



## Flipped classroom with a gamification case method approach for learning statistics

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### ABSTRACT

Integrating flipped classrooms and gamification in educational statistics aims to enhance student motivation and understanding. This approach actively involves students in case-based learning, immersing them in real or hypothetical problems relevant to the course. This development aims to create an engaging and effective learning model applicable to statistics education. The model development follows five stages: analysis, design, development, implementation, and evaluation. During the flipped class, students review learning materials before the session, allowing in-class time to focus on case-solving discussions and gamification activities. The experiment involved sixth-semester educational technology students taking a statistics education course. Learning design experts validated the model, receiving a positive response (96%), indicating its suitability for implementation. The model's effectiveness was evident in the experiment, with a high success rate of 99%. The design's attractiveness, mainly due to engaging gamification elements, contributed to positive student responses. Research results highlight the success of integrating flipped classrooms with case-based gamification methods, providing an attractive and effective approach to statistics education.

### ARTICLE INFO

#### Article History:

Received: 14 Nov 2023

Revised: 20 Feb 2024

Accepted: 22 Feb 2024

Available online: 2 Mar 2024

Publish: 22 May 2024

#### Keyword:

Case-based learning; flipped classroom; gamification; learner involvement; Statistics

#### Open access

Inovasi Kurikulum is a peer-reviewed open-access journal.

### ABSTRAK

*Integrasi kelas terbalik dan gamifikasi dalam statistika pendidikan bertujuan meningkatkan motivasi dan pemahaman mahasiswa. Pendekatan ini melibatkan mahasiswa secara aktif dalam pembelajaran berbasis kasus, membenamkan mereka dalam masalah nyata atau hipotesis yang relevan dengan mata kuliah tersebut. Tujuan dari pengembangan ini untuk menciptakan model pembelajaran yang menarik dan efektif untuk diterapkan pada pembelajaran statistik. Pengembangan model melalui lima tahap: analisis, desain, pengembangan, implementasi, dan evaluasi. Selama kelas terbalik, mahasiswa meninjau materi pembelajaran sebelum kelas dimulai, memungkinkan waktu di dalam kelas untuk fokus pada diskusi penyelesaian kasus dan aktivitas gamifikasi. Percobaan melibatkan mahasiswa teknologi pendidikan semester keenam yang mengambil mata kuliah statistik pendidikan. Ahli desain pembelajaran memvalidasi model tersebut, mendapatkan tanggapan positif (96%), menunjukkan kesesuaian untuk diimplementasikan. Efektivitas model terbukti dalam percobaan, dengan tingkat kelulusan tinggi sebesar 99%. Daya tarik desain tersebut dicatat karena elemen gamifikasi yang menarik, berkontribusi pada respon positif dari mahasiswa. Hasil penelitian menyoroti keberhasilan integrasi kelas terbalik dengan metode kasus gamifikasi, memberikan pendekatan yang menarik dan efektif dalam statistika pendidikan.*

**Kata Kunci:** *Flipped classroom; gamifikasi; keterlibatan pemelajar; pembelajaran berbasis kasus; Statistika*

### How to cite (APA 7)

Kuswidayani, N., Soepriyanto, Y., & Praherdhiono, H. (2024). Flipped classroom with a gamification case method approach for learning statistics. *Inovasi Kurikulum*, 21(2), 571-582.

### Peer review

This article has been peer-reviewed through the journal's standard double-blind peer review, where both the reviewers and authors are anonymised during review.



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## INTRODUCTION

Statistics is knowledge about collecting, processing, or analyzing data and drawing conclusions based on the data collection and analysis performed (Janna, 2020). Statistics learning in the higher education curriculum in Indonesia aims to provide a foundation for understanding quantitative methods and their applications for every graduate of the study program. Statistics learning is a form of education that requires basic mathematical skills, and one of these skills is statistical reasoning. Statistical reasoning is essential for students to master concepts in statistics that can be applied in research and real-life situations (Rohana & Ningsih, 2020). Teaching statistics encourages students to understand concepts, connect them, and make interpretations to draw accurate conclusions from the generated outputs (Kusumarasdyati, 2019).

