



Designing gamification for case and project-based online learning: A study in higher education

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Abstract

The emergence of online learning has become important during the COVID -19 pandemic due to the advent of internet technology. The unpreparedness of planning and implementing online learning has caused many problems during the pandemic such as limited or monotonous academic materials as well as difficulty in organizing activities and student involvement. Online learning is also more stressful because students are stuck in private academic processes in the absence of challenging and fun activities leading to knowledge development difficulties. Therefore, this study aims to develop and analyze the feasibility of a gamification model for case and project-based online learning in universities. This analysis used the research and development (R&D) method with the experimental procedure containing model development as well as product validation and testing. In the validation process, two learning design and media experts as well as 76 students participated with a descriptive statistical analysis used to analyze the data. The results of the learning design experts' assessment showed a score of 4.35, learning media experts' assessment showed a score of 4.90 and the average score of the students' assessment was 4.33. Based on the results, the developed learning model was feasible to use in university academic processes.

Keywords: Case methods, Game education, Gamification, Learning media, Online learning, Project-based learning.

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Contribution of this paper to the literature

This research provides theoretical contributions in the form of alternative solutions to various problems that have arisen from online learning practices so far through the development of online learning model designs by applying game elements in active learning especially the case method and project-based learning in tertiary institutions.

1. Introduction

The emergence of the COVID-19 pandemic has globally prompted teachers to adopt an online teaching process where learning content and activities are digitally recorded and shared (Lemay, Bazelais, & Doleck, 2021). This process is carried out through various learning management system (LMS) platforms such as Moodle, Google Classroom, WebQuest, Edmodo, Schoology and other online channels (Augustine & Ezeoguine, 2022; Octaberlina & Muslimin, 2020; Restuati, Nasution, Pulungan, Pratiwi, & Safirah, 2021; Saad, Ghallab, & Hawa, 2021; Zulfa & Laras, 2020). However, various problems are often confronted by teachers and students worldwide including in Indonesia when implementing this learning method during and after the pandemic. In planning and implementing online learning, the unpreparedness of teachers is considered the main cause of these problems (Churiyah, Sholikhhan, Filianti, & Sakdiyyah, 2020). This has led to the identification of several academic problems such as (1) Monotonous and uninteresting learning materials. (2) Passive students. (3) Low learning interactions. (Irfan, Kusumaningrum, Yulia, & Widodo, 2020). (4) Students' stress due to private academic processes. (5) Educational focus difficulty (Yusnilita, 2020). Online learning content is more theoretical in nature and there are still few online learning activities providing opportunities for students to actively learn and practice. In this case, the emergence of digital mediocre content is a major problem (Dhawan, 2020). The absence of challenging activities also causes unmotivated traits in students (Suartama, Mahadewi, Divayana, & Yunus, 2022) indicating the inability for complete learning processes to be digitally achieved (Adnan & Anwar, 2020).

These considerations are used as references to determine the challenges faced by lecturers and students during online learning in universities. Various pedagogical factors such as interest, intention, motivation and attitude are also important in their online learning behaviours and involvements. These factors are influenced by several elements including the provision of rich content and teaching materials, systematic and challenging learning strategies and steps (Huang, 2021) as well as an academic environment responsible for student improvement (Hao, Dennen, & Mei, 2017). Furthermore, students often learn through various styles, self-management strategies, modalities and preferences (Suartama et al., 2021). This shows that the provision of various learning resources as well as interactive and challenging activities is important for maintaining their academic abilities (Dhaliwal, Simpson, & Kim-Sing, 2018). Systematic planning is also needed to determine and define these pedagogical factors regarding the development of interesting online learning activities. In this case, an effective learning environment should carry out the following steps: (1) encourage faculty and student interaction, reciprocity and collaboration and (2) ensure prompt feedback, assignment periods, active learning techniques, communication as well as respect for students' diversity and academic styles (Yaniaja, Wahyudrajat, & Devana, 2020). Several recommendations are also identified for lecturers to organize content on learning platforms. These include: (1) positive quick feedback (2) assignment provision for skill level (3) attempting new ideas and repeating assignments (4) formulating more specific goals (5) providing different paths toward goal achievement (6) using different game methods and motivational activities even during failure.

One of the biggest challenges of online learning emphasizes the motivation and engagement of students in educational performances. According to Mitchell, Schuster, and Jin (2020), students are generally uninterested in carrying out lengthy daily digital work although they are willing to spend a lot of time playing games. This indicates that several efforts are needed to provide learning materials and activities capable of combining pedagogical principles with games or entertainment. In this case, the use of game elements (gamification) is often applied to motivate, entertain and attract students' interest leading to the achievement of learning objectives (Marín, Frez, Cruz-Lemus, & Genero, 2019). Gamification has also been considered a key aspect of pedagogy used to increase learning engagement and motivation (Poondej & Lerdpornkulrat, 2019). This proves that the use of learning techniques is rapidly developing and becoming popular in online learning. According to modern educational theory, this technique also aims to maximize student satisfaction, motivation, success rates and abilities (Puritat, 2019). This modern theory states that learning is most effective when emphasizing activeness, skill and event orientations as well as direct feedback provision (Divayana, Sudirtha, & Suartama, 2021; Warni, 2013). Moreover, several active learning methods are often combined with game elements (Murillo-Zamorano, López Sánchez, Godoy-Caballero, & Bueno Muñoz, 2021) including the case and team project approaches (Park, 2022; Suartama, Triwahyuni, & Suranata, 2022; Zhao et al., 2020).

A case method is a constructivist approach where real problems close to students' lives are presented in learning. This method provided opportunities for students to carry out the following: (1) analyze cases and contents (2) increase exploratory knowledge by independently searching for information, data and literature (3) improve critical thinking by solving provided cases (4) achieve better collaboration through team answers and (5) increase the acquisition of feedback through presentations and improvements. In learning, the cases presented

commonly contain various problems regarding the environment, conditions, situations or future of the students (Mayer, 2002).

Meanwhile, the team project method uses educational activities as learning media. In this method, students often perform information acquisition, exploration, assessment, interpretation and synthesis to produce various forms of learning outcomes (Soboleva & Karavaev, 2020). Team-based projects are also student-centred learning models for conducting in-depth investigations. This prioritizes the collaborative and constructive performance of in-depth learning with a research-based approach toward serious, real and relevant problems and questions (Lam, 2012).

