



# Gamification of 2D and 3D Animation Subjects to Improve Learning Outcomes

Hari Sugiharto Setyaedhi<sup>1\*</sup> 

<sup>1</sup> Curriculum and Educational Technology, Surabaya State University, Surabaya, Indonesia

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## ABSTRAK

Animasi 2D dan 3D dianggap oleh sebagian besar guru sebagai mata pelajaran keterampilan saja, tidak membutuhkan teori. Hal tersebut membuat peserta didik menjadi kurang berminat dalam belajar sehingga menyebabkan penurunan hasil belajar. Tujuan penelitian ini yaitu mengembangkan gamifikasi pada mata pelajaran animasi 2D dan 3D sehingga dapat meningkatkan hasil belajar peserta didik. Penelitian ini merupakan penelitian pengembangan Model Lee Owens untuk menilai kelayakan dan efektivitas gamifikasi. Untuk menguji kelayakan menggunakan validasi ahli sedangkan untuk menguji keefektifan menggunakan uji-t yang diperoleh dari nilai hasil rata-rata uji coba pretes dan postes. Penelitian ini melibatkan sampel 60 orang. Pengumpulan data menggunakan pretes dan postes, pengamatan, wawancara serta angket. Hasil kelayakan pengembangan gamifikasi dinyatakan valid dengan pertama, hasil validasi materi layak (77%). Kedua, hasil validasi media pembelajaran sangat layak (89%). Ketiga, hasil validasi desain pembelajaran sangat layak (88%). Keempat, hasil uji coba perorangan layak (78%), e) hasil uji coba kelompok kecil sangat layak (98%) dan uji coba lapangan sangat layak (89%). Hasil uji-t menunjukkan terdapat perbedaan yang signifikan (nyata) antara mean hasil belajar postes kelas eksperimen dan kelas kontrol. Disimpulkan gamification mempunyai kelayakan dan keefektifan dalam meningkatkan hasil belajar peserta didik.

## ABSTRACT

2D and 3D animation is considered by most teachers as a skills-only subject, requiring no theory. It makes students less interested in learning, causing a decrease in learning outcomes. This research aims to develop gamification in 2D and 3D animation subjects to improve student learning outcomes. This research is research into developing the Lee Owens Model to assess the feasibility and effectiveness of gamification. To test feasibility, expert validation was used, while to test effectiveness, the t-test was obtained from the average value of pre-test and post-test trials. This research involved a sample of 60 people. Data collection uses pre-test and post-test, observation, interviews, and questionnaires. The feasibility of developing gamification was declared valid, with the results of material validation being feasible (77%). Second, the results of the validation of learning media are very good (89%). Third, the learning design validation results are very feasible (88%). Fourth, the results of individual trials are feasible (78%), e) the results of small group trials are very feasible (98%), and field trials are very feasible (89%). The t-test results showed a significant (absolute) difference between the mean post-test learning outcomes for the experimental and control classes. It is concluded that gamification has feasibility and effectiveness in improving student learning outcomes.

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## 1. INTRODUCTION

Games or games are part of computer technology that is developing rapidly to this day (Krisbiantoro, 2020). Recent studies show that games can engage and motivate students (Dehghanzadeh et al., 2021; Tinedi et al., 2018). Games are very good for learning methods because by using games, students can directly participate in the learning process (Dehghanzadeh et al., 2021). Along with the modernization of time and technology, games that were originally only for entertainment have now innovated to become educational-based games or what are known as educational games. The structure and elements common to games have inspired the application of gamification in education (Kam & Umar, 2018; Marisa et al., 2022). This phenomenon means that the elements contained in the game can be used by users to carry out educational activities which make it possible to solve educational problems (Marisa et al., 2022). Educational Game Activities (EGA) was developed so that students have a sense of responsibility for their own learning, such as learning happily, comfortably, with communication and cooperative skills. Students can understand abstract concepts that are difficult to understand in lessons (Kiliç, 2022). Educational Game Activities is an educational game known as gamification (Kiliç, 2022).