Based on observations from the previous semester's educational statistics course, information was obtained that educational statistics material was difficult for students to understand, especially when interpreting the results of data analysis. Apart from that, many students have low data processing skills. Learning activities are also carried out practically and theoretically through discussions. This underlines the tendency that not all students are active in class, and active students are dominated by those who understand the material better. On the other hand, students who do not understand usually remain silent or have a negative attitude and do not dare to argue or reveal ways to solve problems related to learning activities. This also has an impact on poor student learning outcomes.

Based on the information above, this research aims to maximize the process and results of statistics learning. Supportive learning methods are needed to maximize the learning process and outcomes. The case method is a constructivist learning approach that presents case-based learning problems. The situations presented in case method learning should directly relate to students' daily experiences to make the connection between learning and its application in students' lives visible. Cases are definitions of realistic problem scenarios and refer to the material studied. The benefits of using cases in learning are that students know how to apply theory in real-world situations, think critically about complex situations, make decisions, develop self-awareness, and develop their perspective. Through this learning, students are also trained to thoroughly investigate topics/problems and questions that are weighty, realistic, and important. This improves students' critical thinking skills. The case method emphasizes participation and discussion skills and developing critical thinking, communication, and group management skills (Fatimah & Taufiq, 2022).

However, the case method often has weaknesses, resulting in uncontrolled and inefficient recording of classroom learning time. Therefore, the flipped classroom model is employed to address this issue. The flipped classroom is a model that supports the curriculum with activities centered on the learners building their knowledge through active involvement (Anggoro et al., 2023). The flipped classroom is a teaching method consisting of two parts: interactive group learning within the classroom and direct one-on-one instruction with computer support outside the classroom (Diningrat et al., 2020). Students are expected to acquire subject content outside the classroom with the help of instructional videos and apply the knowledge they have acquired in class. The goal is for students to know in advance what material they will study in class so that they can understand the problems they face in class by identifying the problems presented. The most significant opportunity for using a flipped classroom is to develop a deeper understanding of the material by giving students more control over what and how they learn (Dirgantoro, 2022). The findings of Ramadhani (2021) indicate that the flipped classroom model is effective and significant in improving students' statistical reasoning abilities. Furthermore, the findings show that students' mathematical abilities also improve indirectly, including critical thinking, analytical, and problem-solving abilities. These results are consistent with Fedistia and Musdi's (2020) and Bego et al. (2020) research. The flipped classroom has also been proven to help students transfer knowledge, strengthening their conceptual understanding. This aligns with the findings of Agung (2021), stating that the flipped classroom learning strategy impacts students' critical thinking skills. The benefit is that learning time

becomes more efficient as instructors no longer spend time explaining basic learning concepts in the first few minutes.

From a learning design perspective, flipped classrooms must be designed to have more excellent value. Innovation and the right support system are needed to increase the positive impact of implementing the Flipped Classroom. One innovation that can be done is to add the concept of gamification to flipped classroom learning, namely the application of game principles and mechanisms to non-game activities, especially in education. The gamification method is used to increase student motivation and overcome barriers to understanding statistics courses by enthusiastically increasing user participation in implementing challenges. Providing gamification design elements into learning can increase the quality of statistics learning. Gamification refers to using game elements, game mechanisms, and game thinking in a non-game context to enhance the appeal of everyday activities, such as the learning process (Ariffin, 2022). The gamification elements used in this research include points, avatars, rankings, levels, rewards, challenges, and leaderboards. Gamification in education does not only take aspects of games but also game mechanics related to learning material. Implement gamification in learning, educators and researchers can use online quizzes as digital games. The results of this process can be in the form of user experience and the results of user involvement in the form of values or achievements during the process. The application of play in the learning process can increase understanding and motivation to learn. We demonstrate the effectiveness of using a gamification approach compared to traditional approaches. Based on the above explanation, this study aims to determine the learning design results of the flipped classroom gamification case method in statistics education (Syajili, 2021).

## LITERATURE REVIEW

### Flipped Classroom

The Flipped Classroom is an active and student-centered approach designed to enhance the quality of the in-class period. This approach provides opportunities for active and structured learning (Strelan et al., 2020) and encourages students to ask questions and interact with teachers, peers, employers, and learning materials. The strategy involves using materials the teacher provides, allowing students to study at home before attending class for the next topic. The Flipped Classroom requires students' commitment and active participation in learning activities both before and during class, all supported by the contributions of information technology (Aprianto et al., 2020). The Flipped Classroom can be expanded and customized to meet the learning needs of students, including flipping specific units of learning, partially, or the entire course.