In online learning, the design and implementation of active methods and gamification differ from classroom teaching (face-to-face) where lecturers are able to manage students directly (Kuo & Chuang, 2016). This gamification process is developed using the Learning Management System(LMS) (Chen, Huang, Gribbins, & Swan, 2018; Poondej & Lerdpornkulrat, 2019). According to Perkins and Pfaffman (2006), the benefits of LMS were observed through the ability of lecturers to develop learning paths, send assignments, provide feedback and badges, quizzes, interactivity, lesson plans, announcements and other academic documents. Moodle LMS also increases students' involvement in online learning and positively affects their activities, motivation, thinking skills and innovation (Chootongchai & Songkram, 2018; Georgouli, Skalkidis, & Guerreiro, 2008; Govender, 2009; Henderson, 2010). After setting up this platform, the planning of badges or awards is possibly achieved by students. Besides this, Moodle LMS also has more optimized functions for producing online learning gamification. According to Gachkova and Somova (2016), several implementations of gamification on the Moodle LMS are detailed as follows:

- 1) Providing points for the actions performed (accessing provided learning resources and activities).
- 2) Obtaining various badges as appreciation for goal achievements.
- 3) Sending certificates and awards after completing all lessons.
- 4) Providing recertification within a specific period.
- 5) Displaying leaderboards in chart and diagram format.
- 6) Showing all the achievable levels.

Although Moodle LMS provides various features facilitating the gamification process in online learning, experience is still needed for their incorporation into the academic designs containing planned materials and activities. Therefore, this study aims to develop and analyze the feasibility of a gamification model for case and project-based online learning in universities using Moodle LMS. In this case, Moodle's developed online courses combine the features commonly used in LMS such as CCM (course content management), quizzes and path reports with gamification strategies and additional plugins.

2. Method

2.1. Research Design

This study used a research and development (R&D) model. Gamification model designs for case and project-based online learning were also theoretically or practically performed (Lee, Lim, & Kim, 2017). This indicated that the model design was developed from relevant literature synthesis as well as simulation and implementation in a learning trial activity. The analysis of learning designs is often classified into three types (Richey & Klein, 2007), namely model development(MD), model validation(MV) and model use(MU). Although, this report used only MD and MV. This gamification model was subsequently developed through a validation process that obtained and analyzed empirical data for the following purposes: (1) to provide support for each model component and (2) to practically prove its usefulness (Richey, 2005). Additionally, the validation of the learning model was internally and externally carried out before being tested in learning activities.

2.2. Procedures

2.2.1. Model Development

Based on the study design, the initial development of the gamification model was carried out. This emphasized the e-learning model developed by Poondej and Lerdpornkulrat (2019); Gachkova and Somova (2016) where the design of gamification showed learning steps and various structures such as experience points(XP), levels, badges, leaderboards and progress bars. The model development was also guided by the basic theory of active learning especially case and project-based methods (Ali et al., 2018; Jalinus, Nabawi, & Mardin, 2017) as well as supported by e-learning pedagogy (Ananga, 2020) and LMS (learning management system) technology (Suartama, Setyosari, Sulthoni, & Ulfa, 2019). Using Moodle LMS, the gamification model design for case and project-based online learning adopted the structure shown in Figure 1.

Based on Figure 1, the model design structure combined pedagogical and technological aspects. This indicated that the gamification strategy was applied to the learning media of a bachelor's degree course. In the e-learning course, the activities and resources also emphasized the stages of the case method through the following steps: (1) setting the case (2) analyzing the case (3) independently determining information, data and literature (4) determining the completion steps of the e-learning course (5) obtaining conclusion from the evaluated answers (6) presentations and (7) improvements.

Meanwhile, the team-based project method was carried out through the following steps: (1) formulating the expected learning outcome (2) understanding the concept of the teaching materials (3) skills training (4) designing the project theme (5) developing the project proposal (6) executing the project tasks and (7) presenting the project report.

The Moodle LMS platform is used to build gamification strategies into all stages of case-based and project-based learning methods through the provision of game elements. In this study, Moodle version 3.2 was installed on the web server including the "Level up!" block which is an additional plug-in for gamification (https://moodle.org/plugins/block_xp). Basic Moodle activity modules and resources were also used on the site to manage lessons and courses. In addition, Moodle's built-in gamification features and "Level up!" blocks were

applied to build gamified elements. Table 1 presents the patterns by which the Moodle LMS features are implemented to incorporate these game elements.

Based on Figure 1 and Table 1, the development stage was subsequently implemented with regard to the design translation into physical forms, namely portals and e-learning courses. The portal's development includes the following: (1) Obtaining a server or web hosting. (2) Transforming portal identity (site name and description). (3) Setting up the Moodle mobile application. (4) Changing themes. (5) Developing categories. (6) Developing and upgrading user states. For course development, the following was observed: (1) Developing and changing course settings. (2) Inputting resources (book, file, folder, Instructional Management Systems (IMS) content package, label, page, uniform resource locator/URL). (3) Developing activities (assignments, chat, choice, database, feedback, forum, glossary, lesson, Learning Tool Interoperability (LTI)/ external tool, quiz, Sharable Content Object Reference Model (SCORM), survey, wiki, workshop) by mapping to the case and project-based learning steps and (4) Inserting and managing game elements (xp , levels, badges, leaderboards and progress bars).

