

# LEARNING MEDIA BASED ON GAME BASED LEARNING TO LEARN DIGITAL TECHNIQUES

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## ABSTRACT

A computer as a learning medium has been used for many years lately. Yet, a computer game that is used as a learning medium not so many researches to measure the validity for a learning medium. Therefore the objective of this research is to measure the validity of computer game as a learning medium and the student's response after using the computer game.

The Game Based Learning (GBL) method is used in this research. It has input-process output model of instructional games and learning that appropriate for development a game as a learning medium. By playing a game, GBL method can give enjoyment and experience for the players (students).

The validation results of GBL as a learning medium shows significant outcome. The validation results come from three experts to assess three aspects such as: game aspects, the material of the problem and the construction of the problem. These aspects have criteria *very valid* for all the criteria of the instrument. Furthermore, we also measure responses from twenty students to appraise the aspects of computer game. These aspects consist of two aspects such as: the attractiveness of the computer game and the aspect of understanding of the material. These aspects also have criteria *very valid* for all the criteria of the instrument.

**Keywords:** *Game Based Learning, Computer Game, Validity, Simulation*

## 1. INTRODUCTION

The using of computer has grown rapidly in various fields such in industry, military, health, education etc. In education, computer has been used as media of education to teach students through the using of power point, simulation, programming and so on. Media computer can be used as a tool to teach students to learn a learning material. The computer can simulate a process such as in physic law, biology law, mathematics law and many more [7]. The computer also can simulate those laws similar to the real system. In the real system, if we want to learn something, we must wait and follow the process. But by using computers, we can produce and replicate the process many times without waiting as though in the real system [13].

The computer that is used as learning media has some advantages such as: more reliable, more interactive and more fun. The students can play and learn from those media to improve their life skills [2]. Computer as learning media usually forms as a

computer game [6], [15]. Rebekah [11] used computer game that can be practiced in a writing classroom. Fengfeng [4] and Serkan & Aysen [14] have used educational computer games for learning math and the results indicated that students developed more positive attitudes toward math learning. Rosana [12] has studied that learning physical education and sport science students through a computer game. The results showed from students' responses that learning through game was well-accepted as an alternative learning tool for ICT, compared to traditional learning tools.

Computer game, used for learning something, is known as Game Based Learning (GBL). GBL also has been developed to become the serious game when the computer game has serious goals for example educational objectives, as tools that support learning processes. Serious game can be used from young people until adult people. Petra *et al.* [10] stated that pupils in the primary school, they can play serious game that called word score to extend their vocabulary. Dominique *et al.* [3]



reported serious game in storyline can stimulate the development of a metacognitive skill's student. The serious game also can be used for power plant manager to learn Economic and Emission Dispatch in power plant by learning the process of the cost of power plant [1]. Therefore, computer game becomes an interesting learning media for students. They can play and learn learning material.

## 2. GAME BASED LEARNING

Game Based Learning (GBL) has been introduced by *Garris et al.* [5]. They used game as instructional content with certain game features. They also introduced an input-process output model of instructional games and learning. GBL can give experience for the players especially where the players in this system are students. *Maja et al.* [8] reported that learning by experience often more efficient than learning by studying where GBL can give this opportunity.

### 2.1 Educational Game Design

*Marina* [9] stated that digital game based learning can be used to assess the learning effectiveness of students and their motivational appeal to a computer game for learning computer memory concepts. Based on that, we design a GBL that uses a vocational material to teach students while playing the game. Design of education game is adapted from the GBL method from *Garris et al.* This GBL method is consisted of some steps such as input, process and output. In this research, we have modified some parts of the GBL method as seen in Figure 1. In the input section, some modifications have been made such as by adding learning material, level of game, scenario of the game and feedback from the validator. Learning material is based on one of the standard competence of curriculum in vocational education in Indonesia. The standard competence is *to repair compact disc player* with three basic competencies such as to describe compact disc as recording media, to identify the type of compact disc and to describe the mechanism of compact disc player. The levels of the game are built to increase the difficulty of the game and also to increase the level of learning material from three basic competencies. The levels of the game collaborate with the game scenario to give experience for students. Another part of modified GBL is validation. Validations from experts are needed to validate the game as educational media. Suggestions from experts are used to improve quality of the game before this game can be used by students.

In the process step, student plays the game by repeating to win the game. *Garris et al.*, [5] suggested that repeating is part of the learning process within the game cycle. Where in the game cycle, there are some learning processes such as judgment, behavior and system feedback. In the judgment, the student learns how to interact with the game and give judgment how to win the game. In behavior, the student learns to adapt with the game scenario. Furthermore, in system feedback, the student learns to respond when interact with the game. This learning process repeats until the student finish play game. While repeating playing a game, the student is expected to elicit desirable behaviors based on emotional or cognitive reactions which result from interaction with and feedback from game play [8].