Gamification is the elements contained in games to solve non-game problems (Chandross et al., 2018; Staller & Koerner, 2021). Gamification in the world of education can be said to be a process of modifying activities

and creating content similar to games (Chandross et al., 2018). Gamification aims to increase digital motivation of students to increase the quantity and quality of output from the activities concerned (Morschheuser et al., 2019). Gamification is a learning strategy that uses aspects of games to motivate students and improve the learning process (Yurissa et al., 2022). Gamification is a new methodology that consists of using it to provide motivation for students in education (Kalogiannakis et al., 2021; Parra-González & Segura-Robles, 2019). The main goal of gamification is changing student behavior or attitudes contextually" (Kalogiannakis et al., 2021). Apart from that, another main goal of gamification is to influence factors, such as motivation, to influence learning-related behavior, favor engagement with educational content, and achieve learning outcomes (Kam & Umar, 2018). Education that is reinforced with educational games can contribute to cooperative learning skills and academic achievement than traditional methods (Öztürk & Korkmaz, 2019). The results show that the effect of gamification depends on the specific characteristics of the user (Smiderle et al., 2020).

2D and 3D animation is one of the subjects in class XI. Several animated works have appeared in recent years (Liu & Sun, 2020). Animation has now penetrated the world of science education (Unsworth, 2020). This is proven by the emergence of new innovations related to animation (Vartiainen et al., 2020). "Hand Drawn Animation" was the first animation created in 1906 (Sani, 2021; Shuo, 2021). Animated films were first known in Indonesia in the early 20th century (Hikmalia et al., 2022). This encourages many researchers (Gae et al., 2021; Rihatno et al., 2020) and historians who studied the development of animation in Indonesia and then discovered the fact that there were still few animated works produced in Indonesia (Wikayanto et al., 2019). The development of animation has finally spread to all aspects, including learning activities.

Such rapid technological progress is a driving force in the world of education (Maritsa et al., 2021; Raja & Nagasubramani, 2018). The use of gamification is very useful for teachers to develop students' interpretation of certain material, because animation in gamification can provide a clear picture through a combination of sound and interesting images (Ho et al., 2019; Shuo, 2021). Making animation is not just drawing, there are several procedures that must be carried out through a complex process (Saputra et al., 2021). Therefore, adequate skills are needed to create appropriate animations, especially at the Vocational High School level.

The use of games and animation in education is given high priority and follows the emergence of new trends. The effects of gamification and animation have been noted and researched by many people (Inangil et al., 2022; Pandey et al., 2019). The use of animation in gamification in online distance learning for students can increase their knowledge and motivation (Inangil et al., 2022). One of the main goals of gamification in an educational environment is to increase student motivation and engagement (Toda et al., 2019). Today's animation and gamification can effectively create interesting educational content in graphic form so that it is able to depict various aspects of the subjects being researched and is dynamic in nature (Inangil et al., 2022). Gamification is emerging as a teaching approach that is effective and fun, provides motivation, and makes the learning process more interesting and active. In learning, animation is a learning medium that is able to bring about constant changes over a certain period of time (Bicen & Kocakoyun, 2018; Fijačko et al., 2020; Teplá et al., 2022).

Observations made by researchers at SMKN 1 Surabaya, teachers did not focus too much on teaching theory in 2D and 3D animation classes because according to them these subjects only focused on skills and the products being made. This is not commensurate because not all students have the same understanding (Noviana et al., 2019). Learning in class feels undeveloped and feels boring. This makes students think that animation subjects are difficult and uninteresting, so that students' learning achievement decreases. In connection with the above, the grades of class XI Multimedia students are below the KKM. This situation can be said to have occurred gap analysis between the hope of fun animated learning through games and the reality that almost all teachers at SMKN 1 Surabaya have not developed gamification, this will of course affect the effectiveness of teaching this subject (Arsanti, 2018). Learning outcomes are defined as the level of mastery of the material provided and changes in behavior after they take part in the learning (Alexandro et al., 2022; Nurrita, 2018). Learning strategies are used by teachers in carrying out teaching to improve the quality of learning (Muazzomi & Sofyan, 2021). Good learning must pay attention to: 1) learning should be student centered, meaning students are more active), 2) the learning process is expected to make students more creative, 3) learning can create an atmosphere that is encouraging and full of challenges, 4) has moral, aesthetic, ethics, logic and kinestics and 5) learning can create learning experiences or learning experiences that are contextual, effective and meaningful (Suarsih et al., 2020). Teachers still use conventional strategies with lectures and questions and answers which causes students to become bored (Dwi et al., 2021; Wijayanti et al., 2021). To overcome the problems described above, researchers developed gamification to improve learning outcomes in 2D and 3D animation subjects, it is hoped that this can provide new breakthroughs that can overcome learning problems.