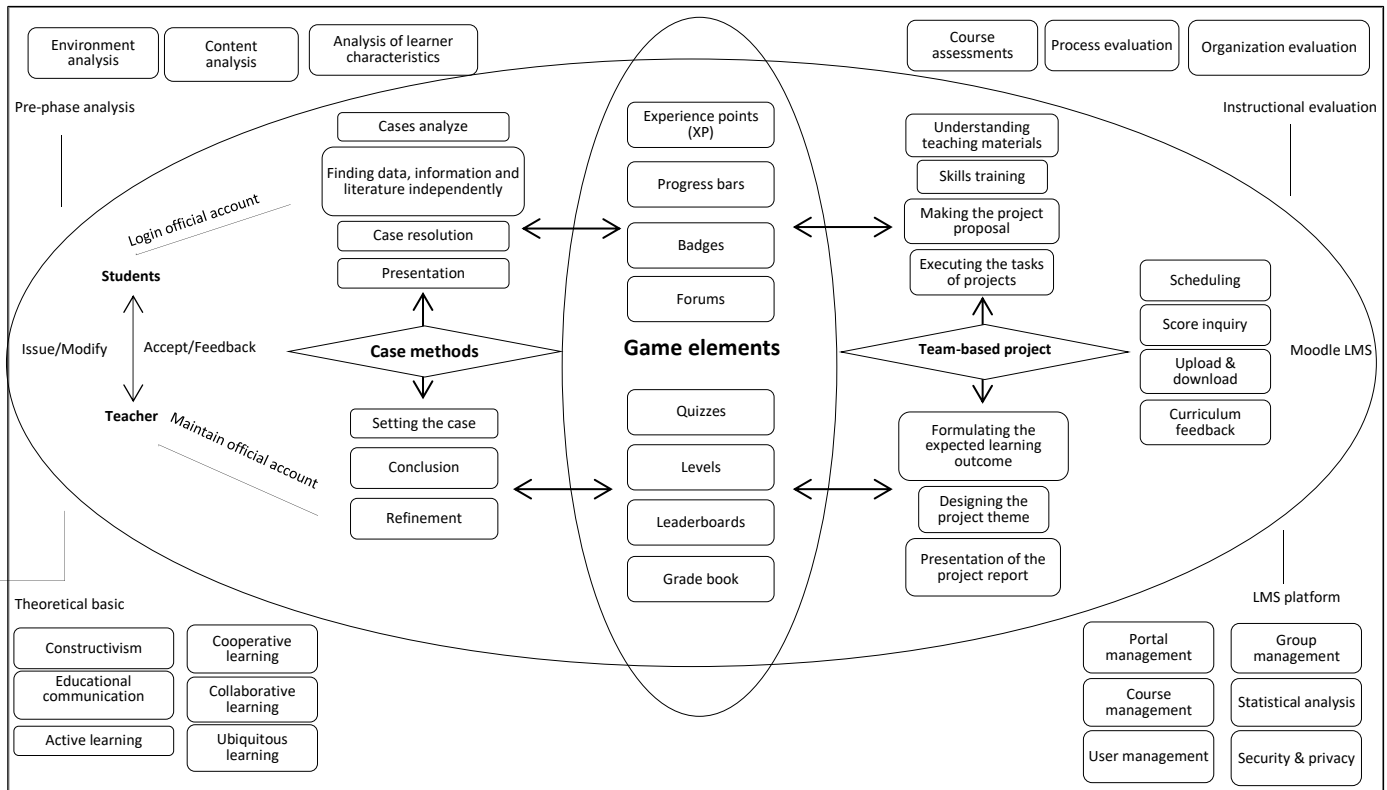


Figure 1. Gamification model design structure for the case and project-based online learning based on LMS.

Table 1. Moodle LMS feature setting for gamification.

Moodle LMS features	Setting up
Activity completion	All pages of teaching materials (resources) and activities are arranged with completion conditions. When all the conditions are met, the activities are displayed as completed (checked) by the system.
Experience points (XP)	Two methods are observed by students to earn XP: (1) Points are automatically awarded when quizzes are completed. (2) Points are awarded for performing specific actions in online learning such as logging into the system, posting to forums and accessing reading material pages.
Badges	Badges and various criteria (completing an activity) are provided and established respectively. This includes the provision of feedback to the student, regarding the reasons for earning badges. In this case, students often automatically obtain a badge from the system when all the criteria have been met. However, some are manually provided by the lecturer. In the learning system, two types of badges are used: (1) To motivate students, several activities need to be completed to earn badges such as forum participation, asking good questions and working hard (2) To measure student achievement, a badge is obtained every time they complete a specific activity.
Grade book	An accumulation of scores and values is found in all student activities.
Quizzes	Provides several types of quizzes such as multiple choice, short answers and matchmaking. In this case, multiple attempts are allowed for students in each quiz with the final grade (the average scores) recorded in the report book. In addition, all quizzes have their own grades and completion settings.
Forums	These are the activities allowing students to socialize and participate in collaborative learning. In these processes, lecturers develop activities and instruct students to post or comment at any time. All forums also have settings where students have to start or reply to specific discussions.
Progress bars	Providing feedback to students greatly improved their learning efforts with progress bars used to display their academic achievement levels.
“Level up!” block plugin	This automatically connects the student experience points (XP) related to their activities such as logging into the system, posting to forums, accessing reading material pages and performing quizzes. It also notifies students when they level up. This notification block is placed on the main page to track the leaderboard as well as display the student's present XP, level and progress bar.
Leaderboards	This provides a visual representation of the patterns by which students are ranked against their peers. In this case, those with the most XP were ranked the highest. This allows students to comparatively assess their progress and performance against other peers in the same class.

2.3. Product Validation

2.3.1. Try Subject

The validation of the developed product was carried out by two content and teaching material experts who are lecturers in teaching media courses. Besides this, two learning media experts with doctoral qualifications in the educational technology field also assist in this process. These experts' validation outputs were important in

obtaining input for the improvement of the developed product, obtaining a guarantee regarding the feasibility of the gamification model.

After the experts' assessments, the product was then tested on 76 students to determine its ability (usability) and quality before actual learning implementation. In this case, the following steps were observed: (1) students' accessibility to the activities and resources in e-learning courses (2) filling out a product assessment questionnaire, (3) data analysis (4) revision of the product in light of the input and suggestions obtained from the trial leading to the production of a final design. This indicated that the quality of the final product was better.

2.3.2. Instrument

The instruments used to validate the content are: (1) the questionnaire on the feasibility of learning material by Walker and Hess (1984) and (2) the online learning media assessment questionnaire by Debattista (2018). In the trial activities, these questionnaires were prepared based on the assessment of material and media experts by adjusting the statements and questions related to the position of students as users of the developed product. Regarding the quality of the instrument, an indicator emphasizes the possession of good validity and reliability. To obtain good quality instruments, the following activities were carried out: (1) document analysis (2) grid development (specification table) (3) expert consultation (materials and media) (4) colleague consultation (5) instrument writing. The instrument grid for content and learning media experts is presented in Tables 2 and 3 respectively.

Table 2. Grid of learning material assessment instruments.

Rated aspect	Indicator
Material aspect	<ul style="list-style-type: none"> • The suitability of the material for the competencies to be achieved • Concept truth • Material updates • The order of presentation of the material • The suitability of the provided example
Learning aspect	<ul style="list-style-type: none"> • Learning objectives • Clarity of learning indicators • Motivation • Summary • Providing training • Suitability of images and videos provided to clarify the material
Language aspect	<ul style="list-style-type: none"> • The suitability of the language with the students' level of thinking • Clarity of language • Term accuracy • Grammar and spelling accuracy • Ability to stimulate students' curiosity

Table 3. Grid of online learning media assessment instruments.