In its implementation, the Flipped Classroom involves a more in-depth examination of materials not yet understood during class. It entails greater student involvement than teacher-centered instruction, where the results of students' work are discussed and presented in the context of class dialogue. Thus, it can be concluded that the Flipped Classroom represents a transformation of learning previously conducted in the classroom into a home-based learning experience. Students are provided with learning materials to study at home before class, and in-class activities focus on a deeper understanding of the materials.

### Gamification

Gamification is using game elements, game mechanics, and game thinking in non-game contexts to make everyday activities, such as learning, more engaging. Gamification does not mean creating a game and then developing a particular application to implement the gamification concept; instead, it involves using simple tools to incorporate gamification elements into the classroom, integrating them into the learning process. Gamification is a learning approach that utilizes game elements to enhance students' motivation

during the learning process and provide a sense of security and connection (Ariffin, 2022). As gamification involves game elements, its application naturally includes concepts related to games, such as points, badges, levels, leaderboards, and rewards. Gamification provides a positive, game-like experience, influencing user behavior and cognitive processes. In the context of self-directed learning, gamification is considered one of the approaches or methods that can boost students' learning motivation. It can create positive impacts, including increased motivation, perseverance, activity, and student engagement in the learning process (Aini et al., 2021; Groening & Binnewies, 2019). Gamification has been applied in education and utilized as a learning tool to solve problems by implementing game mechanisms (Aguilar-Castillo et al., 2020).

## **Case Based Learning**

Case-based learning is a constructivist approach that presents learning challenges through case-based scenarios. Often defined as a teaching method that requires active student participation in real or hypothetical problem situations, case-based learning reflects the expertise of professionals in the field of study. The situations presented in case-based learning should directly relate to students' everyday experiences, establishing a clear connection between case-based learning and its application in students' lives. Case-based learning involves a case-based approach where students discuss and analyze real-life examples. It focuses on developing knowledge and teamwork to examine cases. Teachers act as mediators while students engage in incidents and analyze them from their perspectives. Case-based learning provides an opportunity for content analysis by introducing core knowledge areas first and encouraging students to explore other knowledge areas that may be related to the presented case. This approach encourages students to learn through realistic stories, allowing them to integrate various sources of information into an authentic context. Case-based learning exposes students to real-life problems and allows them to explore solutions afterward (Cahyawati, 2020).

Baheti et al. (2020) state that the Case-Based Learning Model is an innovative learning approach to understand the material better and train students to be more active in learning. Case-based learning helps students transfer knowledge from learning materials and bridges the gap between theory and practice. Therefore, students have theoretical knowledge and can apply it to specific situations. Dharmayanthi (2022) emphasizes the advantages of the Case-Based Learning Model, including (1) the ability to develop analysis skills, (2) the ability to apply context (theory) and field reality, (3) independence in seeking and solving tasks through problem-solving training, and (4) the improvement of confidence, motivation, cooperation in groups, and oral communication skills (presentation).

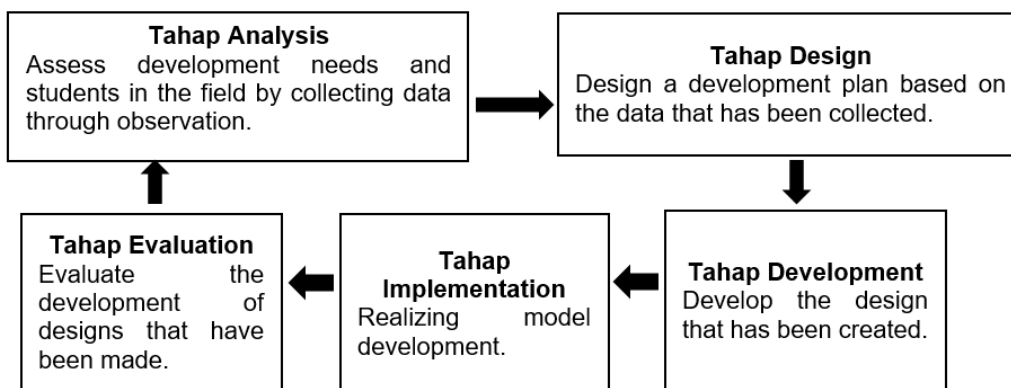
## **Flipped Classroom Gamification Case Method**