Previous research findings state demonstrate effectiveness in student engagement (Rahman et al., 2018). Other findings also state that gamification can also help students solve problems, organize data logically, and model problems, and increase learning motivation (Fitria, 2023; Ningsih, 2021). The application of gamification in learning has an influence on increasing their motivation and involvement during the teaching and learning process. The positive impact of gamification on student behavior and learning outcomes, including affective,

cognitive, behavioral, and performance or others (Nurtanto et al., 2021; Senthil Kumaran V et al., 2023). In the implementation of gamification game elements such as points, leaderboards, are provided to learners for a better e-learning experience (Alsawaier, 2018; Inangil et al., 2022). Based on these findings, it can be concluded that 3D models and animations have a positive effect on students and teachers should include visual aids in their lessons. Gamification will be developed as content gamification, applying game elements but not turning the material into an actual game (Yurissa et al., 2022). Using Android cellphones as a means of gamification (Benitez et al., 2022). The use of Android cellphones is the right tool to improve learning outcomes effectively and efficiently compared to those who don't use it (Aisyah Mustikasari et al., 2023). This modification is an unprecedented novelty in the subject of 2D and 3D animation. The urgency of this research is that gamification can facilitate the process of learning activities and solve learning problems faced by students (Chandross et al., 2018; Hendriyati Haryani et al., 2023; Wijaya et al., 2021; Yurissa et al., 2022). Through these activities, students can learn learning activities and make the content like a game. This research aims to assess the feasibility and effectiveness of gamification in 2D and 3D animation subjects so that it can improve student learning outcomes.

## 2. METHOD

This type of research is development research. This research intends to develop gamification that is feasible and effective for use (Rahman et al., 2021). The development stages follow the Lee and Owens model, namely 1) Assessment & Analysis 2) Design, 3) Development 4) Implementation 5) Evaluation (Lestari, 2018). Feasibility data was obtained from the implementation stage, while effectiveness data was obtained from the evaluation stage. For gamification feasibility testing purposes, it is required development research subjects for validation, namely: 1 material expert, 1 media expert, as well as 1 design expert learning. Products in the form of gamification also need to be tested on 3 students, namely: individually people, small groups of 6 people to large groups of 36 people. Students were selected heterogeneously with high, medium and low abilities. To test effectiveness gamification with a sample size of 60 students at SMKN 1 Surabaya. To test the effectiveness of Researchers divide the class into 2, namely the experimental class and the control class. The experimental class was given treatment using gamification, while the control class using conventional methods. The subjects of this research used simple random sampling (Sugiyono, 2017). Data was analyzed quantitatively descriptively. Quantitative analysis techniques are used to calculate feasibility and effectiveness gamification. Gamification first validated by experts (expert judgment) in terms of media, materials and learning design. The prerequisite tests for normality and homogeneity are carried out before the hypothesis is tested (Wingga Pratami et al., 2019). The trial instrument uses objective questions (multiple choice). The validity of the questions is tested using the point biserial formula, while the reliability test uses the KR-20 formula.

Data collection methods are observation, interviews and questionnaires. a) The observation or observation method is the collection of data by direct observation and designed systematically for research purposes to carefully examine the activities carried out (Khoridah et al., 2019; Muchta, 2019; Pramana et al., 2020). Data obtained through the observation method is more accurate because researchers observe directly according to reality (Dwiqi et al., 2020). Observations were carried out at SMKN 1 Surabaya with the research object being Multimedia Class students who were taking 2D and 3D animation subjects, b) the interview method was data collected through systematic question and answer and the results were documented. The interview method aims to obtain accurate data from the questions in the interview (Khoridah et al., 2019), c) The questionnaire method is a data collection technique where researchers present a list of questions to media experts, material experts, and learning design experts with the aim of measuring the feasibility of graphic media gamification products (Dwiqi et al., 2020; Pramana et al., 2020). The questionnaire method is used to obtain accurate data from the questions contained in the questionnaire (Khoridah et al., 2019).