Aspect	Indicator	
Learning opener	<ul style="list-style-type: none"> • Accessibility • Role • Description • Behaviour 	<ul style="list-style-type: none"> • Integrity • Technical competences • Ownership
Learning resources	<ul style="list-style-type: none"> • Provision • Application • Entitlement 	<ul style="list-style-type: none"> • Variety • Openness • Academic integrity
Interaction and community	<ul style="list-style-type: none"> • Fostering • Management 	<ul style="list-style-type: none"> • Peer learning
Student support	<ul style="list-style-type: none"> • Instructional support • Academic support 	<ul style="list-style-type: none"> • Technical support • Administrative support
Technology design	<ul style="list-style-type: none"> • Support • Centricity • Openness • Authentication 	<ul style="list-style-type: none"> • Access • Interface • Investment • Management
Closing of learning	<ul style="list-style-type: none"> • Assessment • Resolution 	<ul style="list-style-type: none"> • Archiving
Learning assessment	<ul style="list-style-type: none"> • Goals and objectives • Strategies • Grading 	<ul style="list-style-type: none"> • Feedback • Management
Learning cycle	<ul style="list-style-type: none"> • Academic review • Technical review 	<ul style="list-style-type: none"> • Administrative review

2.4. Data Analysis Technique

The data obtained from these validation processes were classified into two categories: qualitative and quantitative. For qualitative data, criticism and suggestions were emphasized by learning material and media experts. The data was obtained and abstracted to improve the design of the learning model. The scores on each instrument item were prioritized by these experts based on the quantitative data. Furthermore, descriptive statistical analysis techniques were used to provide the value and quality of the gamification model in the developed

online learning. In this case, the scores obtained were totaled and averaged as well as converted using a 5-scale criterion-referenced test table. Based on these results, a minimum feasibility value of 4 (good) was determined based on the assessments from the learning material and media experts. When the final (overall) assessment obtains a "good" score from the experts, the developed gamification model is then considered feasible for learning applications.

3. Findings

3.1. Gamification Model Design for Case-Based and Project-Based Online Learning

The design of the gamification model for case and project-based online learning was developed in the Learning Media (LM) course. This course was important for students' pedagogic competencies especially in designing, developing, using, managing and evaluating learning resources and media. The design components of the learning model specifically the teaching material were organized in several forms such as documents (doc, pdf, xls and txt), presentations (ppt), images (jpg, gif, png), videos (mp4, mpg, wmv), sound (mp3, au, wav) and animation (swf, gif). The sequence of the learning steps used also emphasized case and team-based project methods. In addition, more Moodle LMS features were used to build various gamification strategies that contained game elements such as experience points (XP), levels, badges, leaderboards and progress bars. Learning activities consist of 14 weeks/topics, including mid-semester exams and final semester examinations. In this case, six activity segments were designed by applying the case method with the following problems: (1) the learning media (LM) position (2) the LM basic concepts (3) the characteristics of the LM types (4) the LM management (5) the LM selection (6) the use of learning media. The following steps were used in this method facilitated by an interactive student worksheet:

- Setting the case
- Analyzing cases independently determining information, data and literature
- Students' determination of the steps for solving the provided cases
- Drawing conclusion from the answers discussed together
- Presentation
- Repair

The following learning activity segments were also designed by implementing the team-based project method on various topics: (1) Learning media (LM) classification. (2) Analysis of LM needs. (3) LM design and production. (4) Learning media evaluation. (5) Simple LM production. (6) Digital learning media production. The following steps were used in this method facilitated with interactive guidance/student worksheets-team-based projects:

- Formulating the expected learning outcome
- Understanding the concept of the teaching materials
- Skills training
- Designing the project theme
- Developing the project proposal
- Executing the tasks of projects
- Presentation of the project report

Based on case and team-based project methods, the gamification strategy was built by applying game elements to the learning steps. The following figure shows some screenshots of the additional Moodle features used to build gamification strategies:

Activity completion: All pages of teaching materials (resources) and activities were arranged with completion conditions. When all conditions are met, the activities are displayed as completed (checked) by the system as shown in [Figure 2](#):

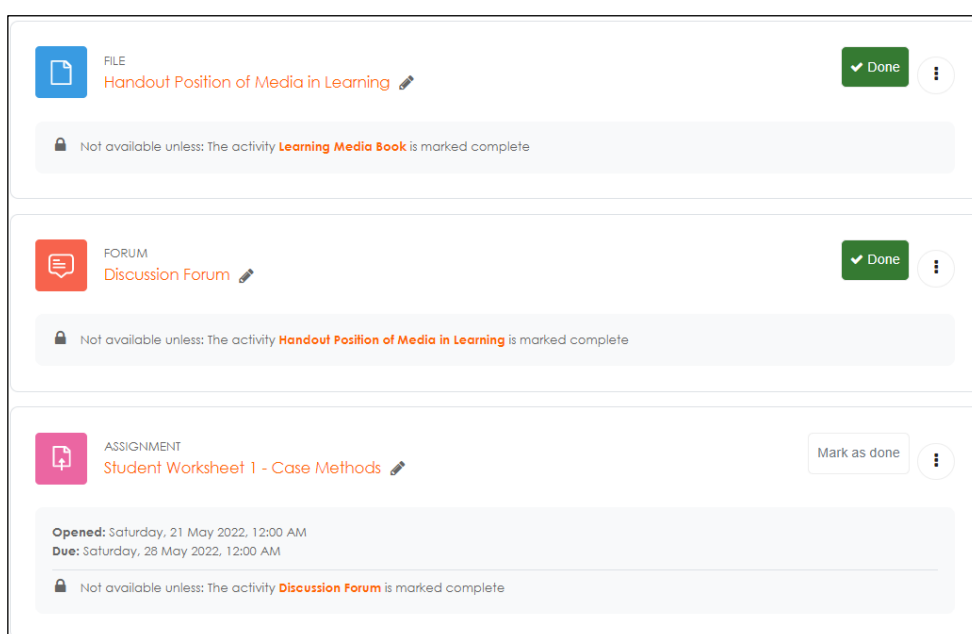


Figure 2. Activity completion.

Badges: Badges and various criteria (completing cases and projects) were provided. This included the provision of feedback to students regarding the reasons their badges were earned. In this case, students automatically obtain a badge when all the criteria have been met. Some of these accolades were also manually provided by the lecturer. The display of this feature is presented in [Figure 3](#).



Figure 3. Badges.

Gradebook: An accumulation of scores and values was observed in all student activities as presented in Figure 4.

