

## Enhancing Student's Motivation Level Using Gamification Methods in Fluid Mechanics Subjects

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**Abstract:** In the 21st century, learning is now a technology that enhances students' understanding and contributes to teaching and learning. In helping the government build 21st Century Education (PAK 21), this study was aimed to identify the level of motivation by using gamification methods in fluid mechanics subjects. From OBE Achievement Report of the Bachelor of Vocational Education Program (Refrigeration and Air Conditioning) semester 1 and semester 2 on 2018/2019 session, the fluid mechanics course did not achieve the prescribed PLO KPI which is at least 60% of students achieved a score above 65% marks. This indicates that the students' level of understanding on the above subject was still low. One of the factors was due to their low level of motivation in this subject. This study used a quantitative research method through a survey using questionnaires as the instrument to get the data and information for answering the research questions. A total of 113 students, including students from three (3) Vocational Education Bachelor Degree courses, were selected based on a purposive sampling method to complete the questionnaire survey given. The data were analysed using the Statistical Package for Social Science (SPSS) version 26.0. During data analysis, the descriptive measurement was conducted, and one-way ANOVA was used to analyse the level of intrinsic & extrinsic motivation among students and the differences in motivation level across the field of study. Content validity, face validity, and construct validity were used in this study to make sure the instrument's validity. Moreover, the pilot study was carried out to obtain the reliability of the questionnaire. Based on the analysis that has been made, Alpha Cronbach's value was 0.84 categorized as a high level. The results showed that the mean scores were high in terms of intrinsic motivation ( $M = 4.24$ ,  $SD = 0.487$ ) and extrinsic motivation level ( $M = 4.43$ ,  $SD = 0.416$ ) after using the gamification method. The results of the one-way ANOVA test inference analysis were not significant, with  $F(2,110) = 3.048$ ,  $p = 0.051 > 0.05$  for intrinsic motivation level across the study area. For extrinsic motivation across the study, one-way ANOVA

test results were not significant, with  $F(2,110) = 0.414$ ,  $p = 0.662 > 0.05$ . Therefore, this study has a positive impact and demonstrates that gamification methods can improve students' motivation level.

**Keywords:** Gamification, Intrinsic Motivation, Extrinsic Motivation

## 1. Introduction

In the context of this post-modern era, the world is being imbued with the use of technology. The increasing use of technology has revolutionized the lifestyle and changed the tastes of consumers. Now almost every movement is at your fingertips based on this technology. This is because information technology is created to facilitate everyday work. The quality of national education in information and communication technology (ICT) will improve as it is used to enhance students' motivation and interest in learning, as well as accelerate the learning process. According to Yusof & Tahir (2017), he noted in his study that the learning process was more enjoyable due to the use of Information and Communication Technology (ICT) as it increased the students' interest in engaging in teaching and learning.

According to Laurillard, (1992), technology-based learning will enhance students' understanding of theoretical concepts. The Ministry of Education Malaysia (KPM) has adapted to this revolution by expanding the use of ICT in schools and institutions of higher learning (Robiah & Nor Sakinah, 2007). This is supported in the daily newsletter, Noh (2019) stating that the government will consider using Augmented Reality or Virtual Reality (AR / VR) technology especially in the areas of technical and vocational education and training (TVET) as it is a right technology and can reduce costs as well as preparations for the Industrial Revolution 4.0

This shows that teachers need to be prepared for all the challenges as teaching and learning are now technology-based. ICT skills are a must for teachers today (Heinich et al., 2002). According to Tamuri et al., (2010) in making the technology system sound, effective and enjoyable, depending on teaching and learning, should be wise and productive in using it as it can improve the delivery performance in the classroom. Video clips, YouTube, and animated powerpoints are examples of modern multimedia that can enhance learning performance and increase student motivation (Dahalan & Singh, 2013).

