behavior expected when implementing the Geography board game is to be able to create a culture of cooperation and solve some problems cooperatively. The Geography board game will be played in groups in completing each mission. It is expected that the difficulty level of completing a mission (hard fun)

will encourage players to collaborate in groups in completing the mission. This action is in line with the Curriculum and Evaluation Standard Document (DSKP) of the Basic Schools Standard Curriculam (KSSR) and the Secondary Schools standard curriculum (KSSM), which is cooperative learning that promotes active and positive interaction in groups and sharing realistic insights. (Bahagian Pembangunan Kurikulum, 2018).

Next, the fourth part is to determine the KPI, which is to establish the main achievement of general knowledge of Malaysian entity identification based on the Geography game board. The KPI in the Geography game is based on Geography DSKP Form 1, 2 and 3. The themes included in the content of this board game are Form 1 geography, namely geographical skills, the landforms, outflow and population and location in Malaysia. Next Geography Form 2 is the weather and climate and transportation in Malaysia. Finally, Geography Form 3 involves the topics of natural plants, wildlife and natural resources in Malaysia.

The second phase is "Interactive Design" which consists of three elements namely design, testing and implementation. Through the inspiration of the Treasure Island and Load of the Ring games, the Geography board will use the theme of exploration and exploration in Malaysia to enhance the knowledge of Malaysian entities in human geography as well as physical geography. Game design involves elements of motivation, flow and involvement (engagement). The game component to be developed covers by three main core. The game board is designed using the "Canva" software. This Geography game board will be more interesting with the selection of colors and images. The design of this game board will be detailed in chapter 4.

Next, in the testing phase, the Geography board will be tested through validity. The board will have been tested and validated by geography educational experts and excellent geography teachers. There are three kinds of characteristics: facial characteristics, content characteristics and constructive characteristics. Through this effectiveness, improvement proposals will be made on the Geography game board.

RESULT & DISCUSSION

Geography Game Board Development

Developing a Geography board game is meeting the objective of one study. The process of developing game-based gamification is based on the Gilbert (2016) method of "gamified system development process". The design process of the Geography game board is focused on the second phase of "interative design" which consists of three elements namely design, testing and implementation. Interactive design consists of two cores: (1) input and output in gamification and (2) identifying the core of experience in Gamification (Gilbert, 2015). The development of this Geography board game covers the subject of the Malaysian entity Geography which consists of physical geography and human geography (Table1).

Table 1: Input and output of gamifase board game Geography

Input	The selected topics consist of Geography DSKP levels 1 to 3 covering Malaysian entities.
Output	Student behavior can be enhanced with encouragement and motivation.

Source: Gilbert (2015)

In addition, the second core, defining the core experience, is a process of input knowledge to the output of gamification. It gives the respondents experience and insight as the game runs and impacts on the player's behavior. Through this method he gives clearer guidance to the player (Gilbert, 2015). Students who play the board game Geography can research with existing knowledge as well as give confirmation to the knowledge acquired for each topic.

Next, Nicole Lazzaro, CEO of XEODesign, stated that there are four types of game style in gamification: (1) easy fun, (2) hard fun, (3) social fun, (4) serious fun. These four are essential elements in producing a component of Gamification (Gilbert, 2015). The gamification style of "easy fun" refers to an exciting and exploratory

game design. "Hard fun" is the realization of difficulty and confusion in order to allow players to identify actions that need to be born such as communicating. "Social fun" was the realisation of interaction between players (communication and collaboration) and finally "serious fun" was the return to the three styles, the creation of aid components to re-improve player motivation. Thus, for building the components of the Geography board game is based on the four styles of gamification above. Table 2 and Table 3 shows the core of board game and the component based on geography syllabus.

Table 2: Identify the core of the board game experience geography
Source: Gilbert (2015)

Example topic	Water bodies and drains (DSKP Geography Form 1)
Question	What is the longest river in Malaysia?
Answer	The longest river in Malaysia is Rajang River, Sarawak
Core experience	Guide card: There's a river map of all Malaysia and one of them is Rajang River. - - Then there's a clear picture of Rajang River on the map.

Table 3: The main component of the Geography board game

Component	Function
Game card	Consists of various questions that refer to the topic of Malaysian entities. It is sourced from DSKP Geography form 1 to 3. - Water and drainage bodies - Demographic - Infrastructure - Flora and fauna - Landforms - Introduction to Malaysia
	Each question on the questionnaire consists of three levels: (1) easy, (2) moderate and (3) difficult.
Token	Roleplay motivates players and increases curiosity among players.
Board Map	Gives a clear picture to the Malaysian map player. - Repeats will strengthen the player's memory.
Indicator Card	The player will face the hard fun phase will experience difficulties and confusion the next clue card will play the role of helping the player get the clue to get the answer.

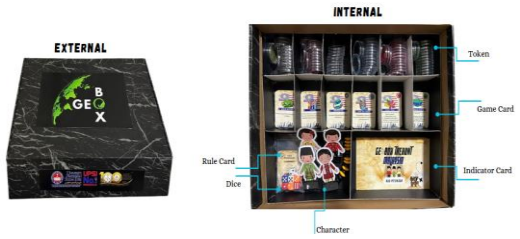

Figure 2: GeoBox board game component

Game Session

The manual has a complete guide to how to play. The game consists of two phases, the preparation phase and the game phase. Preparation phase, players are ready to make sure every component such as tokens, characters and dots is available. The next phase of the game, there are two activities that will be carried out repeatedly: (1) recognizing the map of Malaysia and (2) questioning on the exploration card. Both activities help stimulate and revitalize the learning that has been learned.

