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# A Need Analysis for the Development of Physics Game-based Interactive Module in Matriculation College

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## Abstract

Online interactive modules encourage active student involvement in the classroom and fulfil student needs of various levels of mastery during learning, because the modules can be accessed anywhere and anytime. The aim of this study was to conduct a need analysis to obtain the information from matriculation college lecturers for the purpose of developing game-based interactive modules among Matriculation Programme students. A survey was carried out to gain relevant information from 25 lecturers who teach Physics DP014 course at seven matriculation colleges. The questionnaire comprised primary constructs related to demographics, eliciting topics with the most difficulties, the need to develop a game-based interactive module, the use of the internet and electronic devices and the factors that make game-based interactive modules suitable for matriculation colleges. The data were analysed descriptively to obtain the percentage and mean values for all the constructs. The results showed that there is a need to develop game-based interactive modules among Matriculation Programme students, especially for critical topics which are difficult for students to master. This need analysis study can provide preliminary information related to the development of game-based interactive modules to help in improving the achievement of Matriculation Programme students in Physics subject.

**Keywords** Need Analysis, Interactive Module, Game-Based Interactive Module, Physics, Matriculation Programme

## INTRODUCTION

In recent years, it has been proven that online learning environment provides the opportunity for self-learning and collaborative learning in borderless world. Online learning is the platform where teaching and learning (T&L) session is facilitated by the use of technology and internet facilities[2] . There are four categories of online learning which are the interaction between teachers and students, students and students, teachers and topic, and students and topic. The interaction between students and teachers keeps on changing and improved with the progressive development of the internet and information technology in the recent years [1].

There are several key factors that influence the effectiveness and quality of teaching and learning (T&L) practices in the classroom. Among them are the implemented T&L practices, the selection of strategies and teacher factors, as well as the level of readiness of the students themselves. The 21st century learning practices is one of the recommendations from the Ministry of Education Malaysia in diversifying T&L activities in classroom as well as preparing students in facing the Industrial Revolution 4.0 [3]. The

components of learning in the 21st century framework include: (i) communication, (ii) collaborative learning, (iii) critical thinking and (iv) creative thinking, and these can be exposed through activities conducted in the classroom. Various types of activities and appropriate materials can be provided by teachers in the application of 21st century learning practices. Among them are flipped classroom, blended learning, gamification, and interactive modules as the primary reference for the students [4]. In this study, the researcher discussed about the need analysis for the development of interactive module that will be used to identify whether the element of gamification can create a fun and fruitful learning environment. This game-based interactive module will be developed using a free web tool called Genially. This platform provides the tools and templates for various types of interactive presentation especially in gamification.

There are several teaching approaches that have been implemented especially in Physics to aid student's understanding in subject learning. Flipped classroom, problem-based learning, project-based learning and gamification are among the learning approaches that have been used in teaching Physics and other science subjects [5],[6],[7]. Physics is one of the compulsory subjects for science students. Effective Physics teaching practices should go beyond memorisation and the use of formulas. The active involvement of students should be enhanced in ensuring that they master the Physics concepts [8]. The use of interactive modules aligned to T&L content has been proven to be effective in assisting students' understanding of Physics concepts[9],[10]. Short videos, interactive simulations, text and images as well as multiple-choice questions that provide immediate feedback are practical features of interactive modules. Gamification elements applied while developing the teaching aids will also provide additional value to students who use them [11].

The 21st century learners seek for several important skills rather than the knowledge itself. Problem -solving, collaboration, communication, critical reasoning, and the ability to use and manage digital tools and devices are the skills that need to be developed among learners [12][13]. Thus, this kind of learners requires a suitable learning style that could help them to achieve the learning objectives. Students manage to improve their knowledge, skills and attitudes through games. This can be achieved when their interest in the learning activities and the subjects increase as they experience an enjoyable and meaningful learning process. The interest in learning will contribute as the internal factor that motivates them to achieve the learning outcomes [14].