Gamification in learning is an educational approach to motivate students in learning by using video game design and game elements in the learning environment. The goal is to maximize student interest and to inspire them to continue learning (Deterding et al., 2011). Therefore, this gamification can be used in weak subjects such as fluid mechanics subjects to increase students' motivation level. Fluid mechanics courses include topics such as introduction to Fluid Dynamics, basic equations, dimensional analysis, simulations of flow conditions, and so on. It turns out that engineering and technical students need this course and that it is a compulsory course for them. It also causes students to lose interest and motivation because students consider this subject difficult.

Therefore, effective learning can occur when using a motivation to overcome motivation problems in learning. One of the most effective ways to do this is to use the rewards of teaching and learning. Therefore, gamification is the best way to have a reward concept. The use of gamification is a very effective and powerful way to influence students' level of motivation during teaching and learning.

### 1.1 Research Background

The subject of Fluid Mechanics is one of the courses that must be taken in the field of mechanical engineering either in IPTA or IPTS. Based on the OBE Achievement Report of the Bachelor of

Vocational Education Program (Refrigeration and Air Conditioning) semester 1 and semester 2 on 2018/2019 session, the fluid mechanics course did not achieve the prescribed PLO KPI which is at least 60% of students achieved a score above 65% marks. This indicates that the students' level of understanding on the above subject was still low. One of the factors was due to their low level of motivation during learning of this subject. According to Pintrich & Groot (1990), the values of self-efficacy and motivation are closely related to cognitive involvement and student performance. Motivation can motivate people to take action to achieve a goal. In the process of teaching, teachers are required to understand the purpose of learning that students have. This concept of intrinsic motivation is related to one's energy being directed toward the achievement of certain goals. Intrinsic motivation is a limited motivation and is the catalyst for doing things for their own benefit or rewards for themselves (Harter, 1981). Harter (1981) has identified five dimensions of intrinsic motivation tendency in the field of learning. Intrinsic motivation can be described as a psychological condition that results when an individual considers himself capable and determines something of his own (Deci, 1975).

The concept of extrinsic motivation is closely related to the notion of reinforcement. Reinforcement is the process by which external events are triggered by a response, causing the reaction to be escalating. For example, the praise given by a teacher to a student for his or her good work or assignments will result in the student's efforts to increase. The study reinforced the initial response to the work or task. Therefore, teachers should design teaching methods so that students can maintain their interest and motivation for learning. In addition, students can encourage them to work on their own initiative in learning.

Gamification is about building and motivating students (Kiili et al., 2014). This is to build a fun experience for the student player (Schell, 2014). In turn, it motivates students to learn and solve problems (McGrath & Bayerlein, 2013) and to develop skills through each level of play (Pappas, 2013). Through this method of gamification, students are indirectly exposed to learning and not only focus on teacher presentations but also teach themselves in a more fun and rewarding way. The use of gamification is said to have great potential in education as it has an impact on the formation of more creative and flexible learning (Huang & Soman, 2013). Whereas according to Muhammad & Bashir (2014) that the use of gamification combined with the application of this element of the game can not only stimulate thinking but also stimulate and motivate students.

## 1.2 Research objective

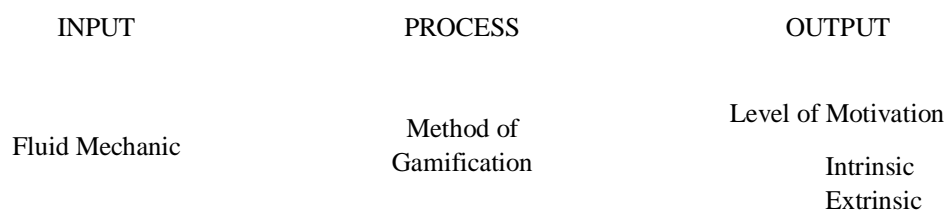
The objectives of this study are to:

- Identify the intrinsic motivation level of the student after using the gamification method.
- Identify the extrinsic motivation level of the student after using the gamification method.
- Know the difference in the level of intrinsic motivation of students across the field of study.
- Know the difference in the level of extrinsic motivation of students across the field of study.

## 1.3 Purpose of the Study

The aim of this study was to study the influence of gamification methods in raising students' motivation levels for Fluid Mechanics subjects in the Faculty of Technical and Vocational Education (FPTV) at Tun Hussein Onn Malaysia University, Batu Pahat, Johor.

