

Gamification for Learning Evaluation

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Abstract – This study develops applications for learning evaluation using game methods and their use in measuring the success rate of implementing game-based learning evaluation on student achievement. In this study, we designed and implemented a game application for learning evaluation that can be used to measure student achievement. This application challenges players to be able to complete the game well while determining the learning outcomes received by participants.

Keywords – gamification, learning evaluation

I. PREFACE

In order to measure the success of the transfer of knowledge to students, the paper-based exam is a traditional way of learning evaluation.

The exam is one method to evaluate whether a learning process has reached its goal or not. Evaluation is one of the important components and stages that must be taken by a teacher. [1]

The use of technology in learning has long been used to help improve the quality of learning. The use of technology in the learning process, especially computer technology makes it easier for educators to explain learning material that is abstract in nature and far from the reasoning of students to be easily accessible or understood. Through learning technology, educators will easily carry out learning simulations approaching the real conditions of abstract learning material. [5]

The development of information and communication technology makes the media used to evaluate learning more sophisticated. The importance of developing media for learning evaluation is one of the determining factors for measuring the success of knowledge transfer to students. Through the development of game-based learning evaluation media, the evaluation process can be more interesting and fun for students.

According to Gesta Wahyu Sasongko, et al, most students feel nervous when carrying out learning evaluations due to the absence of interesting and fun media to support learning evaluation resulting in evaluation being feared or making students nervous. This code causes students to not be able to show their best achievements.[2]

The problem to be solved from this paper is how to build a game based for the evaluation of learning outcomes and measure the success of implementing gamification learning evaluation on student achievement.

This study proposes the game-based application can be used as a media for learning evaluation, assist lecturers in learning evaluation, facilitate lecturers to correct the evaluation results, helping students not be nervous or feel the evaluation is a scary thing, and helping students to show their best achievements / express what is understood from the learning process and measures the success rate of implementing game-based learning evaluation on student achievement.

The rest of this paper is organized as follows: section II related research about learning evaluation, computer-based exams and the development of learning media using game methods. Section III explanation of the game. Section IV implementation and evaluation of the game. Section V report and result from implementation evaluation from the game. And the last section explains the conclusion and future works.

II. RELATED WORKS

Evaluation is a process for determining quality rather than related to values and meanings taking into account certain criteria. To obtain better evaluation results, an evaluation process must provide principles of continuity, comprehensiveness, fairness and objectivity, co-participation and practical.

The main purpose of the evaluation is to get accurate information about the level of achievement from the instructional goals of students so that the follow-up actions can be pursued. such as placement in the right place, giving feedback, diagnosing students' learning difficulties and determining graduation.

According to Harmiyuni, et al. The implementation of computer-based exams compared to the paper-based, has many advantages [3] :

1. Computer-based exams are more effective because there is no need to do rounding in answering questions.
2. More cost-effective because there are no more costs for printing questions and answer sheets.
3. Test results are valid and accountable because the participants are difficult to get help from any party.
4. Increasing participant literacy towards information and communication technology.
5. Minimizing the occurrence of leak test questions because the questions can only be accessed during exam hours.
6. Stakeholders difficult to provide assistance and participants difficult to collaborate in the exam because the test questions are randomly automated by the server.
7. Student exam results are faster to know because the server directly processes the test results.

From all these advantages computer-based exams will foster confidence and honesty of participants because they will not be able to get help from any party.

Several studies on the use of games as a method of learning have been conducted, Hery Haryanto, et al. conducted research on the application of personal finance management learning media in elementary age that produces cashflow games as a medium for learning social science about personal finance management in 3rd-grade elementary school. [4]

Another study was conducted by Tony Arifin, et al. created an educational game-based science media that was integrated solar system material with Facebook sites in the 8th-grade junior high school, as well as to find out the

attractiveness, convenience, and effectiveness of science media-based educational games integrated with Facebook sites. [5]

Another study was conducted by arik kurniawati who aimed to improve the competence of programming skills by creating game-based learning applications. From the results of the study, information was obtained that game-based learning can increase students' motivation and interest in learning and can help understand the material provided. [6]