According to [15], extrinsic motivation of the student can be developed by applying gamification in the classroom since it can encourage the player to win and defeat his classmates. [13] also agreed that gamification is able to enhance the motivation and engagement as well as knowledge acquisition along the process. In developing gamification in the classroom, the activities provided must balance between the element of fun and knowledge acquisition among the students. Gamification will help to create an enjoyable and positive environment in the classroom. Besides that, it can enhance the focus of the students and promote healthy competition among the students [12]. Students can also gain knowledge and strengthen their 21st century skills which include problem-solving, communication and collaborative skills through the gamification applied in their learning process.

Renz and Ge (2015) explained that puzzle and simulation games are among the games related to physics that had been developed recently. Puzzle games on mobile device seem to be the most popular game which require the skill of the player to solve a physical puzzle using various laws of physics. The Super Stacker is one of the puzzle games which requires the player to build a stable structure. Besides that, Angry Bird is one of the kinds that requires the player to dismantle a stable structure. Meanwhile, the extensive physics concepts are needed in such simulation games to create a more realistic real-world task in a simulated environment. The Microsoft's Flight Simulator for example, has an extremely realistic and complicated physical system to be controlled by the player. The computer vision and the augmented reality elements are combined to produce real and visual objects in the game's interface.

Gamification is one of the alternative methods that can be applied in T&L for a critical topic. The element of gamification will create an enjoyable presentation of the content. Moreover, a flexible and active T&L activity can be achieved through the use of gamification[16]. The word gamification, which means applying game elements in an activity that is not initially a game, was introduced by Nick Peiling in 2002 [17]. Applying gamification elements such as badges, scoreboards, challenges, levels, rewards, progress bars, and appropriate characters into interactive modules can create a much more fun atmosphere and attract students' attention. This, in turn, helps motivate the students and encourages them to participate actively in the learning process [18]. In previous study, fun learning in gamification seemed to motivate the students and changed them to become actively engaged in the learning process. Students became more attentive and

more focused. Besides that, gamification can also trigger a healthy competition among students in the process of knowledge acquisition[12],[13].

## PROBLEM STATEMENT

Physics is a subject that students often found difficult to master due to several factors. Lack of exposure to apply the concepts learned in real-world problems and students' problems in mastering related mathematical operations are among the contributing factors to these issues [19]. For example, in the research of [20], the concept of energy is an abstract concept in which the students found difficult to comprehend. However, students' understanding can be boosted with the aid of simulation and videos that show the concept application in daily life. Besides that, the experiments in lab and field trips to expose them with real-world application can help to enhance their understanding of the concept.

In addition, Physics is the basis of most science subjects, but previous researchers found that students' interest in Physics is low compared to other science subjects [8]. Memorising, drilling and focused examinations are traditional methods that are used in learning physics. By undergoing this kind of method, students often find that physics is a challenging subject to master. The steps in solving the problems as well as the mathematical calculation and a lot of concepts in the syllabus also contribute to the difficulties in mastering Physics among students[21].

Conventional teaching approaches which evolve around static and non-interactive media such as textbooks, analogies and chalkboards in problem-solving related to Physics concepts are no longer relevant in achieving the classroom learning objectives [12] ,[22]. These kinds of teaching methods emphasise lecturing to the students rather than exploring the knowledge with them. The teacher-centred T&L practices in matriculation colleges, which usually involve the use of whiteboards, and the preparation of lecture notes slides as the source of student's reference were found to contribute to the difficulty among the students in understanding the Physics concept [23],[24].

Apart from that, for educators; there are other challenges that they need to deal with in teaching Physics. Limited sources, time and technological expertise are the common problems in developing more efficient and interesting learning materials[21]. The ability of the teacher in choosing and implementing the suitable teaching strategies to meet students' expectation during the learning process is crucial. A good teaching practice will be able to capture students' interest, motivates them to explore the knowledge and sparks student's engagement along the process[14],[15]. The development of technology which increases rapidly nowadays could be one of the challenges that need to be considered in preparing the suitable strategies in T&L. There is an urgency to ensure that the pedagogical tools and learning approaches are aligned with the rapid development of technology [6].