### 1.4 Conceptual Framework



**Figure 1: Conceptual Framework**

## 2. Methodology

The study is a descriptive study, and it is used in the quantitative research method. In this method, a survey-based survey approach was used to collect data from the respondents on the motivation level after using the gamification method. During the survey, respondents' background was also used to test the motivation level of the respondents. In this study, the researcher determined that the independent variable was a method of gamification and that the student's motivation level was the dependent variable.

In this study, the study population refers to students who have taken up the subject of Fluid Mechanics on FPTV, which is a student in the Bachelor of Education and Vocational Machining (BBA) program, Bachelor of Education and Vocational Welding & Fabrication (BBD) and Bachelor of Education and Vocational Freeze Cooling & Air Conditioning (BBG). Based on the factors of a shortage of time and constraints, the study population was limited to three semesters, namely semester 2 year 2016/2017, semester 1 year 2017/2018 and semester 2 year 2017/2018. A total of 157 students from all three programs were the population of this study and the distribution of students by program and admission.

In this study, the research instrument used was the questionnaire form. This questionnaire was distributed to a sample of students who took Fluid subjects at the Faculty of Education and vocational education. They were given questionnaires after using the gamification method in the teaching and learning process. The questionnaire was divided into two sections; part A, demographics were placed to determine the respondents' background. Part B is to study the motivation level of the respondents. Subsequently, this study used Cronbach Alpha of 0.50 to measure reliability.

The pilot study will be conducted on 30 students from the Bachelor of Vocational Education (Electrical and Electronic) programs of Year 3 and 4 who were not selected as the study sample. Subsequent analysis was performed to obtain Alpha Cronbach's alpha. Table 2 shows that a pilot study was conducted and obtained an alpha Cronbach's alpha value ( $\alpha = 0.837$ ) and a good level of reliability. The study has two sub-scales of construction, namely intrinsic motivation level, and extrinsic motivation level. In this subscale, the reliability level for the intrinsic motivation level with eight items was moderate ( $\alpha = 0.774$ ). In contrast, the reliability level for the subscale extrinsic motivation level with nine items was close to good ( $\alpha = 0.793$ ). The overall reliability of these items is from moderate to good. This data analysis method was performed using Statistical Packages for Social Sciences Series (SPSS) version 26.0 software. The mean values obtained will be performed based on table 1 to give the results of the mean scores obtained as low, medium, and high. Then, using ANOVA to obtain the third and fourth research questions. The results will be presented in a table format for easy reading.

**Table 1: Min. Range Level Interpretation**

Mean score	Mean interpretation
3.68-5.00	High
2.34-3.67	Moderate
1.00-2.33	Low

**Table 2: Respondents' Reliability Values**

Dimensions	Respondents' Reliability Values	Total Item
Intrinsic Motivation	0.774	8
Extrinsic Motivation	0.793	9
Total	0.837	17

### 3. Results and Discussion

#### 3.1 Results

Descriptive statistics analysis was performed using SPSS to answer this research question. Based on the analysis conducted in Table 3, the students' level of Intrinsic motivation after using the gamification method was found to be high ( $M = 4.24, SD = 0.487$ ). This is because the mean score for each item is within the range of 3.94 to 4.54. The highest mean score value in this Intrinsic Motivation is item (i7) "*I feel the urge to answer the next question in this Quizizz app.*" This shows students are interested and excited about answering the next question in the Quizizz app.