Using the Case Method, flipped Classroom Gamification activities can be applied in statistics courses. Case Method is a learning method that uses case studies to introduce students to situations that occur in the real world. Students will be asked to analyze a case and find the right solution. In applying the Case Method, students can experience active learning that involves critical thinking and high involvement. In statistics courses, applying flipped classrooms with gamification activities using the case method is done by giving assignments to analyze data from a real case relevant to the material being studied. Students will be asked to independently study relevant statistical concepts and then apply these concepts to the analysis of given data. Furthermore, in class, students will be allowed to discuss the results of the analysis that has been carried out and find the most appropriate solution for the given case. In implementing a Flipped Classroom with Gamification activities using the Case Method, game elements can be added as simulation games or interactive quizzes integrated with the studied statistical material. This can increase

students' motivation to study and make them more involved in learning. Students can also work in teams to complete assigned tasks and deepen their understanding of statistical concepts (Aprianto et al., 2020).

## METHODS

This research is designed using the Research and Development study design. Research and Development (R&D) is a research approach or method to develop and evaluate new products or learning models. Its main objective is to enhance the quality of learning or solutions in a specific context. According to Molenda (Khuluq, 2023), the development of the learning model consists of five stages: analysis, design, development, implementation, and evaluation, as illustrated in Figure 1.



**Figure 1.** Development Stages, according to Molenda

Source: Khuluq 2023

Analysis Stage aims to examine conditions in the field obtained through observations and interviews to obtain information used to make decisions in developing learning models. There are three stages at this stage; the first is needs analysis, which is used to identify course objectives following the product development needs analysis. The second stage is the analysis development of the flipped classroom gamification case method, which has limited references. Therefore, this development has been adapted to needs. The final stage is student analysis, which has various characteristics.

The design stage is the realization stage of the previous stage. The design has been developed at this stage based on meeting analysis and needs. The design is adjusted to the needs and learning objectives stated in the RPS.

The development stage is the realization stage of the design design stage. All stages are arranged into one unit, which will then be validated by experts who have competence in the field of learning. Validation of the learning model aims to produce a feasible and effective product to be applied to the statistical learning process. Once declared feasible, the design that has been developed will be implemented to determine its success. All activities are monitored so that they adhere to specified research principles. The attractiveness and effectiveness of the developed model are obtained based on learner responses, which will be evaluated at the next stage.

The closing stage of the entire series of research processes is evaluation. Questionnaires are given to students to determine student involvement in the learning process and the attractiveness of the model applied.

The subjects of this research are students from the 2021 Department of Educational Technology undergraduate program taking the Educational Statistics course. Three classes are available in the Department of Educational Technology Class of 2021: Offering A, B, and Offering C. The number of students for Offering A is 36, Offering B is 37, and Offering C is 32. Researchers took research samples

in this research, namely Offering A with 36 students and Offering C with 32 students. The sample selection in this study was based on suggestions and input from lecturers in the Educational Statistics course at the Department of Educational Technology and the researcher's observations during the observations. Lectures were held over 16 meetings with the model application at the 9th to 15th meetings.

In this study, five alternative answers were used to make it easier to obtain data. The average value calculation analyzes expert validation and design trial results. In decision-making, each item's total value is presented as a percentage. The scale consists of five levels, namely Very Good (90-100), Good (75-89), Fair (65-75), Poor (55-64), Very Poor (0-54). All quantitative data obtained is presented descriptively in the results section.

## RESULTS AND DISCUSSION

This chapter presents the results of development, validation by learning design experts, and responses to students regarding the attractiveness and effectiveness of the model. The results of developing the flipped classroom gamification case method learning model are in the form of syntax, which can be seen in **Table 1**.