The 21$^{st}$ century learners always demand for more engaging learning strategies. They prefer to participate in a precise teaching and learning process which can motivate them and encourage their engagement [12]. The ongoing digitalisation in education and the changes occur in current educational environment need to be considered in selecting the strategies to implement in the classroom. Gamification and flipped classroom are among the recommended strategies as the response to the current changes in educational environment nowadays [12],[13]. Students' failure to master Physics is often associated with their ability to master the basic concepts of the subject. For example, the concept of "Force and Motion" is the root for nearly half of the 1$^{st}$ semester's Physics syllabus in Matriculation College. Thus, students must have deep understanding and are able to master the concepts in order to excel in their 1$^{st}$ semester evaluation [24]. The T&L practice of Physics which focuses on problem-solving solely through equations and algorithms cause students' conceptual mastery to be marginalised [25]. As a result, students' achievement in Matriculation Program Examination for Physics course is unsatisfactory for some matriculation colleges. In most matriculation colleges, the achievement is below the mean score set by Matriculation Division. Among the factors contributing to these problems is due to the conventional teaching aids used in teaching and learning Physics [23]. Previous studies have shown the need to develop an alternative approach to replace the conventional teaching and learning methods in matriculation colleges [4], [21], [23].

## RESEARCH METHODOLOGY

The researcher used a survey method to collect the required data that are relevant to the need analysis in developing a physics game-based interactive module for matriculation college. A need analysis study is a vital process in obtaining the information from the target group on the needs of a product to be designed and developed [26]. The needs analysis conducted in this study focused on the discrepancy model that was introduced by [27]. This model is typically used in education where it emphasises normative expectations and involves three phases:

i. Goal setting; identify what should be.
ii. Performance measurement; determine what is happening.
iii. Difference identification lists the differences between what should be and what happened.

In this study, the questionnaire was distributed through Google Form platform to the lecturers from different matriculation colleges. The instrument was adapted from the need analysis questionnaire of the m-Learning Arabic module design study in the Institute of Teacher Education (ITE), developed by [28] and the m-Learning study in ITE [29]The instrument consisted of five primary constructs, as the following:

i. Respondent's demographic information.
ii. Eliciting topics with the most difficulties
iii. Frequency in using electronic devices and internet access facility
iv. Game-based interactive module development requirements
v. The factors that make game-based interactive modules suitable for matriculation colleges

A well-handled needs analysis can provide sufficient and meaningful information in providing the necessary solutions to address problems or issues that arise [26]. The validity of the needs analysis instrument was conducted by four experts including two senior lecturers from a public university, a senior lecturer of a teaching institute and a senior lecturer of a matriculation college. Content validity and face validity analyses were carried out for the questionnaire instrument. The Item Content Validity Index (I-CVI) value obtained was 0.94, indicating a high score. According to[30], items with an I-CVI of .78 and above is considered as good for content validity measurements.

This study used purposive sampling method. The respondents were among the lecturers who teach Physics course DP014. It is a compulsory course for all students from Module 1 and Module 2 of the Four Semesters System Matriculation Program. A number of 25 lecturers from seven (7) matriculation colleges were involved in this study.

A 5-point Likert Scale was used to obtain the feedback for all items in this instrument. The detail for each scale is shown in Table 1:

**Table 1:** Likert scale

| Likert Scale | Indicator |
|---|---|
| 1 | Strongly disagree / Very not often |
| 2 | Disagree / Not Often |
| 3 | Moderate |
| 4 | Agree / Often |
| 5 | Strongly Agree / Very Often |

The data obtained from this need analysis were analysed to obtain the mean, frequency and percentage values for each item. The findings are important in determining the need to develop game-based Physics interactive modules from the perspective of lecturers.

## RESULTS AND DISCUSSION

### Demographics

The respondents in this study were five male lecturers and twenty female lecturers. This study focused on the development of Physics game-based interactive module for the Two-Year Programme in Matriculation College. Thus, the number of male and female lecturers who taught Physics DP014 course and responded to the questionnaire varied for each matriculation college. From the total of 25 respondents, 82% of the respondents have served more than ten years as lecturers in matriculation colleges, while 28% have served in less than ten years.