The development model for this research was adopted from Lee Owens' model (Lee & Owens, 2004). This model is suitable for multimedia development (Rorita et al., 2018). The Lee & Owens model has 5 stages of development, namely 1) assessment & analysis 2) design, 3) development 4) implementation 5) evaluation (Lestari, 2018). 1) The Assessment & Analysis stage is divided into two, namely needs assessment and Front - end Analysis. Need assessment or needs analysis is used to identify gaps in the learning process, where the expected conditions do not match real or ideal conditions. Front-end Analysis or initial and final analysis is a collection of techniques used to overcome gaps obtained from the analysis results. 2) The Design Stage or design is the planning stage in multimedia development. This stage is the most important part in determining the results of the product to be developed. At this stage what is carried out is the Course, Design Specification (CDS) or creating material design product specifications, 3) Development stage. is the development stage where the product specifications that have been designed will be developed in accordance with the objectives of the learning needs. In this development stage there are many things must be considered, such as content, aesthetics (visual and audio), material content, navigation and evaluation. 4) Implementation is the trial stage where the product that has been developed will be used or tested in real learning, with the help of media experts, materials, and learning design

experts to determine the level of suitability and effectiveness of the media. 5) Evaluation is the final stage in the Lee & Owens model which is no less important than the other stages. The evaluation stage is carried out after implementation to determine the effectiveness and efficiency of the product and provide further suggestions or revisions.

Feasibility testing is carried out by subject experts, media experts, and learning design experts before development gamification implemented. The feasibility test uses several questionnaires, aiming to find out whether gamification what has been developed is suitable for implementation or not. As for the instrument grille from learning material experts, learning media experts, and learning design experts, individual, small and field trials. The learning material expert instrument grid consists of aspects; 1) precision, completeness, balance, accuracy, suitability, systematic presentation, contextual, test quality, flexibility, instructional interaction, and grammatical suitability (Andriana & Setyaedhi, 2023). The learning media expert instrument grid consists of aspects; identify programs, images, animations, videos, fonts, colours, relevance, resolution, functions, game elements, and interactives (Andriana & Setyaedhi, 2023; Surjono, 2017). The learning design expert instrument grid consists of aspects: curriculum, learning objectives, material content, student characteristics, interactive, media, learning resources, and tests (Andriana & Setyaedhi, 2023). The individual, small and field group instrument grid consists of aspects; Content Material, language, interactive, knowledge, individual, visual presentation, audio presentation, and flexibility (Andriana & Setyaedhi, 2023).

After the instrument grid and test subjects (individual, small and field groups) have been completed, the next step is to test the validity of the instrument. Experts validate the instrument on the instrument items, the assessment results are in accordance with the feasibility category (Pangestu et al., 2019). Meanwhile, to determine the effectiveness of gamification, trials were carried out using the quasi experimental design method. The t-test calculation was carried out by comparing the pre-test and post-test means of the experimental and control classes.

### 3. RESULT AND DISCUSSION

#### Result

This research analyzes two things, namely: a) analyzing the feasibility of development gamification graphic media, b) analyze the effectiveness of development gamification. The two analyzes will be reviewed below: a) analyzing the development feasibility test gamification. First, analyze. The analysis stage is divided into two, namely needs assessment and front-end analysis. Need Assessment (Needs Analysis) is obtained from: teacher interviews, facility analysis, and students. As a result of in-depth interviews with teachers at SMKN 1 Surabaya, several obstacles were found, namely the difficulty of students in memorizing theory in 2D and 3D animation subjects. These subjects are in the form of rote memorization, not practice that is of interest to students. The teaching style used by animation subject teachers so far is using project demonstrations, where the teacher shows video tutorials for making animation on a projector screen without explaining in detail at the beginning regarding the basic principles of animation. This is done because time is limited. Students are provided with animation worksheet book facilities and in the learning process animation teachers use YouTube media as reference material where students are free to use any software including those demonstrated by subject teachers.