**Table 1.** Syntax Flipped Classroom Gamification Case Method

Phase	Activity Learner	Activity Learner
Study independent pre-class	Learners upload material on SIPEJAR, which will be discussed in class, and then provide information to students via WhatsApp Group to study the material to prepare for class learning.	Learners must study the material provided in SIPEJAR entirely so that when studying in class, they already understand the material that will be discussed. After that, students create a resume to prove they have studied the material at SIPEJAR.
Question fundamental	Learners convey the rules of learning and gamification and the rules of learning activities in class.	Learners ask questions if there is confusion regarding the rules of learning activities in class.
Distribution group	Learners divide students into several groups for the learning process in class for the next five weeks.	Learners create strategies to divide the roles or avatars that have been determined by the learner into each member. Each role or avatar has a different additional point value.
Discussion and solution case	Learners provide cases for students to solve in groups in class within 30 minutes. The level of difficulty of the material increases every week.	Learners solve cases given by students in groups and collect the results of discussions with students on a Google Form link that has been shared to be presented by representatives of the groups who advance each week.
Giving feedback	Learners provide feedback on the results of the presentation and provide explanations regarding material that they do not understand. This can be seen from the correctness of the results of the learner's presentation.	Learners ask questions about things they do not understand.
Measure understanding learner	Learners are given quiz questions via Kahoot with 15 minutes to reinforce the material. Learners give awards in the form of badges or points to the group that gets the highest quiz score. The assistant then updates the results on the leaderboard, and students share the leaderboard with other students via WhatsApp Group.	Group representatives take turns each week to take quizzes to compete for badges or points. The representative who came forward during the presentation and quiz was the same person.

Phase	Activity Learner	Activity Learner
Assignment	Learners convey various things related to tasks that must be completed by individual students, which must be validated by the assistant within a predetermined period.	Learners ask about related things that the lecturer does not understand.
Evaluate experience Study	Learners or assistants provide revisions or validate individual assignments.	The learner validates the task individually and resumes to the assistant if there is a revision. The learner is given time to revise.

Source: *Khuluq 2023*

After the learning model is developed, validation expert design learning is done. Test expert This aims to know the results of developing learning models in the form of syntax flipped classroom learning with a gamification case method strategy. The results of validation expert design learning can be seen in **Table 2**.

**Table 2.** Results Design Expert Validation Learning

Validator	Rated aspect	Results
Design Expert Learning	Identity	100%
	Systematics	92%
	RPS substance	100%
	Time Allocation	94%
	Gamification Instructions	100%
	Evaluation	90%
<b>Average</b>		<b>96%</b>

Source: *Khuluq 2023*

Results validation expert design learning on aspect identity, RPS substance, and instruction gamification obtain 100% results. On aspect, systematically obtained a yield of 92%, allocation time obtained a 94% yield, and on aspect evaluation obtained a 90% yield. Based on provision validation expert design learning, the average result is 96%, so design learning is stated well and worthy of implementation.

As for the qualitative data, three assistants are companion students in the Assigned job, which is effective for helping the builder's eye study. Other results show that the approach gamification case method creates pleasant activity learning and makes students more involved in activity learning. Students can also apply statistics to the case. This can increase the student's ability to solve problems. After design, learning stated worth it; then test furthermore is tested respondents were used to measure attractiveness and model effectiveness. From the results, the model is final and does not need to be repaired. On the test, attractiveness obtained 95% results, so the model stated very interesting. This matters because the gamification case method exists as activity learning; skills solve problems in context case and increase the learner's motivation. Criticism is given to students who add the amount of validator assistance to overcome many queue moment validations.

Students who successfully passed the points studying obtained 99% results on the test, so that model was very effective. This matter-based experience study student activity in class activity gamification case method has been designed with clear rules, appropriate assignments, good plans, and clear goals.

## Discussion

The flipped classroom learning method facilitates learner-centered learning. With this approach, students are responsible for learning outside the classroom by studying independently using learning videos provided to replace lectures in regular classes. Some students can use existing free videos from internet

sites, and some produce them for learning (Astuti, 2021). To start a flipped classroom, students need to start recording their lessons using various video software that can be used for video editing, such as Screencast-O-Matic, Movie Maker, and EduCreations. The videos will be distributed to students via the learning management system (LMS). This learning management system contains learning content in various forms, such as videos, books, and multimedia presentations that students can use to learn statistics before class. In this way, students will be ready to participate in classroom learning. Therefore, the learning time in class can be maximized with active and innovative learning activities, such as discussions, case-solving, presentations, and quizzes. Students are given assignments in the form of a material resume to support learning while watching videos.