Grade item	Calculated weight	Grade	Range	Percentage
LEARNING MEDIA				
Student Worksheet 1 - Case Methods	8.20 %	78.00	0-100	78.00 %
Student Worksheet 2 - Case Methods	8.20 %	80.00	0-100	80.00 %
Student Worksheet 3 - Team Based Project	8.20 %	90.00	0-100	90.00 %
Exercise 1	8.20 %	100.00	0-100	100.00 %
Student Worksheet 5 - Case Methods	8.20 %	75.00	0-100	75.00 %
Student Worksheet 6 - Case Methods	8.20 %	82.00	0-100	82.00 %
Student Worksheet 7 - Team Based Project	8.20 %	87.00	0-100	87.00 %
Student Worksheet 8 - Team Based Project	8.20 %	70.00	0-100	70.00 %
Student Worksheet 9 - Team Based Project	8.20 %	95.00	0-100	95.00 %
Student Worksheet 10 - Case Methods	8.20 %	85.00	0-100	85.00 %
Practical Worksheet 2 - Team Based Project	8.20 %	77.00	0-100	77.00 %
Practical Worksheet 1 - Team Based Project	8.20 %	85.00	0-100	85.00 %
Midterm Exam	0.82 %	8.33	0-10	83.33 %
Final Exams	0.82 %	8.18	0-10	81.82 %
Course total	-	1020.52	0-1220	83.65 %

Figure 4. Grade book

Quizzes: Several types of quizzes were provided such as multiple choice, short answers, matchmaking and true or false. In this case, multiple attempts were allowed for students in each quiz with the final grades (average scores) being recorded in the grade books. In addition, all quizzes possessed their respective pass grades and completion settings. This feature is presented in Figure 5.

Forums: These are the activities allowing students to socialize and participate in collaborative learning. Lecturers often develop these activities and instruct students to post or comment at any time. All forums have an arrangement where students have to initiate or reply to a discussion while providing various opinions. This feature is presented in Figure 6.

Levels: This plugin automatically connects student experience points (XP) according to their activities such as logging into the system, posting to forums, accessing reading material pages and performing quizzes. The feature also notifies students when they level up. This notification block was subsequently added on the main page to track the leaderboard as well as display the students' XP, level and progress bar to the next level. The experience point (XP) and level features are shown in Figures 7 and 8 respectively.

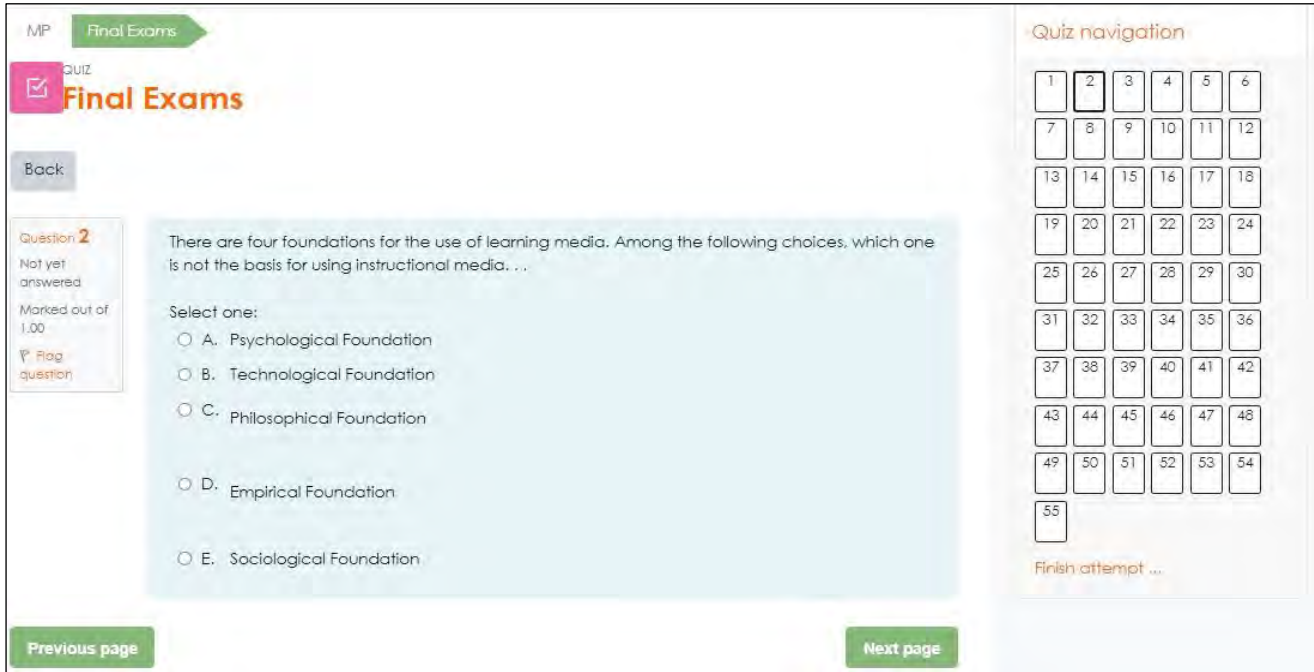


Figure 5. Quizzes.

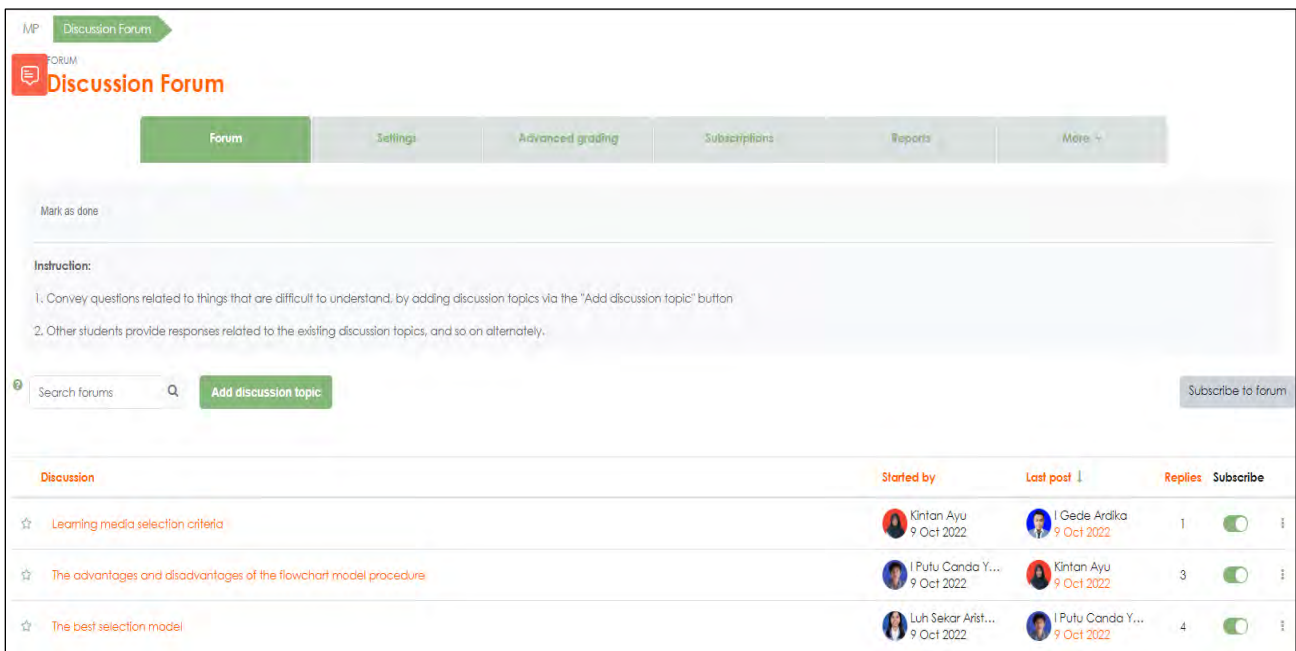


Figure 6. Forums.