Other supporting facilities in the classroom so far include LCD projectors in each class, and 24 monitors/PCs in one room in the computer laboratory, a total of 48 for 2 laboratory rooms. When learning animation, students are required to go to the laboratory, but with only half as many monitors as the number of students, many still use personal laptops. In the Multimedia department, students tend to like learning that uses media. Students are more interested in learning with video, animation or audio, but there is no new learning media that accompanies students in mastering the basic principles of animation which results in problems in student learning outcomes. Students tend to feel bored using book media. The main point obtained is how to overcome students' boredom in learning. Front-end analysis is obtained from the results of a questionnaire created in Google form to determine students' learning needs. Researchers used a questionnaire to determine students' learning styles. Based on the results of the questionnaire on Google form, it was concluded that 95% of students liked the visual auditory learning model. In the questionnaire, it was found that 80% of students did not understand the animation concept being taught. Based on these problems, gamification needs to be developed to overcome the lack of learning facilities, interest, time constraints, etc.

Second, design. In the design stage, researchers carry out 1) designing a lesson plan to understand how development goals and skills will be realized, 2) designing a framework such as: Program identification (consisting of media title, media type, targets, subjects, basic competencies, general goals, special goals, format, outline of material content, outline of content), Material, Flowchart, and Script. 3) designing references such as: Student worksheets, journals, YouTube and others.

Third, development. The process uses several applications such as: Microsoft Word, Photoshop voice in web and structure. The appearance of this media design is as follows: 1) The Home slide has three buttons, namely the start button, information button and profile button. 2) Slides, the Information Menu has three buttons, namely,

objectives, instructions and functions, each of which has information in it. 3) the Program Objectives slide contains several program objectives explained, as evidence of the development background gamification. 4) The Usage Instructions slide contains the steps that must be taken when using gamification, 5) Slides Button Functions contains information regarding the use of the buttons provided in gamification, 6) Slides Developer Profile. The developer profile slide contains information regarding the developer's biodata gamification. 7) The initial slide of the game uses a narrator's voice to inform the next step that the main character "Woody" must take to get to the level menu. 8) The Level Menu slide contains levels from 0 - 12 that the player must go through to complete the character's "Woody" mission main, 9) The material slide contains several materials according to the levels passed, for example above is an image of the material slide at level 12. 10) The quiz slide contains questions according to the material that has been studied at that level. Development results are presented in Figure 1.