The development of learning evaluation using the game method was carried out by Gesta Wahyu Sasongko, et al. who carried out game development as a media for learning evaluation in 10th-grade computer assembly subjects majoring in multimedia. Observations in several Vocational Schools in Malang, several problems were found, most students were still experiencing nervousness when facing evaluations and could make students unable to produce their best abilities. After observing students and teacher interviews, the results show that students and teachers support an interesting media evaluation game and can reduce students' nervousness. [7]

III. DESIGN

A. Game Design

1. Game Space



Picture 1. The Game Space

Picture 1 shows the game space in a full-screen web-page that shows the board games, question, and answers button.

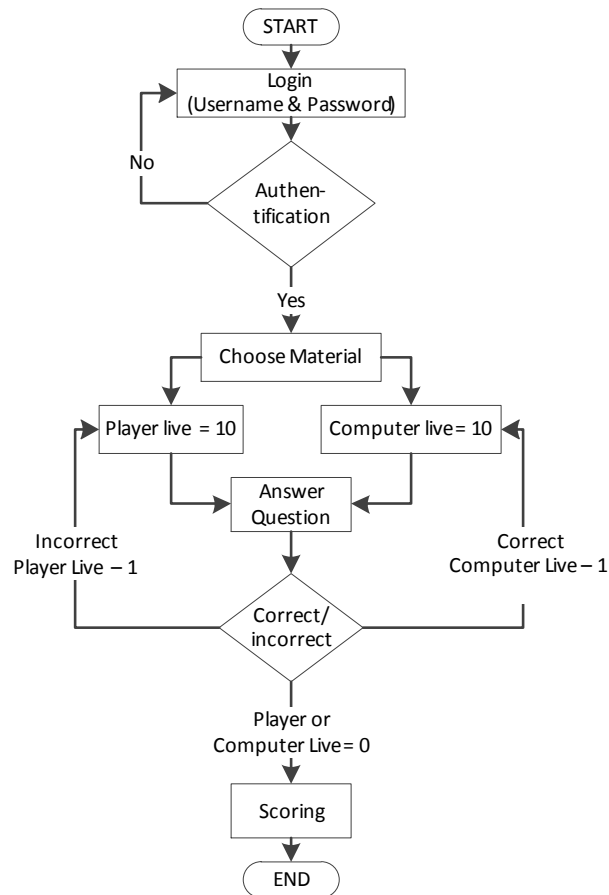
2. Game Rules

Players must answer the questions by choosing 1 of 4 options to move to the next question.

3. Boundaries

- The Game plays when the player clicks the start button.
- The board game consisting of 10 lives between player and computer that must be finished by the participant with answering the questions correctly.
- Scoring based on the quality of answers.

4. Rule for Interaction



Picture 2. The Rule for Interaction

Picture 2 shows the rule for the interaction of the game.

a. Entering Student ID and Password



Picture 3. Login Page

Picture 3 shows the first step to start the game, the player must fill the login page by typing the student ID and password. If the Student ID and password entered correctly, the player will be directed to the Material map.

b. Chose the material and press the start button.



Picture 4. Material

Picture 4 shows the map must the player completed all material and the player can play the game with press the start button.



Picture 5. Game Board

Picture 5 shows the game board. Player has 10 lives and computer also have 10 lives. Choose the answer to the next question.

c. Answer the picture appear.



Picture 6. Random Picture and Answer Option Button

Picture 6 shows the picture that the player can start the game by answering the random picture that appears. The player must choose 1 answer from the options button.

d. Correct Answer



Picture 7. Computer Live Decreased

Picture 7 shows the computer live will be decreased if the player answers correctly and can move to the next random question.

e. Wrong Answer



Picture 8. Computer Live Decreased

Picture 8 shows the player live decreased if the player chooses the wrong answer and continue the next random question.

5. Objectives

The player must answer the question correctly

6. Challenges

- Complete the game by answering the questions correctly as many as possible.
- The player must be as little as possible giving the wrong answer to get the maximum score.

