

Research Article

Development of i-Know Board Games

Muhammad Afiq Zahran Rizalsham¹, Muhammad Farhan Rosman¹, Ahmad Waiz Ahmad Sabri¹, Muhammad Shakirin Muhamad Shukri¹, Muhammad Riyadh Luthfil Shahrial¹, Hazriel Faizal Pahraraji^{2*}

¹ College of Engineering (Mechanical), UiTM Johor Branch, Pasir Gudang Campus; 2022834302@student.uitm.edu.my;

² College of Engineering (Mechanical), UiTM Johor Branch, Pasir Gudang Campus; hazriel@uitm.edu.my;

 0000-0002-5291-0482

* Correspondence: hazriel@uitm.edu.my; +60196767580.

Abstract: I-KNOW" board games are an innovation that has been introduced which consists of mechanical movement and involves electrical component. These board games have a lot of advantages to the users in terms of helping students with theoretical subjects and creating alternative ways of teaching. This product is designed to fulfil the needs and requirements of the user based on the survey that has been carried out before. Many students agreed they have problems and difficulties in learning theoretical subjects. This one will be a strong point for I-KNOW board games to be introduced to the community. In addition, the statistic also shows students will be attracted to applying games in a classroom. By applying board games in the classroom will advance education in teaching and learning strategies, especially for the theoretical subject.

Keywords: Board Game; Teaching; Material



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1. INTRODUCTION

To create a product, the first step needs to do is to design. Design is to formulate a plan to satisfy a particular need and to create something with a physical reality (G.E Dieter & Linda C. Schmidt, 2021). In terms of Mechanical engineering design, it used the knowledge of statics, dynamics, thermodynamics, and strength when the design process is happening. This concept of design is the crucial part of the beginning to create a product (D.G. Ullman, 2003).

Teaching aids are materials the classroom teacher uses to help students understand the concepts she introduces during lessons. These teaching aids can take many forms, from beans students count and sort while learning simple kindergarten math to photos of famous people and places introduced during a middle school history lesson. Choosing aids that match student grade levels and corresponding interests and abilities helps to engage students beyond a simple lecture format. From manipulative to media, these teaching aids used in context can complement classroom instruction (Susan Ruckey, 2018). The objective is to create or invent a prototype that utilizes new methods in its mechanism or system to help in improving the teaching and learning process in the university. The scope of this objective is specifically for the university.

Since it used to be, the way of teaching is the same and more traditional. Students were facing the problem to learn especially in the theoretical subjects. Yes indeed, some more websites or

applications add another way of teaching method, but it yet it has many weaknesses such as the students must have the internet to log in and sometimes the systems are broken down. To solve the problem, educational board games known as “i-KNOW” are created so that the problem that is faced by the students can be solved. The name itself has its meaning. This product stands for students and KNOW stands for knowledge. i-KNOW board games have their objectives which are to help the students to score in theoretical subjects and to add another method of teaching.

For this product to be created, the problem statement needs to be clear, and the design of this product must achieve the objectives. The first step to designing this board game is to discuss a problem about difficulties in learning theoretical subjects. Second, to analyze the best question to be included in a survey. Then survey a proper or specific target response. After that, interpret the result of the survey. Next, select a suitable benchmark for the product. When selecting a suitable benchmark, list the advantages and disadvantages of the benchmark. The next step will be establishing the relative importance of needs based on the survey also benchmark. The following step is to design 5 sketches of the product. Finally, choose the best design for the product.

In a nutshell, the design process is an important part of the product's success. The i-KNOW educational board games successfully meet the objectives and have mechanical and electrical components to meet the requirements. The students and lecturers can use these board games to learn and teach theoretical subjects.

2. METHOD & MATERIAL

A brief study of the market analysis was conducted to find out the problems they must develop this product. There are five phases involved, namely information and idea gathering, literature review analysis, design, development, and testing. There is no task overlap between the phases, and each step must be completed before moving on to the next.

- a) Phase 1 (Information and Idea Gathering) – This phase is focused on the application's requirements. Detail of the problem statements and survey analysis was gathered.