Variations in the implementation of flipped classrooms in statistics learning are also found in learning activities in the classroom. Learners use group learning methods and case methods during face-to-face learning activities. The group methods used are peer-to-peer teaching and cooperative learning. Apart from that, individual assignments, group presentations, and weekly quizzes are carried out at the end of learning activities in class. Case-based learning is a learner-centered learning method that uses real cases as learning topics. Another view states that case-based learning involves interactive conditions, such as students' exploration of concrete real-life situations. The case method is a learning activity emphasizing participation and discussion skills and developing critical thinking, communication, and group management skills (Fatimah & Taufiq, 2022).

Even though many research results show that learning using the flipped classroom approach has a positive impact, several studies show different results, as research states that there is no significant difference in learning outcomes between students who take part in flipped classes and traditional learning. In learning using the flipped classroom approach, it was found that the level of student satisfaction decreased. Therefore, to develop an exciting and effective flipped classroom learning model, students can combine it with a gamification case method approach to increase student group involvement and critical thinking skills, communication, and management. Gamification activities in flipped classroom learning can increase student motivation and engagement, although the results regarding student performance are mixed and inconclusive. Meanwhile, the case method focuses on developing conceptual analysis skills, social interaction, and good decision-making (Saleem, 2022).

The syntax of the flipped classroom gamification case method has eight stages. At the pre-class independent study stage, students must study the material provided in SIPEJAR so that when studying in class, students already understand the material that will be discussed. The flipped classroom is consistent with the personalized aspect of learner-centered learning theory, which suggests flexibility and choice regarding learning activities and resources. In addition, this approach allows students to learn using various learning models, regardless of time and location (Syajili, 2021). The dimension of self-direction requires students to have autonomy and responsibility for their learning. Additionally, evidence was found in the literature that flipped learning leads learners to see themselves as independent learners. This culture allows students to use class time to study topics more deeply and gain broader learning opportunities. After studying independently, students are required to make an assignment in the form of a resume as proof that they have studied the material at SIPEJAR.

At the basic questions stage, learners must attract students' interest and attention by conveying the learning rules using gamification strategies. This is intended to motivate students to show involvement in learning by explaining the role of traditionally applied gamification elements such as rules, points, badges, rewards, avatars, levels, challenges, and leaderboards. Rules include regulations to guide students in learning activities in class (Koivisto, 2019).

At the group division stage, students divide themselves into several groups for the learning process in class for the next five weeks. Each group member will get a role/avatar to represent the group when competing with other groups to win the weekly quiz. Each role has different influences and also has



additional points. The assignment of this role is based on the student's statistical abilities. Therefore, students must be strategic with their groups in dividing roles to win the competition, considering that the material's level/level of difficulty will increase every week. This follows the motivation theory applied in gamification, namely self-determination theory. This theory explains three basic needs, one of which is the need for relationships. This need refers to feelings of belonging, connection, and care for the group. Learners' intrinsic motivation becomes more vital when given space to collaborate and share experiences and goals. Creating a learning environment that supports social relationships so students' relationship needs can be met.

At the discussion and case-solving stage, students discuss to solve cases given by students in groups as a learning activity in class. This problem-solving activity allows students to apply their knowledge and understanding, which they use to solve everyday problems. Such learning not only influences the development of students' knowledge and understanding but also influences students' intrinsic motivation as their relationship needs are met. This can provide space for students to construct knowledge in a social context with friends and lecturers. Case-based learning has two advantages that make it feasible to apply. Namely, students' speaking skills can be developed based on direct learning experiences, and students can develop critical thinking skills by solving a case (Cahyawati, 2020).

At the feedback stage, students will provide feedback based on the results of the group presentation. With feedback, students will know what is missing from their presentation results (Huang et al., 2019). Feedback can also be used to motivate learner performance. Apart from that, students will also provide explanations regarding material that they do not understand; this can be seen from the correctness of the student's presentation results. Learners must be professional, meaning that the learner's role cannot be replaced by flipped learning, but the learner's role in this approach is more important than in traditional learning.