7. Goal

Tebak Gambar Alat Instrumentasi Selesai !!

NIM : P07134117220
NAMA : AGUSTINA MAWARNI
BENAR : 10
SALAH : 2
SKOR : 90,00

Kembali

Picture 10. Result

Picture 10 shows the result if the player is stated completed the game or learning evaluation when they finished the game. Player got information about the number of correct answers and the number of wrong answers and the final score.

B. Game Mechanics

1. Mobility

The player can move to the next question by choosing 1 of 4 option button at the bottom of the picture question.

2. Questions

- Each question consists 4 answer choices button.
- Each material consists of several questions.

3. Scoring

To provide an assessment of student achievement, this application processes data obtained from the work of the player and then calculate using the table :

True	False	Score
10	0	100,00
10	1	95,00
10	2	90,00
10	3	85,00
10	4	80,00
10	5	75,00
10	6	70,00
10	7	65,00
10	8	60,00
10	9	55,00
9	10	50,00
8	10	45,00
7	10	40,00
6	10	35,00
5	10	30,00
4	10	25,00
3	10	20,00
2	10	15,00
1	10	10,00
0	10	00,00

4. Application

This application interface uses the PHP programming with MySQL database run on the server and the participants can be accessed online via the internet or intranet.

IV. IMPLEMENTATION AND TESTING

A. Participant

In order to measure the effectiveness of the use of learning evaluation applications using the game method and random questions, we asked 21 students of the 4th-semester diploma IV at health polytechnic of Banjarmasin who participated in the instrumentation materials in accordance with the data to be tested. Participants consisted of 1 man and 20 women.

B. Testing Method

The application is run on a website. Application is distributed via internet networks.

Participants use the application through their computer that is connected to the server via the internet.

C. Evaluation Models

In order to get feedback on the application that is made, an evaluation is needed that explores how this application can have a positive impact on the participants.

There are 3 main things that are evaluated: Stress levels of participants when attending learning evaluations, experience following a game-based learning evaluation, experience following learning evaluation using random questions. Each main things are described in 4 specific

questions that are answered with a statement that strongly agrees, agrees, disagrees, strongly disagrees.

Kuesioner Penelitian
Tingkat Stress Mahasiswa Dalam Menghadapi Evaluasi Pembelajaran Berbasis Permainan

Berikut ini adalah kuesioner yang berkaitan dengan penelitian tentang tingkat stress mahasiswa dalam menghadapi evaluasi pembelajaran berbasis permainan. Oleh karena itu, kami mohon dengan hormat kesediaan Anda untuk dapat mengisi kuesioner berikut ini. Jawablah kuesioner secara obyektif sesuai dengan apa yang Anda rasakan.

Usia : _____ tahun
 Jenis Kelamin : ☐ Laki-Laki ☐ Perempuan

Peluruik pengisian : Mohon klik pada setiap pernyataan yang Anda pilih.
 Keterangan :
 SS = Sangat Setuju
 S = Setuju
 TS = Tidak Setuju
 STS = Sangat Tidak Setuju

Picture 11. Questionnaire Display

Picture 11 shows the questionnaires that must be filled out by participants after following the learning evaluation.