Table 1. Analysis Survey

Question	Data	Description
Do you agree that board games become a medium of learning theoretical subjects?	A pie chart with a legend. The legend shows a blue circle for 'Yes' and a red circle for 'No'. The pie chart is divided into two segments: a large blue segment labeled '92.6%' and a small red segment labeled '7.4%'.	92.6% agree with the statement. 7.4% disagree with the statement.

In learning theoretical subjects, what are the best methods to learn?	● E-Learning ● Board games ● Lab/Workshop ● Video	About 59.3% suggest that board games can be the best method to learn theoretical subjects.																		
Do you think theoretical subjects are only suitable for lectures?	<table border="1"> <thead> <tr> <th>Level of Agreement</th> <th>Number of Students</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>3</td> <td>11.1%</td> </tr> <tr> <td>2</td> <td>7</td> <td>25.9%</td> </tr> <tr> <td>3</td> <td>12</td> <td>44.4%</td> </tr> <tr> <td>4</td> <td>4</td> <td>14.8%</td> </tr> <tr> <td>5</td> <td>1</td> <td>3.7%</td> </tr> </tbody> </table>	Level of Agreement	Number of Students	Percentage	1	3	11.1%	2	7	25.9%	3	12	44.4%	4	4	14.8%	5	1	3.7%	Most of the students said agreed that theoretical subjects are suitable for lectures.
Level of Agreement	Number of Students	Percentage																		
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4	4	14.8%																		
5	1	3.7%																		
Do you agree that most students lack focus in learning theoretical subjects in class?	● Yes ● No	88.9% agree with this statement.																		
Do you agree that our board game can improve in learning this subject? If not, give your opinion.	Answer: The board game will cost too much Answer: The board games are not user friendly	Some feedback against this new method to apply in the classroom due to high cost, and no interaction with others																		
Do you think that games can attract students in learning theory subjects?	● Yes ● No	Students agree the games can attract their attention in learning theory subjects.																		

This survey was conducted in UiTM Pasir Gudang among the students. Based on the survey, many respondents agree they have difficulties in learning theoretical subjects. This

one will be a strong point for i-Know board games to be introduced to the community. In addition, the statistic also shows students will be attracted to applying games in a classroom.

- b) Phase 2 (Benchmarking Analysis) – Benchmarking is a way of discovering what is the best performance being achieved. While competitive products are referring to competitors that we measure by their performance. Both are important to help the organizations know their product at what kind of level/standard. As the table below shows, a few benchmarks for i-KNOW board games to meet customer needs and be in sync with the market.
- c) Phase 3 (Design) – Design is one of the critical phases. The developer used SolidWorks software to design the prototype based on five concepts.
- d) Phase 4 (Development) – There are several steps in the fabrication process namely, material selection, measuring, cutting wood according to their respective dimensions, drilling, and cutting.
- e) Phase 5 (Testing) – Testing is critical to ensure the prototype will function as intended to the requirements. Testing was carried out by providing test inputs, simulation testing, and confirming that the result fulfilled all the objectives.

3. FINDINGS

There are several findings from this prototype.

1) Engineering analysis

Von Mises Stress state that the design is safe only if the value of Von Mises Stress induced in a material is less than the strength of the material. If not, it will be failed. Based on the simulation result above, the max amount of Von Mises Stress happened at the upper end of the shaft where it is carrying the cover's load. The amount is about 9.181×10^7 Pa and it is less than the value of yield strength. Therefore, the design is safe.