**Table 3: Descriptive Power Distribution of Intrinsic Motivation Level Buildings**

No Item	Survey Item	Mean	Standard Deviation	Mean interpretation
i1	I love learning the subject of Fluid Mechanics through the Quizizz app because it is challenging.	4.19	0.730	High
i2	I easily understand the language used in this Quizizz app.	4.31	0.682	High
i3	I want a task that allows me master learning through this Quizizz app.	4.31	0.669	High
i4	I love getting learning information from the Quizizz app.	4.18	0.697	High
i5	I am excited to use Quizizz because of its creative learning content.	4.39	0.674	High
i6	I spend more time doing exercises in the Quizizz app than training in the form of paper sheets.	3.94	0.938	High
i7	I feel the urge to answer the next question in this Quizizz app.	4.54	0.641	High
i8	I love it when this Quizizz app is used in technical courses.	4.08	0.867	High
TOTAL		4.24	0.487	High

Based on the descriptive statistics analysis in Table 4, it is shown that the extrinsic motivation level of students after using the gamification method is high ( $M = 4.43, SD = 0.416$ ). On closer examination, as a result of the analysis performed found that the mean score for each item is in the range of 4.3 to 4.58. There were two questionnaire items that scored the most in the mean score were item e1, "*I feel happy to be able to compete with friends while using Quizizz.*", And item e8, "*I answered Quizizz's question because of the lecturer's encouragement.*"

**Table 4: Descriptive Power Distribution of Extrinsic Motivation Level Buildings**

No Item	Survey Item	Mean	Standard Deviation	Mean interpretation
e1	I feel happy to be able to compete with friends while using Quizizz.	4.58	0.564	High
e2	I feel appreciated by the score display provided by Quizizz.	4.40	0.774	High
e3	The atmosphere and environment while implementing Quizizz help in learning.	4.30	0.778	High
e4	I often discuss in groups to answer fluid subject exercises using the Quizizz app.	4.30	0.789	High
e5	Collaboration among classmates made it easy for me to implement this Quizizz question.	4.39	0.749	High
e6	Discussions with friends in Quizizz activities can increase my motivation to answer questions.	4.45	0.707	High
e7	I find that joining the Quizizz community can help each other in learning.	4.47	0.584	High
e8	I answered Quizizz's question because of the lecturer's encouragement.	4.58	0.678	High
e9	New technology encourages me to use Quizizz in learning.	4.32	0.837	High
TOTAL		4.43	0.416	High

Based on Table 5, the resulting output table, shows  $F = 3.048$  and  $Sig = 0.051$  values. Given the value of  $Sig > 0.05$ , we can conclude that there is no significant difference in the level of intrinsic motivation of students across the field of study.

**Table 5: Anova Intrinsic Motivation Level Test Schedule**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.397	2	0.698	3.048	0.051
Within Groups	25.206	110	0.229		
Total	26.603	112			

Based on Table 6, the resulting output table, showing  $F = 0.414$  and the value of  $Sig = 0.662$ . Given the value of  $Sig > 0.05$ , the researchers concluded that there was no significant difference in the level of extrinsic motivation of students across the field of study.

**Table 6: Anova Extrinsic Motivation Level Test Schedule**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.145	2	0.073	0.414	0.662
Within Groups	19.271	110	0.175		
Total	19.416	112			

### 3.2 Discussions

In this study, the mean score was high in intrinsic and extrinsic motivation. This proves that motivation is a very important part of the process of teaching and learning because it can make a person feel motivated. This is also supported by Sang, (2011), who states that intrinsic motivation is built when there is an internal motivation for students to participate in learning. Remember, the level of extrinsic motivation depends on the ability of the gamification system as a whole to relate to the use of the element it wants to achieve (Ryan & Deci, 2000). ANOVA tests showed no differences in intrinsic and extrinsic motivation levels in the study. Researchers argue that students' levels of intrinsic motivation and extrinsic motivation across the field of study are high. All three areas of study are of high quality.

Highly motivated learners often have a strong and persistent impulse to remain interested in what is being conveyed as a result of internal and external motivation.

#### 4. Conclusion

This method of gamification is able to motivate students to improve and assist achievement in the subject of Fluid Mechanics. According to Azizi Yahaya & Jaafar Sidek Latif (2005), it is stated that motivation is considered to be the element that enables students to engage actively in the teaching and learning process. In addition, Jia et al., (2016) suggest that people who are more motivated are more likely to choose gameplay elements of points, levels, and leaderboards. This shows that gamification is the best way to have a reward concept. The use of gamification is a very effective and powerful way to influence students' intrinsic and extrinsic motivation during teaching and learning.

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