No	Pertanyaan	Pernyataan
Stress Mahasiswa Menjalani Evaluasi Pembelajaran Berbasis Permainan dan Soal Random		
1	Saya tidak merasa pusing / sakit kepala	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
2	Saya tidak merasa gugup	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
3	Saya tidak merasa gelisah / cemas	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
4	Saya tidak merasa ujian menjadi beban	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
5	Saya tidak merasa tegang	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
Evaluasi Pembelajaran Berbasis Permainan		
6	Saya merasa enjoy dalam menjalani evaluasi pembelajaran berbasis permainan	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
7	Saya merasa lebih percaya diri dalam menjalani evaluasi pembelajaran berbasis permainan dibandingkan evaluasi pembelajaran tertulis	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
8	Saya merasa kelegaan menghadapi evaluasi pembelajaran teratikan dengan permainan	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
9	Saya merasa tertantang untuk menyelesaikan permainan dengan cepat	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
10	Saya merasa evaluasi pembelajaran dengan permainan lebih baik dari evaluasi pembelajaran tertulis	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
Evaluasi pembelajaran Dengan Soal Random		
11	Saya merasa penasaran dengan soal yang muncul selanjutnya	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
12	Saya merasa tertantang untuk menjawab soal dengan benar	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
13	Saya merasa gembira apabila dapat menjawab soal dengan benar	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
14	Saya merasa saya senang dengan model soal evaluasi pembelajaran random dibandingkan soal yang sudah ditentukan	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS
15	Saya merasa evaluasi pembelajaran dengan soal random lebih menantang dibandingkan soal yang sudah ditentukan	<input type="radio"/> STS <input type="radio"/> TS <input type="radio"/> S <input type="radio"/> SS

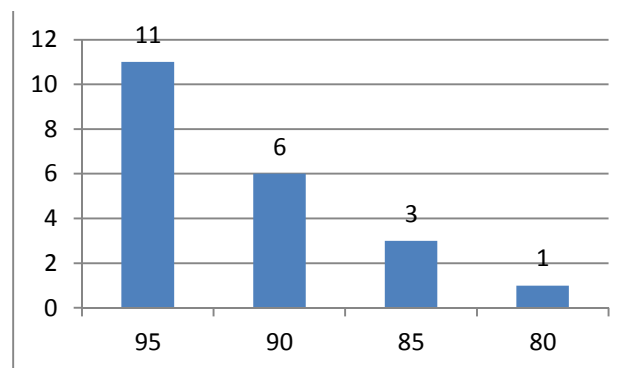
Picture 12. List of Questionnaire Questions

Picture 12 shows a list of 15 questions in the questionnaire.

V. RESULT

A. Result

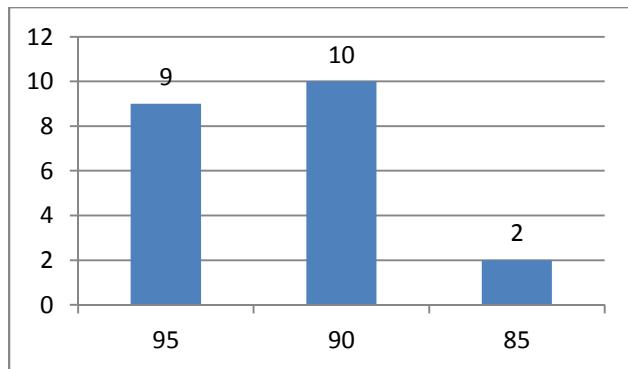
Based on the results of the implementation of the learning evaluation followed by the participants, the score of participants is obtained.



Picture 13. Number of participants and score instrument picture material

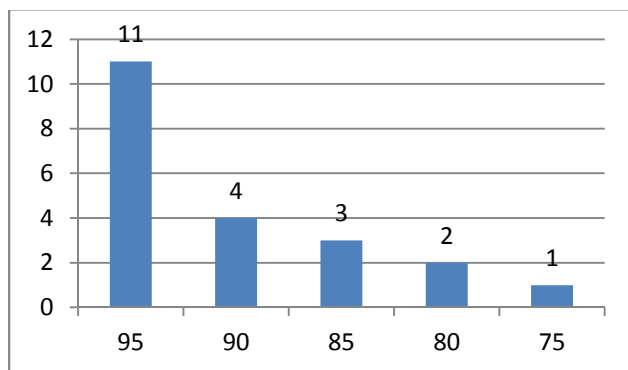
Picture 13 shows that 11 participants get score 95 it means the participant just choose 1 wrong answer, 6

participants get score 90 it means the participants choose 2 wrong answers. 3 participants get 85 or choose 3 wrong answers and 1 participant get score 80 or choose 4 wrong answers to complete the instrument picture material.