At the stage of measuring understanding, students will take weekly quizzes using Kahoot at the end of learning activities. This aims to measure the level of understanding of the material that students have studied independently before class and which has been discussed together in class. Points will be earned after students complete the weekly quiz. Challenges are given to students to challenge students to win weekly quizzes to compete for badges. The badges received are then turned into tangible awards that students enjoy and find useful. Groups that get badges during the quiz will get rewards in the form of additional points. Direct and concretely beneficial rewards are a sure way to motivate students to learn (Rumianda et al., 2020). The student can take back the badge if, the following week, the student gets weekly quiz points below the agreed standard. This will challenge students to continue to increase their points and maintain their badges. The points obtained will be converted into grades at the end of learning.

At the assignment stage, students convey various things related to assignments that students must complete individually. This is a follow-up to students' understanding of the material. This assignment contains justification for the results of group work in solving cases carried out in class. Students must validate the assignment with the teaching assistant within no more than one week after giving the assignment. If the specified time limit is exceeded, the value will be reduced.

At the stage of evaluating learning experiences, learning activities in class are recorded and displayed on the leaderboard as a form of evaluation and feedback (Park & Kim, 2021). This allows learners to use all their skills to retain and secure the best placement. This learning context occurs through social behavior as a form of game competition. The resulting competition can encourage individual students to work harder to obtain better rankings. This shows that the role of the leaderboard is more important than just receiving prizes and badges.

Based on the results of validation tests from learning design experts, this learning model can increase student motivation and engagement. The gamification elements motivate learners and keep them involved in the learning process. Meanwhile, case-based learning positively influences students' understanding of

concepts. The problem with the low pass rate for educational statistics courses is that it is challenging to motivate students to understand statistical concepts and statistical material, which is difficult for students to understand, especially in interpreting data analysis results (Nurhusain & Hadi, 2021). However, the Flipped Classroom Gamification Case Method achieved satisfactory results with a pass rate reaching 99%. These results are proven by the satisfaction of students who provide exciting assessments of the existence of the Flipped Classroom Gamification Case Method. This attraction cannot be separated from the role of game elements in making learning activities more enjoyable and fostering students' sense of competition. The role of three assistants who act as companions in carrying out assignments is to facilitate the needs of individual students. The assistance provided helps students understand their knowledge, and this support is hoped to continue in their future studies.

## **CONCLUSION**

A series of flipped classroom gamification case method learning activities generated positive responses from learning design expert validators and students as research respondents. Despite the limited literature on the flipped classroom gamification case method, the learning design in this study indicates that flipped classroom gamification case method learning can be implemented in educational statistics courses. While traditional gamification activities are still infrequently implemented, their role in maintaining student engagement in learning remains influential. The case method applied here also allows students to construct knowledge in a social context with peers and instructors. This way, learners can achieve optimal results through learner-centered learning possibilities, including personalization, higher-order thinking, autonomy, and collaboration. The implementation process still receives criticism from students, such as the limited number of teaching assistants resulting in delays in the assignment validation process. Additionally, the badge revocation system in gamification activities can slightly diminish student motivation in competition. However, most students enjoy learning with the flipped classroom gamification case method, as evidenced by student feedback and a high % graduation rate of 99% for the educational statistics course. For future research, it is recommended to delve deeper into strengthening aspects that may still pose challenges in implementing the flipped classroom gamification case method. Attention should be given to the number of teaching assistants to meet task validation needs efficiently. Solutions to enhance student motivation in competition, such as refining the reward system or offering more appealing incentives, should also be explored. Furthermore, future research can focus on in-depth analysis regarding the impact of the flipped classroom gamification case method on the development of critical, analytical, and problem-solving skills among students. Further evaluation of social interactions in the learning context can provide more comprehensive insights into the effectiveness of this model. It is also suggested that further research be conducted involving more significant and diverse student groups, exploring their understanding of the learning experience with the flipped classroom gamification case method. Thus, future research can contribute further to developing and implementing this innovative learning model in the context of statistics education.

## **AUTHOR'S NOTE**

The authors honestly declare that no conflicts of interest exist regarding the publication of this article. The authors ensure that the data and content of the article are plagiarism-free.

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