(1) **Malaysia map identification** can help players identify and recognize the location of states and capitals on the map of Malaysia.
(2) **Question card questions** can help players improve their knowledge of geographical entities in Malaysia. The six main topics focused were Malaysia's identification, demography, infrastructure,

water bodies and drains, flora and fauna and the landforms.

(3) Analysis

Once the GeoBox game board runs the implementation in the test stage, the findings obtained from the test will allow the game based on this game board through the design cycle process of testing and implementation at the pre and post test levels.

The importance of gamification for lifelong education

Gamification consists of the use of game design principles that consist of education and not education (Nisa et al., 2017). The principle of gamification helps develop clear goals to be achieved, levels and rewards as well as giving room to individuals using strategies and engaging directly or indirectly in social activities and creating competition and cooperation between games (Ellaway, 2016). Additional gamification helps create an environment capable of increasing the intrinsic (internal) motivation to engage with the game (Fithriyah et al, 2019).

Several studies have been carried out on gamification and applications aimed at massaging and tracing data for methods of reducing vehicle carbon emissions as well as promoting the use of alternative transportation, for example the game "Mordor Sharper" which simulates the use "carpooling" to promote the method of train sharing in Warsaw, Poland. (Olszewski, 2018). As a result of the game, the app can reduce the number of vehicles on the highway by 20,000 trains a day with reduced carbon emissions of more than 30,000 metric tons a year. Likewise, the "Kid-Go-Green" app encourages students to learn about sustainable methods (Marconi et al., 2018).

In addition, there are several studies involving drainage systems and the importance of good water management. According to Koroleva (2020) every researcher will study the need main of every gamification built. For example, methods to increase community involvement with the government in dealing with water issues; the Ning Plan for water conservation during the drought. Participants will be interested in helping and supporting the community to prepare for the water problem. The resulting reaction to the use of gamification will push them towards intrinsic motivation (Novak et al., 2018). Board games like the "Water Ark" can enhance the player's knowledge of perceptions and responsibilities to water sources (Cheng et al., 2019). The board game "Ocean Limited" also demonstrates increased cooperation in solving marine sustainability issues, for example, detecting oil spill response to marine life and preventive methods (Koenigstein et al., 2020).

The revenue of application in this board-based game-gamification, greatly helped the country in realizing a sustainable country in environmental sustainability. It gives an advantage to the board-shaped gamification of geography entities in Malaysia highlighted with relevant topics such as the surface of the earth, drainage, transportation and rocks in order to produce societies that are knowledgeable in environmental sustainability. Next, society will learn about statehood, environmental sustainability, and so on (Schualtz, 2022).

The need for educational elements for sustainable development

According to Douglas and Brauer (2021), board-based gaming is an effective way to educate people about sustainability in general. Example board games "Oil Springs" and "Settlers of Catan" led to increased pro-resilience attitudes and self-sustainable behavior (Chappin et al., 2017). Games like "Factory Heroes" are designed to enhance sustainability leadership in the context of increased knowledge and action in ensuring environmental sustainability (Despeisse, 2018). Thus, it can be classified as an effective game board to describe the impact that an individual has on other players and the subsequent environment.

Furthermore, according to Siwar et al. (2011) the education system consists of several elements of sustainable development that refer to continuity and advancement in the goals of economic, social and environmental sustainability.

These three components support each other in sustainable growth. Sustainable education aims to produce individuals of quality, able to adapt to change, and to have an awareness of environmental and social issues (Yusof et al., 2016). The field of education plays an important role in fostering sustainability (UNESCO, 2006) and enabling the implementation of other goals in the SDGs (UNESCO, 2017). Therefore, education is a very important medium in developing human perspectives in the preservation of nature (Said & Ahmad Shaari, 2021).

Referring to the Development Section of the Curriculum (2015), the curriculum used in the application of sustainability elements is the subject of Geography. The application of global sustainability and global citizenship elements is applied in the lower and upper secondary levels of education to produce students who are positive towards a sustainable environment while the lower education and preschool levels practice environmental sustainability through practices of reduction "Reduce", "Reuse" and "Recycle" (Hanifah Mahat et al., 2015). In this regard, Zain and Aiyub (2021) affirm that geography education in Malaysia is based on ideas and concepts involving education and a global dimension that encompasses sustainable development (SD) and education for sustained development (ESD).

Conclusion

The GSDP gamification design will run the main framework in the design of the game board, the GeoBox. This GSDP design has a partnership as well as consistency in improving the product. Even within the GSDP there are KPIs in determining the achievement of the set objectives. This KPI is also used in the Geography High School Standard Curriculum (KSSM). The five steps of the gamification process, the design of the game board will be simulated as a whole in the development of the GeoBox game board. The development of the GeoBox game board has been prototyped based on the gamification design used. The game may be closely aligned with the Malaysian geography curriculum, which could limit its applicability in other educational contexts or regions. Based on the results of the research carried out, the objective of the first study, namely the development of a Geography game board based on geographical entities in Malaysia, has been achieved. The next step is to do an experimental study to obtain empirical data on its impact on the usability and playability of this board game. The result is a measure of the usability and playability of the board game to the community.

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