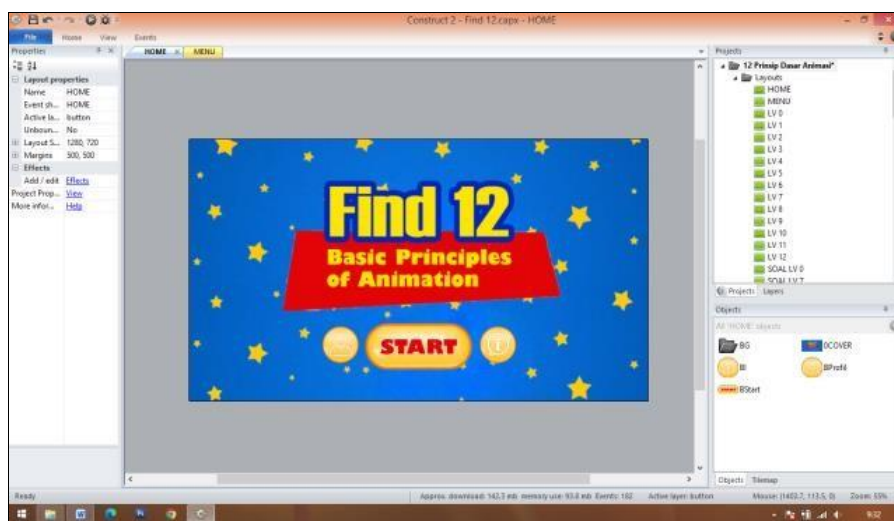


Figure 1. Media Development Results

Fourth, implementation. The activities carried out in this phase are: 1) testing the product through several scientific stages. This is done so that the product is valid, reliable, and its usefulness can be measured and tested by involving material experts, media experts, and learning design experts. At this stage, media experts will assess the suitability of the product in terms of appearance and functioning of each existing program gamification and accompanying materials. The material experts will assess the material presented here gamification this. After assessing its feasibility, the researcher received input, suggestions and constructive responses from media and material experts. After that, the researcher carried out revisions according to the notes provided by the relevant parties so that the resulting media meets standards and meets the needs of students, 2) product trials which include individual group trials of 3 students, small group trials of 6 selected students. Heterogeneously, a field trial of 36 students. After testing, 16 students were asked to provide responses or opinions about gamification which was developed as a form of evaluation to minimize deficiencies. Assessments carried out by experts and product trials are intended to determine feasibility gamification which has been developed.

Table 1. Product Validation Assessment Results

Test Subjects	Amount	Validity Results	Information
Learning materials expert	1	77%	Worthy
Learning media expert	1	89%	Very Worth It
Learning design expert	1	88%	Very Worth It
Individual Trial	3	78%	Worthy
Small Trial	6	98%	Very Worth It
Langan Trial	36	89%	Very Worth It

Observing Table 1 shows that: feasibility test using Calculation of All Aspects (PSA) using a scale 5 questionnaire. Expert assessment of the content of learning material scored 96% (very feasible), expert assessment of learning media scored 96% (very feasible), expert assessment of design learning score 94% (very feasible), individual trial results scored 94% (very feasible), small group trial results scored 94% (very feasible).

Fifth, evaluation. The activity carried out at the evaluation stage is an evaluation of the gamification product. The evaluation carried out in this development research was based on a feasibility test. The media

feasibility test is evaluated based on the results of expert validation and product trials. The effectiveness test of the gamification being developed can be seen from the data analysis calculations from the test results. Evaluation of gamification development aims as follows: 1) students' attitudes towards learning activities as a whole, 2) increasing students' abilities, 3) institutional profits as a result of increasing students' competencies (Cahyadi, 2019). Analyzing the effectiveness test of gamification development is as follows: the results of the validity of the test items show that all test items have  $r_{\text{count}} > r_{\text{table}} = 0.468$  with  $N = 18$  at the 5% significance level. The results of reliability calculations show that  $r_{\text{count}} = 0.898 > 0.70$ . The test criteria are if the reliability value of the calculation results is  $> 0.7$  then the instrument is said to be reliable (Siregar, 2017). Before carrying out the t-test there are two requirements, namely: the data must be normally distributed and homogeneous. The t-test was carried out to determine the overall calculation results of the research.

Based on the normality test, the Sig. value is known. (2-tailed) is 0.206 for the experimental class (pretest) and 0.102 for the control class (pretest), each above 0.05, so the data can be said to be normally distributed. Data analysis results Sig. value is known. Levene's Test for Equality of Variances is  $0.740 > 0.05$ , so it can be interpreted that the data variance between the experimental class (pretest) and the control class (pretest) is homogeneous or the same. In the "Equal variances assumed" section, the Sig. value is known. (2-tailed) is  $0.688 < 1.677$ , so as is the basis for decision making in the independent sample t-test, it can be concluded that  $H_0$  is accepted and  $H_a$  is rejected. Thus it can be concluded that there is no significant (real) difference between the average value of learning outcomes for the experimental class (pretest) and the control class (pretest). The second t-test is to compare the experimental class (post-test) with the control group (post-test).

Based on the normality test, the Sig. value is known. (2-tailed) of 0.248 for the experimental class (post-test) and 0.90 for the control class (post-test), each above 0.05, then the data can be said to be normally distributed. Data analysis results Sig. value is known. Levene's Test for Equality of Variances is  $0.324 > 0.05$ , so it can be interpreted that the data variance between the pretest experimental class and the control class is homogeneous or the same. In the "Equal variances assumed" section, the Sig. value is known. (2-tailed) is  $2.425 > 1.677$ , so as is the basis for decision making in the independent sample t-test, it can be concluded that  $H_0$  is rejected and  $H_a$  is accepted. Thus, it can be concluded that there is a significant (real) difference between the mean post-test learning outcomes for the experimental class and the control class. This means that the experimental class (post-test) and control class (post-test) experienced a significant increase in the average score of students. The experimental class (post-test) that uses gamification, the average score of students is much better than the control class (post-test) without using gamification, so it can be concluded that gamification is effective in improving student learning outcomes.