**Table 2:** Demographics

| Item | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 5 | 20 |
| | Female | 20 | 80 |
| Working experience | 0 - 5 Years | 1 | 4 |
| | 6-10 Years | 6 | 24 |
| | 11-15 Years | 14 | 56 |
| | 16-20 Years | 3 | 12 |
| | More than 20 Years | 1 | 4 |
| Matriculation College | Malacca Matriculation College | 6 | 24 |
| | Negeri Sembilan Matriculation College | 1 | 4 |
| | Selangor Matriculation College | 8 | 32 |
| | Johor Matriculation College | 3 | 12 |
| | Perak Matriculation College | 3 | 12 |
| | Kedah Matriculation College | 3 | 12 |
| | Kelantan Matriculation College | 1 | 4 |

### Eliciting the most difficult topics

Table 4 provides the information of a total of six topics which were identified as the most difficult topics as perceived by the respondents. The level of interpretation in the table is based on the mean score of the items [31]. The Rotational Motion of a Rigid Body and Heat, Gas Law and Thermodynamics were recorded as the topics with the highest mean values of 3.84 and 3.80 respectively as depicted in Table 3.

**Table 3:** Topics that are difficult for students to master in Physics DP014 course

| Topic | Percentage (%) | Mean Score | Level of Interpretation |
|---|---|---|---|
| Heat, Gas Law and Thermodynamics | 72 | 3.80 | High |
| Rotational of Rigid Body | 60 | 3.84 | High |
| Forces | 60 | 3.64 | High |
| Circular Motion | 40 | 3.44 | High |
| Introduction to Physics | 52 | 2.48 | Low |
| Linear Kinematics | 40 | 3.36 | High |
| Work, Energy and Power | 32 | 3.4 | High |
| Momentum and Impulse | 16 | 2.96 | Low |

The values of the percentage refer to the number of respondents who agreed that the topic is difficult to master by their students. By referring to the percentage value, the topic of Heat, Gas Law and Thermodynamics scored 72%. Meanwhile, the topic of Rotational Motion of a Rigid Body scored the same percentage value with the topic of Forces which was 60%. Therefore, based on the percentage value, it indicates that the topic of Heat, Gas Law and Thermodynamics is the most challenging topic to be mastered by students for Physics DP014.

As shown in Table 4, there are various factors which contribute to difficulties in understanding the subject matter; Physics DP014. 92% of the respondents agreed that there are many physics concepts which must be acquired by the students in this subject. According to [23], the variety of Physics concepts that need to be acquired by students at the matriculation college contributes to their difficulty in developing the understanding hence affecting their achievement. Based on the Physics syllabus in semester one, there are eight (8) topics that have to be mastered by the students. Each topic consists of the combination of more than two basic concepts of physics. Besides that, the inability of the students to visualise the concepts also leads to the difficulties in understanding this subject. The difficulty in visualising the concept taught leads to unclear picture of the idea learned. Therefore, lecturers should provide a solution to help students by preparing a suitable content of a teaching aid to apply in their classroom [21].

Apart from that, the issues raised related to student's mathematical skills which are negligence in algebraic manipulation and incompetence in using the appropriate formula in problem-solving also contribute to the difficulties of students in mastering the topics. This finding is in line with a study conducted by [32] which found students' difficulties in mastering Physics as they are not proficient in using the appropriate formulas negligence in algebraic manipulation while solving the questions. The memorisation of formulae without having a strong concept mastery will lead to the difficulty of students in problem-solving skill for physics subject. This is due to their failure to construct meanings of the problem statement and their inability to relate to the meaning of the statement in the problem given [32].