Picture 14. Number of participants and score instrument function material

Picture 14 shows that 9 participants get score 95 it means the participant just choose 1 wrong answer, 10 participants get score 90 it means the participants choose 2 wrong answers and 2 participants get 85 or choose 3 wrong answers to complete the instrument function material.

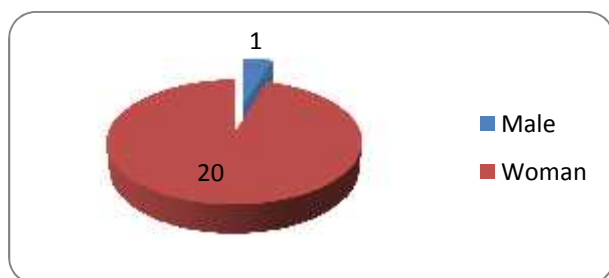


Picture 15. Number of participants and score instrument work principle material

Picture 15 shows that 11 participants get score 95 it means the participant just choose 1 wrong answer, 4 participants get score 90 it means the participants choose 2 wrong answers. 3 participants get 85 or choose 3 wrong answers. 2 participants get 80 or choose 4 wrong answers. 1 participant get 75 or choose 5 wrong answers to complete the instrument work principle material.

B. Evaluation

The evaluation was carried out by filling out the questionnaire after the learning evaluation. The questionnaire respondents were participants in the learning evaluation. This questionnaire aims to explore the experiences felt by participants.



Picture 17. Gender Participant

Picture 17 shows the evaluation respondents were 21 people consisting of 1 male or 5% of the total respondents and 20 women or 95% of the total respondents.

The following will be presented are the recapitulation of the results of the questionnaire based on 3 main things. The stress level of participants when participating in learning evaluation, the experience of participating in game-based learning evaluation, and the experience of participating in learning evaluation using random questions.

No	Question		%
1	I don't feel a dizzy / headache	71	84.52
2	I don't feel nervous	73	86.90
3	I don't feel anxious	73	86.90
4	I don't feel the test is a burden	65	77.38
5	I don't feel uptight	69	82.14
	Sum	351	417.84
	Mean	70.20	83.568
	Conclusion	Strongly Agrees	

Picture 18. Participants Didn't Feel Stressful When Following Learning Evaluation

Picture 18 shows that 83.568 % of respondents stated strongly agree with the statement that they did not feel stressed during the learning evaluation.

No	Question		%
1	I feel enjoy following the game-based learning evaluation	68	80.95
2	I feel more confident in following game-based learning evaluations than evaluating written learning	65	77.38
3	I feel tension following evaluation of distracted learning with the game	65	77.38
4	I feel challenged to finish the game quickly	68	80.95
5	I feel that game-based evaluation is better than paper-based evaluation	66	78.57
	Sum	332	395.23
	Mean	66.4	79.046
	Conclusion	Strongly Agrees	

Picture 19. Participant's response to Game-Based Evaluation Model

Picture 19 shows that 79.046 % of respondents stated strongly agree with the game-based learning evaluation statement.

No	Question		%
1	I feel curious about the question that appears next	70	83.33
2	I feel challenged to answer the question correctly	69	82.14
3	I feel happy when I can answer the questions correctly	69	82.14
4	I feel happy with the random question model compared to the predetermined question model	66	78.57
5	I feel the learning evaluation with random questions is more challenging than a predetermined question model	65	77.38
	Sum	339	403.56
	Mean	67.8	80.712
	Conclusion	Strongly Agrees	

Picture 18. Participant's Response to Evaluation Model With Random questions

Picture 18 shows that 80.712 % of respondents stated strongly agree with the learning evaluation using random questions.

VI. CONCLUSION DAN FUTURE WORKS

A game-based method using a computer can be used as one of the alternatives for learning evaluation because it has several advantages including reducing costs, evaluating results can be immediately known, reducing stress, and give the participants maximum achievement.

This application still lacks in terms of design and gameplay, in the future researchers will develop the application using better designs and more challenging gameplay.

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