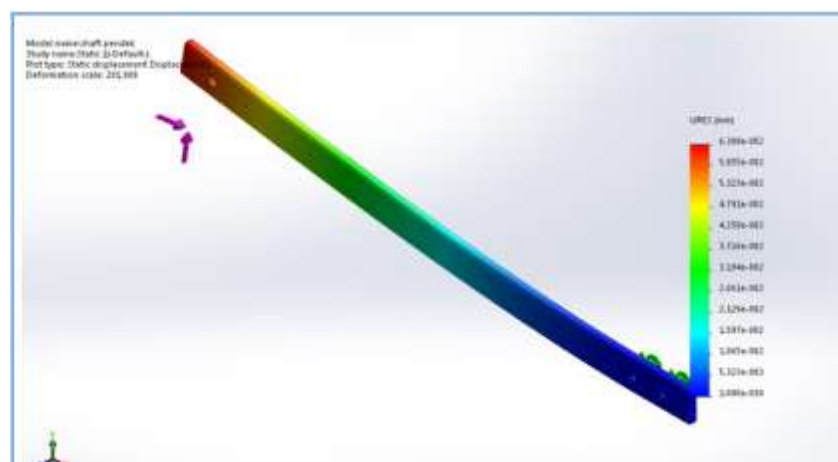


Figure 1. Shaft analysis

2) Complete Prototype

Figure 2 shows the complete design for this prototype. There is the usefulness of this product:

a) *The function of the board games*

This type of design consists of a switch power window to open the cover of the board games automatically and can be closed automatically.

b) *The size and the portability of the board games*

The size and portability are very easy to carry. The prototype is built in moderate size which is A3 size so that the player will be comfortable to use it.

c) *Aesthetic value for the board games*

I-KNOW board games used LED dice as dice to decide the turn for the player and how many squares should the player land whether he will end up in jail, question, or chance. These LED dice make the board games look more interesting despite their function. Thus, it will attract the students to play.



Figure 2. Complete Prototype

4. DISCUSSION

The design process happened at many kinds of stages. From the beginning which is the idea of the product until the fabrication process happened, there were a lot of disagreements and arguments between the developer. A lot of experiences also can be gained throughout the process of designing this prototype. During the fabrication of the product, plenty of errors and malfunction occurs. To create and produce this type of prototype, everything must plan accordingly so that the flow of the process is going smoothly and not making any mistakes.

The project design process must be followed regularly like example, the problem statement must be in the first stage followed by the generation of the idea, embodiment design, processing of the data, production of detail drawing, evaluation of designed product, and finally presentation of the product. If this process does not follow in order, the product will not come out with high quality and the worst part is the outcome not function very well.

Overall, the reflection of the design process as in the dictionary definition is the consideration of some subject matter, idea, or purpose towards the things that have been discussed. There are a few things that need to be considered during the design process such as aesthetics, ergonomics, manufacture, and materials. These are the important aspect during the process of making the prototype.

5. CONCLUSION

The team has introduced the innovation of "i-KNOW" board games, which consist of mechanical movement and electrical components. These board games offer several benefits to users in terms of assisting students with theoretical subjects and developing alternative teaching methods; hence, the aims of this product have indeed been achieved. Based on the results of a previous survey, this product has been developed to meet the user's wants and requirements. Many students concur that mastering theoretical courses is tough and fraught with challenges. This will be a launching point for the introduction of i-KNOW board games to the community. In addition, the data reveals that learners will be drawn to classrooms that incorporate games. Therefore, using board games in the classroom will increase teaching and learning methodologies, particularly for theoretical subjects.

Incorporating board games into teaching and learning practices could have significant benefits for students, as board games promote brain development and provide a variety of chances to expand the mind. In addition, there are no board games that replace ordinary dice with LED dice. Only this board game, i-KNOW, uses led dice to engage children and make it easier for the player to determine his or her turn and the number of squares that will be landed.

Safety is also an important criterion. The corner of the gaming board is not in a sharp condition and poses no risk to nearby individuals. In addition, the product must be user-friendly by including labels and instructions on how to operate the gaming board. The instructions are straightforward and appropriate for all ages. This instruction will assist reduce the rate of product damage, hence increasing its durability.

Numerous characteristics of this board game, i-KNOW, can compete with other board games on the market in this country. This board game is intended specifically for education (learning and teaching in the classroom) to attract students, lecturers, universities, and other institutions of higher education. In general, these board games have superior benefits over competing products and high commercial success potential.

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