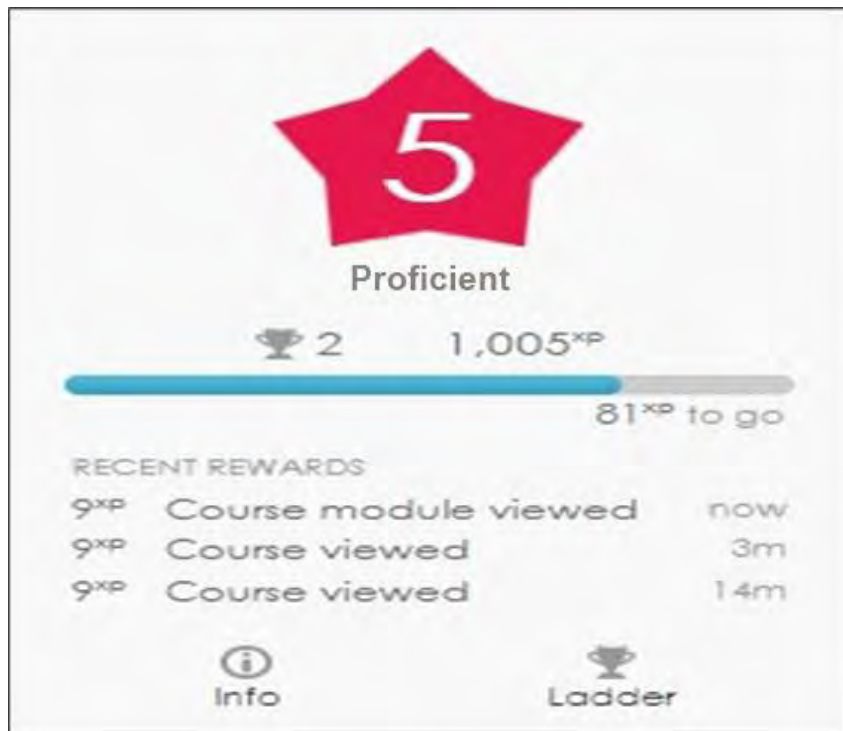


Figure 7. Experience points (XP).

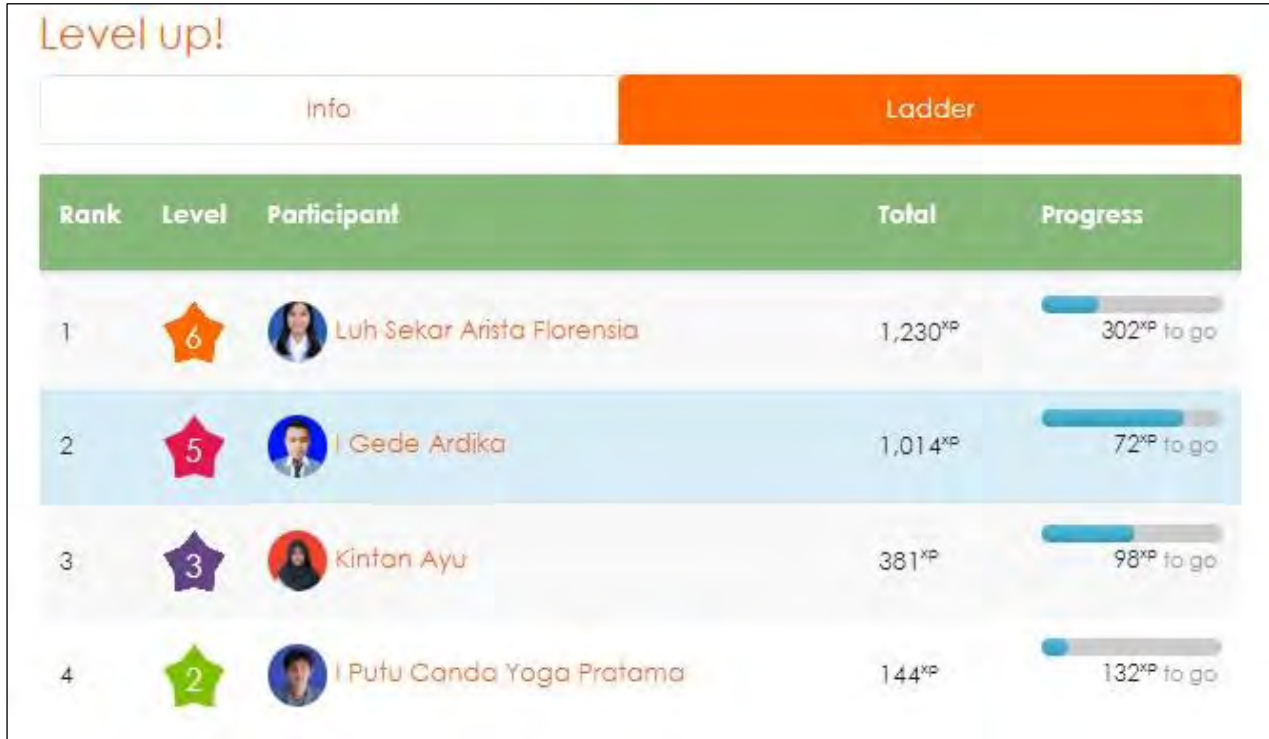


Figure 8. Levels.

Progress bar: The provision of feedback to students greatly improved their learning efforts by using the progress bar. This was to display the academic progress levels of students. The feature is presented in Figure 9.