In the output step, while playing the game, student will have the learning experience. The forms of learning experience are the knowledge, skills and abilities that also called as learning outcomes. *Garris et al.* [5] stated that the learning outcomes of computer games are often divided into skill based (technical, motor), knowledge based (declarative, procedural, strategic), and affective (confidence, attitudes, dispositions). In this research, student's response questionnaire is used to measure the expediency of game as learning media. The instruments to measure the expediency consist of two aspects namely aspect of the attractiveness and aspect of understanding of the material.

## 3. FLOWCHART OF EDUCATION GAME

This education game is not only made for playing but also for learning some of materials education that uses the standard competence "*to repair compact disc player*". Then, each of the competencies of the standard competence is broken down into some levels of the game. The detail is as follows: at the first level, the students learn about compact disc as recording media. In the next level, the students learn to identify types of compact disc and students learn the mechanism of compact disc player, in the last level. Detail of can be seen on Figure 2 that shows flowchart of this education game.

At the first level, players must fight with some robots in order to collect 7 chips. Each time players can collect a chip, they will have a question to answer. If they answer correctly the number of chip item will increase and if they answer wrong the number of chip item will not increase. But before the players can answer those questions, they must find CD icons to get learning materials. To continue



next level, players must collect score at least 70 and they also get a code to open next level.

At the second level, players face robot androids with more power to rather difficult to eliminate them. In the same way, players must find CD icons learn materials in order to answer the questions and collect 7 chips in order to get score at least 70 and able to continue next level. And at the final level, players face robot androids with large number of them and more power to eliminate them. When players can win all the levels, a report will show to players the learning materials that have been learned.

4. RESULT

To analyze the answers from validators and respondents, this research uses the weight of value from scale 1 to 5 as seen in table 1. The weight of value is used to convert qualitative value such as media validation and the student's response to be quantitative value.

Table 1: Weight Of Value For Media Validation And Student's Response

Media Validation	Student's response	Weight of value
Very valid	Very Interesting	5
Valid	Interesting	4
Fair	Average	3
Less valid	Less interesting	2
Not valid	Not Interesting	1

The rating is used to validate education game as learning media. The formula of rating is as follows:

$$Rating = \frac{\sum \text{validator's response}}{\text{the highest value of validator}} \times 100\%$$

In this research, we divide rating's value to be five ranges. Then the result of the rating is interpreted as a criterion. The criteria for media validation are such as *very valid*, *valid*, *fair*, *less valid* and *not valid*. Meanwhile, the criteria for student's response consists of *very interesting*, *interesting*, *average*, *less interesting* and *not interesting* as seen in table 2.

Table 2: Criteria For Media Validation And Student's Response

Rating's Value	Media Validation	Student's response
81% - 100%	<i>Very valid</i>	<i>Very Interesting</i>
61% - 80%	<i>Valid</i>	<i>Interesting</i>
41% - 60%	<i>Fair</i>	<i>Average</i>
21% - 40%	<i>Less valid</i>	<i>Less interesting</i>
0% - 20%	<i>Not valid</i>	<i>Not Interesting</i>

Three validators were selected based on their expertise in the field of learning media to validate

education game as learning media. These validators validated some instruments based on some aspects for example: game aspects, material of problem, and construction of the problem. Then, twenty students were chosen as respondents. Their responses were measured by instrument based on two aspects such as: aspect of the attractiveness and aspect of understanding of the material.

In the game aspects, we build an instrument that has some indicators. The indicators are: level of ease of use, game display, game illustration to help understand the concept of learning materials and audio compatibility with the game. Table 3 shows the instrument of media validation for game aspects that has the rating result at 83.33 %. This rating (83.33%) indicates the criteria of the instrument is *very valid* as shown in Table 2. Therefore, from the game aspects, this education game has indication very good to use for students as learning media.

Table 3: Instrument Media Validation For Game Aspects

Indicators	Weight					Validator's Response	Rating Result (%)
	1	2	3	4	5		
Level of ease of use	0	0	0	2	1	13	86.67
Game display	0	0	1	1	1	12	80.00
Game illustration to help understand the concept of learning materials	0	0	0	2	1	13	86.67
Audio compatibility on game	0	0	1	1	1	12	80.00
Sum of rating results							333.33
% Average							83.33

Figure 3 shows us, the display of education game. The players must collect some CDs in order to get the material of learning and when they get it. They must study it. Why the players must learn it. Because in the next step, the player must be able answer some questions based on the material of learning that they get before. Therefore, the players must read and learn it.