**Table 4:** Factors contributing to the difficulty of students in mastering the topics of Physics DP014

| Theme | Item | Percentage (%) | Mean Score | Level of Interpretation |
|---|---|---|---|---|
| Physics Concept | Many concepts need to be mastered. | 92 | 4.28 | Very High |
| | Unable to visualise a concept. | 88 | 4.24 | Very High |
| | There is a misinterpreted concept. | 76 | 3.92 | High |
| Everyday Life Application | Conceptual correlations in everyday life applications are limited. | 80 | 4.04 | Very High |
| Students' mathematical skills | Negligence in algebraic manipulation while solving questions. | 88 | 4.24 | Very High |
| | Not proficient in using appropriate formulas. | 84 | 4.08 | Very High |
| | The students do not master the concept of vectors taking into account positive and negative signs in problem-solving. | 76 | 4.12 | Very High |
| Problem - Solving | Many problem-solving steps need to be done to get the correct answer. | 76 | 3.92 | High |
| | Basic negligence of mathematical computation in problem-solving. | 72 | 4.08 | Very High |
| Students' Involvement | Minimal student involvement and interaction between students are at a low level. | 76 | 3.96 | High |
| Time | Limited duration of teaching and learning (T&L) sessions. | 76 | 3.8 | High |
| | There are misinterpreted definitions. | 48 | 3.4 | High |

| | | | | |
|---|---|---|---|---|
| Definition of Physics terms | Many definitions need to be mastered. | 44 | 3.36 | High |
| Teaching aids | The teaching aids used by the lecturers are less attractive. | 44 | 3.28 | High |
| | Lack of use of the interactive medium in the T&L sessions. | 36 | 3.2 | High |
| Teaching methods | The teaching methods are less attractive. | 36 | 3.2 | High |
| | Lecturers used less attractive digital platforms during T&L sessions. | 32 | 2.88 | Low |

## Frequency of electronic device usage among lecturers and internet access facilities

The frequency of using electronic devices and internet among the respondents for the purpose of teaching and learning practices also showed a high score value. Referring to Table 5, all respondents use smartphone and 88% of them agreed that they use internet to search for lessons and implement lessons using their own electronic devices. At the same time, 84% of the respondents agreed that they share teaching materials with students using internet.

The changes in learning environment from traditional approach to online learning approach have been proven to be more effective and enjoyable. However, there are a few factors that need to be put into consideration and the most crucial is the internet access facilities. Most of online learning platforms require a high speed and reliable internet connection in ensuring that the T&L process can be conducted efficiently and effectively [33], [34]. Thus, in this study, we also wanted to have the information about the types of internet access facilities that are available for the lecturers in conducting the online teaching. As in Table 5, 88% of the respondents agreed that they use their own mobile data connection to access the internet.

**Table 5:** Frequency of electronic device usage among lecturers and internet access facilities

| Construct | Item | Percentage of agreement (%) | Mean Score | Level of Interpretation |
|---|---|---|---|---|
| Frequency of use of electronic devices among lecturers | I use a smartphone. | 100 | 4.8 | Very High |
| | I perform teaching using my own electronic devices. | 88 | 4.48 | Very High |
| | I searched for teaching materials through the internet. | 88 | 4.40 | Very High |
| | I share learning materials with my students using the internet. | 84 | 4.32 | Very High |
| | I use a laptop. | 76 | 4.12 | Very High |
| | I use a tablet computer. | 72 | 4.00 | Very High |
| | I interact with my students for teaching and learning using the non-face to face method. | 64 | 3.72 | High |
| | I use a computer. | 52 | 3.44 | High |
| Internet Access Facilities | Personal mobile data. | 88 | 4.48 | Very High |
| | LAN network. | 52 | 3.40 | High |
| | College wireless network (WIFI) | 44 | 3.08 | High |
| | Computer centre's internet access. | 20 | 2.20 | Low |

## Interactive Module Development Requirements

Gamification is one of the approaches in teaching and learning practices that integrate the 21st century learning skills among the students [35]. Thus, the development of a game-based interactive module is one of the applications of gamification in classroom activities. Based on Table 6, 88% of the respondents with the mean score of 4.2 agreed that game-based interactive modules should be developed for challenging topics for students to master. While 84% with the mean score of 4.04 agreed that a module should be developed for Physics DP014.