## Discussion

Gamification is a specially organized system that involves various activities aimed at learning and educational outcomes through game mechanisms (Lam & Tse, 2022; Raitskaya & Tikhonova, 2019). Gamification often used as a term that refers to the use of game elements (non-game context) to motivate students and make learning much more interesting (Lam & Tse, 2022; Wijaya et al., 2021). The advantages of gamification are 1) it can replace the role of the teacher, 2) it can replace books, listening to lectures, exams, 3) the material is presented more interestingly, 4) it can motivate students to learn (Hendriyati Haryani et al., 2023; Hutson et al., 2022). The ease of accessing media causes students to be interested in re-accessing the material they have studied outside of lecture hours. This is supported by research (Setiyaningsih et al., 2019).

The results of the material feasibility test were 77% (feasible), media were 89% (very feasible), learning design was 88% (very feasible), individual trials were 78% (feasible), small group trials were 98% (very feasible), and field trials of 89% (very feasible) for use. Meaning this research shows that the learning outcomes of students who use gamification are more appropriate than those of students who do not use it gamification (Arisa et al., 2020; Wardani & Susilowibowo, 2021). This supports the results of previous relevant research that there is a positive influence of gamified learning on learning outcomes (Smiderle et al., 2020). In addition, the results of this study support research that entitled Using Gamification in Education: A Systematic Literature Review which states that gamification can improve students' learning performance in addition to motivation, engagement, self-efficacy (Fabricio De, 2018). In field trials it was observed that students were more enthusiastic in learning. This is in accordance with Olivera's research which states that gamification can also increase students' concentration, motivation, involvement and other positive experiences (Oliveira et al., 2023). The enthusiasm of students is caused by increased motivation of students in the academic field when they use gamification (Redy & Ariningsih, 2020; Rincon-Flores et al., 2022).

The implication or contribution of the results of this research is development gamification which can improve learning outcomes. The results of this research can be used as an empirical basis for practitioners or teachers who will teach 2D and 3D animation subjects to use the gamification method. It is possible that similar subjects or those that have the same characteristics can also use gamification methods. This is according to research which states that gamification can improve skills and optimize their learning (Ariessanti et al., 2020; Nisa et al.,

2020; Smiderle et al., 2020). This development product can be monitored for its level of suitability for improving student learning outcomes. This is quite reasonable because of several benefits gamification 1) helps develop students' cognitive aspects, 2) in some cases, helps physical development, 3) increases students' active participation in the classroom, 4) helps students understand the material, and 5) gamification can not only be applied in the classroom just class (Redy & Ariningsih, 2020; Wardana & Sagoro, 2019).

The limitation of this research is development gamification still limited to SMKN 1 Surabaya and for 2D and 3D animation subjects. So this gamification is recommended. Later it can be expanded to high school and vocational school levels and to other subjects. Researchers who will develop gamification are expected to expand the scope of the subject and apply it to other fields of science. The research results show that gamification can be integrated into various scientific disciplines (Marisa et al., 2022; Yaniaja et al., 2021). Gamification in the field of education must be developed as a form of innovation in motivating students (Chandross et al., 2018; Permata & Kristanto, 2020). Gamification can be said to be feasible if the validation results from experts are categorized as feasible or very feasible. With the help of gamification, students can create their own information, study a lot of material and learn independently (Khusniyah, 2020).

#### 4. CONCLUSION

The development of gamification received a very worthy qualification. It was concluded that the development of gamification was proven to be feasible and effective in improving student learning outcomes. Based on the findings above, it is recommended that students can utilize technology, especially in the learning process. Teachers use gamification as learners, teachers must remain at the forefront and master technology to overcome all learning challenges in the classroom. This gamification only requires android smartphones which does not burden the device. This gamification can only be done online offline and flexible so it can be used anywhere and anytime. Further research with different material is presented in a more varied manner and interesting to improve student learning outcomes.

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