Figure 3: Display Of Education Game



Figure 4: Material Of Problem In Education Game

In the material of the problem, we build an instrument that has some indicators. The indicators are: material of problem in accordance with the indicators, questions in the game are based on basic competence, the choice answers are homogeneous and logical and only one answer key.

In the construction of problem, we build an instrument that has some indicators. The indicators are: subject matter defined by a brief, clear and unequivocal, formulation of questions and answer choices are statement which just required, the subject matter does not give guidance answer key, the answer choices are homogeneous and logical in terms of material, images, graphs, tables, diagrams or similar are clear and functioning and relatively same the length of answer choices.

Table 4: Instrument Media Validation For Material Of Problem

Indicators	Weight					∑ Validator's Response	Rating Result (%)
	1	2	3	4	5		
Material of problem in accordance with the indicators	0	0	1	2	0	11	73.33
Questions in the game are based on basic competence	0	0	0	3	0	12	80.00
The choice answers are homogeneous and logical	0	0	0	2	1	13	86.67
Only one answer key	0	0	0	1	2	14	93.33
Sum of rating results							333.33
% Average							83.33

Table 4 shows the instrument of media validation for material of problem that has the rating result at 83.33 %. This rating (83.33%) indicates the criteria of the instrument is *very valid* as shown in table 2. Figure 4 shows us, the material of the problem in education game. The material problem will show if the player able to collect some CDs.

Table 5: Instrument Media Validation For Construction Of Problem

Indicators	Weight					∑ Validator's Response	Rating Result (%)
	1	2	3	4	5		
Subject matter defined by a brief, clear and unequivocal	0	0	0	3	0	12	80.00
Formulation of questions and answer choices are statement which just required	0	0	1	1	1	12	80.00
The subject matter does not give guidance answer key	0	0	0	1	2	14	93.33
The answer choices are homogeneous and logical in terms of material	0	0	0	3	0	12	80.00
Images, graphs, tables, diagrams or similar are clear and functioning	0	0	0	2	1	13	86.67
Relatively same the length of answer choices	0	0	0	2	1	13	86.67
Sum of rating results							506.67
% Average							84.44

Table 5 shows the instrument of media validation for construction of problem that has the rating result at 84.44%. This rating (84.44%) indicates the criteria of the instrument is *very valid* as shown in table 2. Figure 5 shows us, the construction of problem in education game.



Figure 5: Construction Of Problem In Education Game

Furthermore, we used twenty students as respondents to get their response to this education game. Two instruments were used to quantify the responses of students. The instruments consist of two aspects namely aspect of the attractiveness and aspect of understanding of the material.

Table 6: Instrument Media Validation For Student's Response (Aspect Of The Attractiveness)

Indicators	Weight					∑ Validator's Response	Rating Result (%)
	1	2	3	4	5		
The education game is able to support learning strategy	0	0	0	7	13	93	93
The education game is able to strengthen student interest	0	0	3	6	11	88	88
Illustration of music in the education game is interesting	0	0	5	10	5	80	80
The education game as learning media is	0	0	2	7	11	89	89

easy to use								
The sentences in the education game are in easy-to-read	0	0	2	7	11	89	89	
The navigation buttons on the education game are easy to use	0	0	2	8	10	88	88	
The audio format of the education game is in harmony	0	1	2	11	6	82	82	
The quality of images in the education game is clear	0	0	4	9	7	83	83	
Sum of rating results							692	
% Average								86.50

In the aspect of the attractiveness, we build an instrument that has some indicators. The indicators are: the education game is able to support learning strategy, the education game is able to strengthen student interest, illustration of music in the education game is interesting, the education game as learning media is easy to use, the sentences in the education game are in easy-to-read, The navigation buttons on the education game are easy to use, the audio format of the education game is in harmony, the quality of images in the education game is clear. Table 6 shows the instrument of media validation for the aspect of the attractiveness that has the rating result at 86.50%. This rating (86.50%) indicates the criteria of the instrument is *very valid* as shown in table 2.