**Table 6:** Game-based interactive module development requirements

| Item | Percentage (%) | Mean score | Level of Interpretation |
|---|---|---|---|
| Game-based interactive modules should be developed for topics that students find challenging to master. | 88 | 4.2 | Very High |
| Game-based interactive modules need to be developed for Physics DP014 course. | 84 | 4.04 | Very High |
| The interactive module is suitable to be used in teaching and learning sessions at the matriculation colleges. | 76 | 3.92 | High |
| Interactive module is one of the alternative approaches that can be applied to replace the traditional learning approach. | 68 | 3.76 | High |

There are several criteria that can be considered in developing a game-based interactive module based on the situation and the current needs of the matriculation college students. Based on Table 7, there are fifteen criteria with high score values of percentage and the mean score. Most of the respondents agreed that tips and guidelines to solve the given questions should be embedded in the interactive module that will be developed with the highest mean score and the percentage of 4.36 and 96%. Apart from this, motivational words to encourage students to learn the Physics subject showed a mean score of 4.4, with 92% of respondents who agreed on this. At the same time, the application of interactive simulations, drilled questions and the display of a checklist of learning outcomes for each subtopic are among the criteria that received a high percentage of agreement of 88%. Thus, these are among the criteria that will be applied in developing the game-based interactive module among the matriculation students.

**Table 7:** Criteria for appropriate interactive modules developed in matriculation colleges

| Item | Percentage (%) | Mean score | Level of Interpretation |
|---|---|---|---|
| Tips and guidelines. | 96 | 4.36 | Very High |
| Motivational quotes. | 92 | 4.4 | Very High |
| Drills and exam clone questions. | 88 | 4.28 | Very High |
| Interactive simulations related to the concepts taught. | 88 | 4.28 | Very High |
| Checklist for each subtopic. | 88 | 4.24 | Very High |
| Self-learning activities. | 84 | 4.28 | Very High |
| Online quiz with instant feedback. | 84 | 4.24 | Very High |

| | | | |
|---|---|---|---|
| Use of platforms that are easily accessible to students and lecturers. | 84 | 4.2 | Very High |
| Mobile applications related to the topic. | 84 | 4.2 | Very High |
| Group discussion activities. | 84 | 4.16 | Very High |
| Website links that contain additional reference sources. | 84 | 4.2 | Very High |
| Video application of concepts learned in everyday life. | 80 | 4.24 | Very High |
| Text that is clear and easy to understand. | 76 | 4.16 | Very High |
| The brief notes are interactive and come with suggested answers. | 76 | 4.08 | Very High |
| Lecture notes in the form of PowerPoint presentations. | 76 | 3.96 | High |
| Lecture notes in the form of video. | 76 | 3.96 | High |

Tips and guidelines are beneficial to the students especially to those who have the difficulties in memorising the formula and algebraic manipulation in solving the questions given. While, motivational quotes will help the students to maintain their enthusiasm along the learning process. The criteria that will be embedded in this game-based interactive module are according to the findings in this study so that this module suits the need of the students in matriculation college based on their lecturer's perspectives. Lecturers were selected as the respondents who answered this questionnaire based on their experience in teaching the same topic to different batches of students throughout the years of their services. As such, lecturers are more aware of the difficulties faced by students in mastering a subject or topic based on their experiences and level of knowledge [36].

The elements of gamification that are suitable to apply in an interactive module depend on the learning objectives and the needs of the students. Table 8 shows that all the items for appropriate game elements in the interactive module to be developed showed high mean scores. About 92% of the respondents with the mean score value of 4.4 agreed that the module should consist of questions with different levels of difficulties. In this study, the questions will be developed based on Bloom Taxonomy and also by referring to the learning outcomes set by the Matriculation Division. In addition, 88% of respondents also agreed with the integration of mobile game applications that are related to the topic into the modules that will be developed.