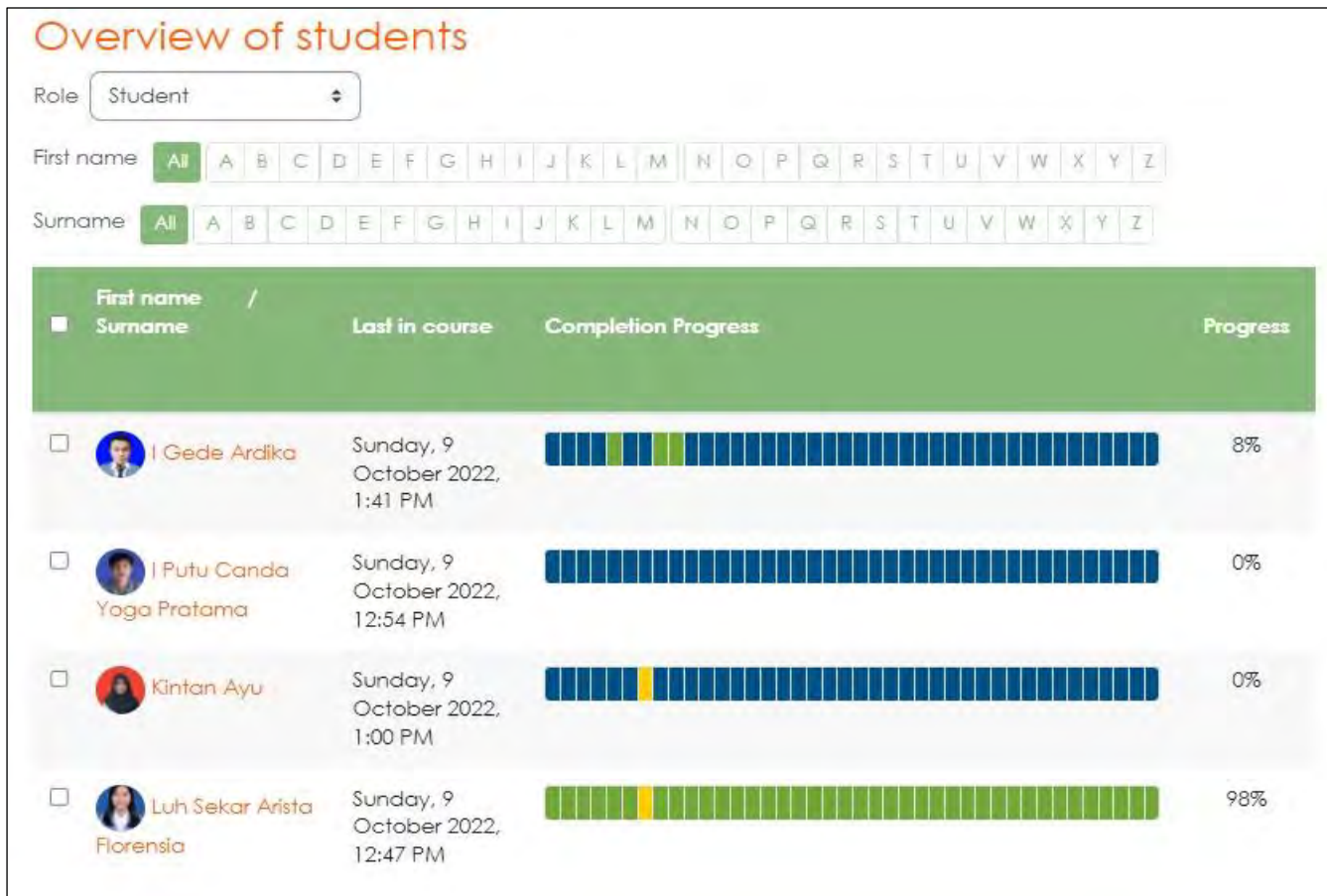


Figure 9. Progress bar.

Note: The use of the following address, <https://u-learningclass.site/course/view.php?id=2> (accessed on 21 November 2022) shows the complete learning media course. It is also accessible through the guest login feature.

3.2. Product Validation and Trial Results

After conducting internal tests to ensure the smooth operation of the product, the validation/evaluation stage is then conducted based on the following steps: (1) Validation by 2 material and 2 media experts (2) Analysis on 76 students. Figure 10 shows the comparison of the average overall score from expert validation and student assessments on product trials.

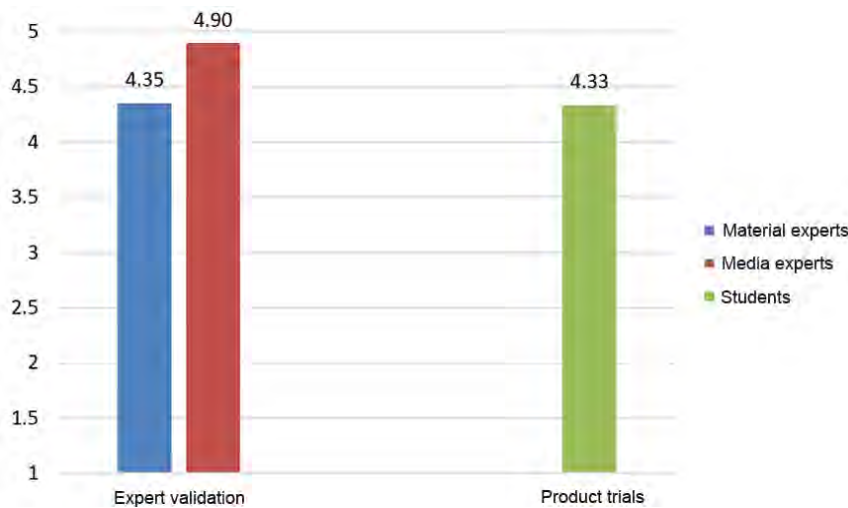


Figure 10. Results of product validation and testing.

Based on Figure 10, the average overall assessment scores of the learning material and media were 4.35 and 4.90 respectively. However, the average score of the 76 students in the product trial was 4.33. A "very good" category was also observed according to the conversion of quantitative to qualitative data using a 5-point scale. This indicated that the material and media aspects of the developed product could be feasibly applied to learning.

Besides providing expert assessments, suggestions were also provided for improving product quality. Regarding the learning material experts, the following suggestions were provided: (1) Learning materials should be updated and enriched with digital technology or Information and Communication Technology (ICT) based learning media (2) The addition of instructions to each activity should be mandated for students to carry out independent learning (3) The presentation of the material should be able to provoke students to think critically.

The following suggestions were also provided by the learning media experts: (1) The diversity of learning resources needs to be increased to accommodate various student academic modalities (2) Relevant and personal learning pathways should be provided to increase academic interest (3) Different forms of gamification need to be provided for each learning activity (4) Feedback features should be provided to improve performance and improve rethinking skills (5) The shape of the badge needs to vary to boost students' enthusiasm about exploration. Meanwhile, the following comments were obtained in the students' trial activity: (1) Learning becomes more flexible because it can be done anywhere and anytime (2) The challenges in each activity enable more curiosity and enthusiasm about learning (3) Adequate determination of learning sustenance from progress bars, feedback, badges and the grades directly provided by lecturers (4) E-learning is easy due to having its high accessibility and positive influencing on more efficient learning processes.

Based on the suggestions, inputs and comments from experts and students, the following product improvements were implemented: (1) Enrichment of materials related to the development of ICT-based learning media (2) Providing a brief introduction before each resource person and other activities are presented in the course (3) Developing more gamification features in each learning resource and activity (4) Providing various badges in each activity (student sheet) (5) Providing more varied learning paths to accommodate diverse student learning modalities.