Table 7: Instrument Media Validation For Student's Response (Aspect Of Understanding Of The Material)

Indicators	Weight					∑ Validator's Response	Rating Result (%)
	1	2	3	4	5		
The education game is able to help strengthen the memory of the material	0	0	4	3	13	89	89
The	0	0	0	10	10	90	90



education game is able to explain the material								
The education game facilitates students to understand the material	0	0	4	5	11	87	87	
The education game is able to provide a better understanding of the learning material than conventional learning method	0	0	2	9	9	87	87	
The learning material is presented systematically in this educational game	0	0	3	12	5	82	82	
Sum of rating results							435	
% Average							87	

In the aspect of understanding of the material, we build an instrument that has some indicators. The indicators are: the education game is able to help strengthen the memory of the material, the education game is able to explain the material, the education game is able to provide a better understanding of the learning material than conventional learning method, the education game facilitates students to understand the material and the learning material is presented systematically in this educational game. Table 7 shows the instrument of media validation for aspect of understanding of the material that has the rating result at 87%. This rating (87%) indicates the criteria of the instrument is *very valid* as shown in table 2.

**5. CONCLUSION**

The use of GBL as a learning medium has shown significant results. It can be shown from validation result from three experts and response from twenty students. The validation from experts show that validation for game aspects has the rating result of

83.33 % with the criteria of the instrument is *very valid*. Validation for material of a problem has the rating result at 83.33 % that indicates the criterion of the instrument is *very valid*. Moreover, validation for construction of problem that has the rating result at 84.44% that indicates the criteria of the instrument is *very valid*.

The student’s response has used to validate the learning media. Media validation for the aspect of the attractiveness has the rating result of 86.50% with the criteria of the instrument is *very valid*. For the aspect of understanding of the material has the rating result at 87% also with the criteria of the instrument is *very valid*.

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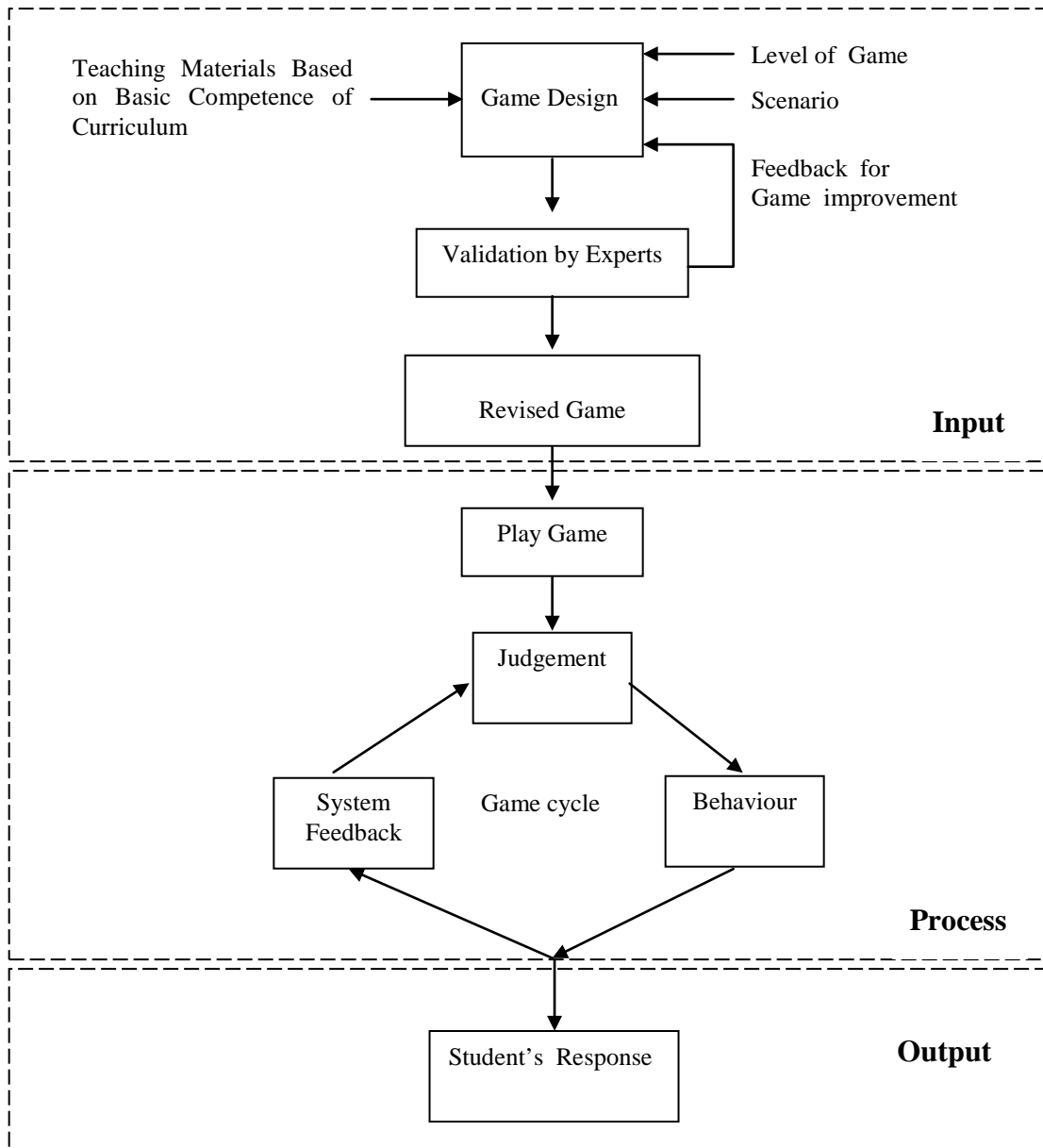