**Table 8:** Appropriate game elements included in the developed interactive modules

| Item | Percentage (%) | Mean score | Level of Interpretation |
|---|---|---|---|
| Questions of varying difficulty level. | 92 | 4.4 | Very High |
| Mobile game applications related to the topic. | 88 | 4.24 | Very High |
| Characters and situations appropriate to the subtopics discussed. | 80 | 4.2 | Very High |
| Rewarded point for each task. | 80 | 4.16 | Very High |
| Rewarded virtual badge to individuals who complete each task or each level. | 76 | 4.16 | Very High |
| Scoreboard display for accumulated points. | 76 | 4.12 | Very High |

Game elements such as badges, points, and scoreboards which show students' progress positively impact students' motivation to be actively involved in the activities [37]. Through the application of game

elements in the developed modules, students will be more motivated to complete the assignments given and make the best use of the materials provided by the lecturer to achieve the objectives set in the activities provided in the module. Therefore, there is a balance in the classroom and a more comfortable learning environment can be created [38].

### Factors that make game-based interactive modules suitable for matriculation colleges.

Previous studies have shown that game-based interactive module gives a good impact for the students to enhance their self-learning skills. In this study, a preliminary perception of lecturers on how the game-based interactive module will affect the T&L practices had been discussed. Based on Table 9, most of the respondents agreed that the game-based interactive module is suitable to be developed in matriculation colleges. About 92% of the respondents agreed that game-based interactive modules could help in strengthening students' collaborative practices, encourage learning at anywhere and anytime, and students will be able to practise self-directed learning. According to [15], self-learning skills among the learners can be developed through gamification as they can access the learning material according to their learning pace, learning problems and ample time. Thus, gamification provides an opportunity for weak students to compete with excellent students as they manage to overcome their weaknesses.

**Table 9:** Factors that make game-based interactive modules suitable for matriculation colleges.

| Item | Percentage (%) | Mean score | Level of Interpretation |
|---|---|---|---|
| Encourage self-learning among the students. | 92 | 4.4 | Very High |
| Strengthen the collaborative practices of the students. | 92 | 4.2 | Very High |
| Encourage learning anywhere and anytime. | 92 | 4.36 | Very High |
| Exploring learning through innovative approaches with the use of interactive modules. | 88 | 4.16 | Very High |
| Save time, energy and cost. | 84 | 4.24 | Very High |
| Able to make dynamic assessments. | 84 | 4.2 | Very High |
| Solve the problem of lack of reference sources. | 84 | 4.08 | Very High |

Most of the respondents agreed that the game-based interactive module will have a good impact on students' learning skills. The use of game-based interactive module seems to be a good strategy to promote the knowledge and understanding of the students. It provides an alternative reference source and allows students to explore the content according to their own pace of learning. According to [9], students will be able to follow the learning process anytime and anywhere and the interactive modules allow the lecturers to constantly update the module content according to the needs of students. Thus, this will develop a dynamic assessment based on the situation and ability of the students besides preparing a platform to expose students to the 21$^{st}$ century learning environment.

## CONCLUSION

In conclusion, the need for developing a game-based interactive module for Physics DP014 is justified based on the results of the need analysis conducted from the lecturers' point of view. The topics that are difficult for students to master are Heat, Gas Law and Thermodynamics and these topics will be piloted to develop a game-based interactive module to determine the effect on their level of mastery and achievement. The

module's design and development will emphasise the criteria such as tips and guidelines for students along with other suitable criteria found in this study. The question's level of difficulties will vary according to the learning outcomes covered in this topic and to cater the various needs of students. The integration of game-based interactive module into teaching and learning practices in matriculation college is expected to enhance self-learning skills and collaborative learning among the students. Hence, the gamification approach that will be inserted into the development of physics interactive module should be designed in such a way to ensure the balance between fun learning environment and effective teaching approach. It is hoped that the students can improve their knowledge, skills, and attitudes by playing games. This might be obtained when their interest in the learning activities and the subjects increase as they get to experience an enjoyable and meaningful learning process. The interest in learning will contribute as the internal factor that motivates them to achieve the learning outcomes [14].

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