4. Discussion

Using the case and team-based project methods, the design of a gamification model for online learning was carried out through the stages of development, validation and testing. These well-organized stages were conducted rapidly and smoothly with adequate planning. Based on the assessments of the material and media experts as well as the students' trial activities, the gamification model design met the eligibility criteria in learning. Some of the reasons emphasizing the suitability of this product for academic use included the following: (1) The e-learning courses designed with this model combine various learning methods (2) The presentation of various learning media as well as activity and interaction formats between lecturers and students (3) The use of game elements in each step or learning activity.

The case-based learning scenario presents realistic problems that are relevant to the studied materials. In this case, the active participation of students emphasizes the integration of various sources of information. They also attempt to solve cases based on experience and previous knowledge (Sanjaya, Suartama, & Suastika, 2022). The case method also emphasizes maximum student activities as learning subjects by searching, determining, connecting and applying concepts in a low-risk environment (Ertmer & Koehler, 2014). Some of the advantages of this method are as follows: (1) Students develop connections between their knowledge and existing problems. (2) The provision of the opportunity to consider similar real-world problems (Koehler, Fiock, Janakiraman, Cheng, & Wang, 2020). (3) Development of critical thinking skills, teamwork and cultural awareness (Yadav, Bozic, Gretter, & Nauman, 2015). (4) Foster, develop and train students' self-confidence, intellectual abilities and mental processes, respectively (Bada & Olusegun, 2015). (5) Development of problem-solving skills (Koehler, Ertmer, & Newby, 2019; Tawfik & Kolodner, 2016).

According to the team-based project method, students often play important roles in engagement, autonomy and responsibility for their learning activities (Guo, Saab, Post, & Admiraal, 2020).

All the stages of this method also contribute to improve critical thinking skills, beginning with the level of project selection according to students' wants and needs. This was accompanied by the planning stage which began with the students' prior knowledge where the configuration and formulation of questions broadened their perceptions and thoughts about the developed activities. In this case, the skills to recognize assumptions and evaluate arguments were also trained through class discussions, project implementation steps and data collection and analysis. These processes were subsequently accompanied by the evaluation phase and project report

presentations. In the stages of project-based learning, students were able to connect their knowledge with real life and stimulate serious thinking when gaining real experience (Issa & Khataibeh, 2021). Collaborative online learning projects also improved their abilities to complete assignments (Yunus, Amirullah, Safiah, Ridha, & Suartama, 2022).

Game elements were paired at every step of the case and team-based project methods, by capitalizing on the various available gamification features or providing plugins to the LMS. Game techniques and mechanisms were also applied in the learning process to achieve specific academic objectives, increase goal completion motivation, and involve students in a friendly competitive environment (Barata, Gama, Jorge, & Gonçalves, 2017). Moreover, the LMS is a suitable setting for gamification due to its automatic recording of digital statistics of students' academic results and progress (Dias, 2017). This increases the possibility of obtaining data on the time spent viewing and interacting with the provided material. When some settings are enabled in this system, students are then encouraged to become active participants in learning discussions, forums and blogs. They are also encouraged to participate in developing learning content through the design of wiki pages. Based on these results, the selection of the Moodle LMS application was able to provide several advantages: (1) The ability to select various available learning-activity formats. (2) Flexibility in determining learning activities, for example, community, journals, quizzes, selection questions, surveys, assignments and chats. (3) All class members' activities in forums, journals, quizzes and assignments were observed on one page and downloaded as a spreadsheet file. (4) Display of various user activities (Suartama, Setyosari, & Ulfa, 2020). The built-in and additional features of this system were also implemented to build game elements such as experience points (XP), levels, badges, leaderboards and progress bars.

Experience points (XP) are automatically awarded to students when they complete assignments and perform specific learning actions such as logging into the system, posting to forums and accessing reading material pages. This attracts, motivates, stimulates and increases engagement and academic productivity (Remus, Julean, & Moholea, 2022). Levels connect students' experience points (XP) with their activities and notify them regarding their academic progress. In this case, the level blocks were mainly used to incentivize students to follow, motivate and complete their learning experiences and activities (Hasan, Nat, & Vanduhe, 2019). Badges are often provided for various activities including assignments, quizzes and lessons. This accolade contains three types: "active", "hard work" and "champion" which were provided as appreciation, motivation and measurement sources for student achievement. They also serve as social markers. Earned badges are publicly visible to everyone. This affects the behaviour of students who always excel in class (Hamari, 2017).

Leaderboards are visual representations of class rankings which are important because they help students concentrate on setting personal goals for the next learning activity. This feature stimulates their preference to observe top peers, regarding the determination of various performance gaps (Bai, Hew, & Gonda, 2021). Furthermore, progress bars are used to show the academic achievement levels of students and provide feedback to improve learning efforts. They are positively evaluated and accepted as management tools for the development of individual and adaptive learning strategies (Bovermann, Weidlich, & Bastiaens, 2018; Chou & Chen, 2015). Based on these results, an effective online learning environment should be able to encourage student activity in a pleasant atmosphere using the gamification model as an educational alternative.

5. Conclusion

Gamification is the use or integration of game elements and techniques in each stage of case and project-based online learning methods. This is carried out to develop student activity, strengthen positive learning behaviours and maximize enjoyment and engagement feelings in the learning process. Based on this study, CD (course development) was carried out with a case and project-based gamification model through the stages of development, evaluation/validation and product testing. In this case, the assessments of several aspects showed results in the "very good" category such as (1) instructional design (2) course opening (3) learning evaluation (4) interaction and community (5) instructional teaching and learning resources (6) learner support (7) technology design (8) course closing (9) instructional design cycle. This indicated that the learning product was feasible for learning applications.

6. Suggestions

Based on the results, the following recommendations are provided:

- This developed product needs to be implemented among the university student groups performing instructional media courses.
- For students who are unfamiliar with online learning, lecturers should provide direction on the patterns of using this product although it is designed for independent learning.
- The gamification model design should be disseminated through various scientific forums such as academic seminars, learning media development training and institutional center collaboration toward higher development and use by many people especially in the analysis of learning media.
- The development of the gamification model needs to be performed by optimizing more varied presentation methods.
- Further research should be conducted to identify the effectiveness of using this model both with classroom action research methods and experimental research and with a wider target group.

7. Limitations

The development of the gamification model for case and project-based online learning is limited to the following:

- The application of this model requires a computer or mobile device.
- Requirements for adequate internet access.

- There was no effectiveness test.
- The assessment carried out did not reach the long-term impact evaluation stage.

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