Figure 1: Block diagram of GBL



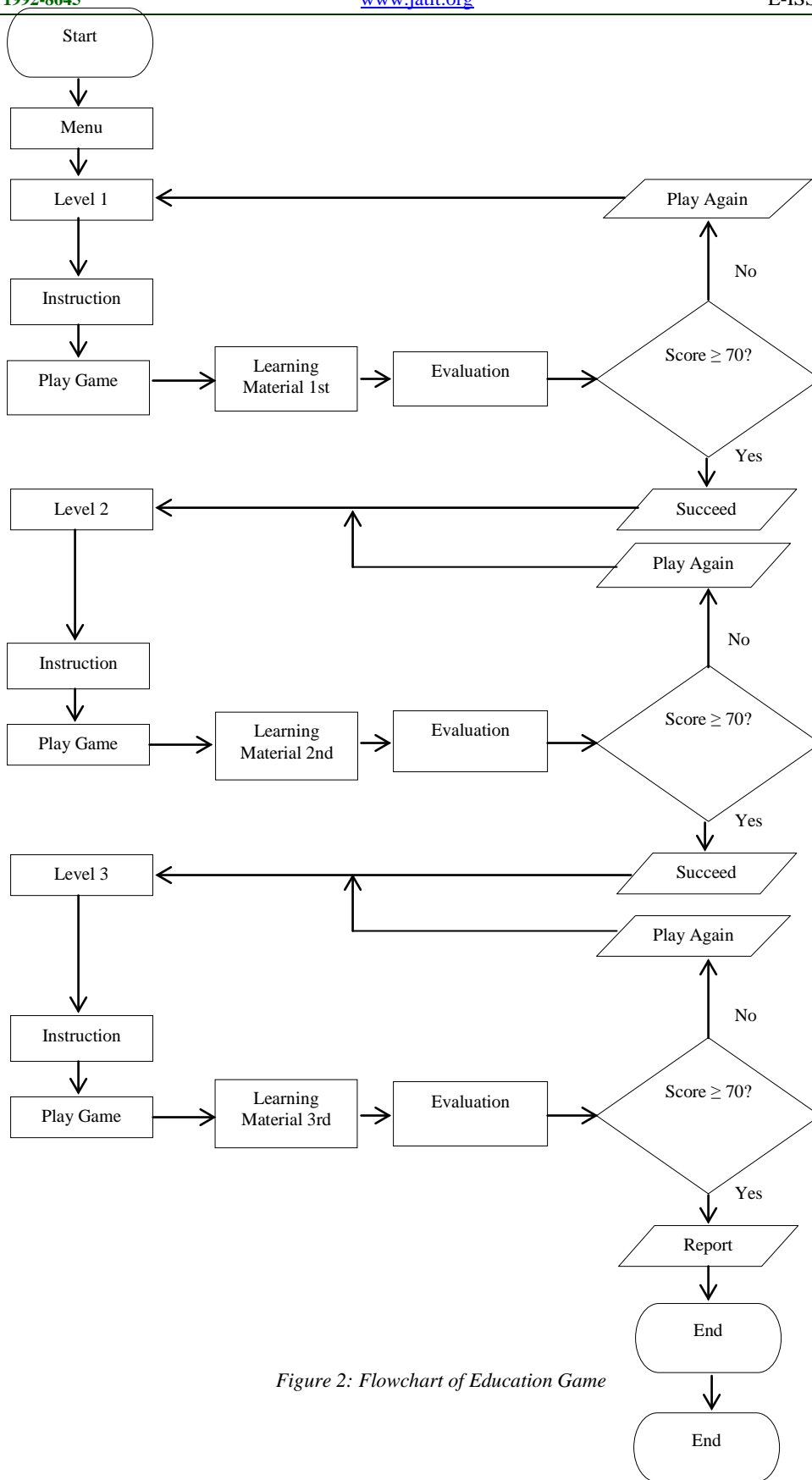


Figure 2: Flowchart of Education Game