

# Development of Game Modification Using Blended Learning in Physical Education, Sports, and Health For Senior High School Students

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**Abstract**—The results of the research were: (1) attractiveness criteria (90.06%), (2) ease criteria (91.35%), (3) clarity criteria (92.58%), (4) effectiveness criteria (90, 41%). The average (91.18%) category is very valid. Based on a large group trial (91.18%) and a small group trial (90.97), this indicates an increase in the yield of 0.21%. Effectiveness test results at each meeting, namely: (1) between the first meeting and the second meeting the average increase of 0.38 with a percentage of 0.48%, (2) between the second and third meetings the average increase of 1.25 with a percentage 1.56%. Overall it was obtained 90.92% with a very complete category. Efficiency test obtained time efficiency, namely: (1) between the first and second meetings obtained 00:02:28, (2) between the second and third meetings obtained 00:01:08. The total time of the three meetings is 266: 02: 11 and the average obtained is 03:19:32. It can be concluded that time efficiency occurs in studying the material and working on the questions in each meeting. The results of the attraction test obtained results from questionnaires in 3 meetings to test the effectiveness of the number of items as many as: (1) 5 items for meeting I (face to face), (2) 7 items for meeting II (offline), (3) 5 items for meeting III (online) items and from these results show the percentage of attractiveness of game modification products in physical education, sports, and health learning (PJOK) using blended learning for: (1) 92.88% meeting I (face to face), (2) 93.48% of meeting II (offline), (3) 93.69% of meeting III (online) with very valid criteria.

**Keywords**—*Game Modification, Blended Learning, Senior High School*

## I. INTRODUCTION

Game modification is the result of changing from the original state by changing an existing game or making a game that does not yet exist [13]. Changes that are intended to have an impact on students in the learning process to be easy and interesting because the game is a good method used for learning and will create a relaxed and pleasant atmosphere [10]. Modifications of the game are grouped into various games based on their equations of motion into precision games (target games), attack games (invasion games), net and wall games (net and wall games), attack and agility games (striking and fielding games) [3]. [11] also explained various types of games in modification of the game are accuracy games (target games), attack games (invasion games), net and wall games (net and wall games), games of attack and dexterity (striking and

fielding games). Teenagers (middle school age students) have the ability to process information on stimulation received from their environment. [30] explains the information processing model in adolescents, including: (1) input, (2) process, (3) output.

The development of Science and Technology (Science and Technology) increasingly developed rapidly in the XXI century, marked by the product and utilization of information technology. The use of technology when giving material to students can explore material that is better than the face-to-face learning method alone [2] [5]. One of the learning media that functions for learning and learning outcomes of problem solving is blended learning. [14] [26] [27] [8] explained that blended learning is learning that combines the delivery of learning through face to face (face to face) face), learning using a computer / laptop (offline), and online (internet and mobile learning). The main purpose of blended learning is to provide opportunities for students to make learning independent, interesting, effective, and efficient [20]. Blended learning has advantages and disadvantages. [8] the advantages of utilizing blended learning as follows: (1) expanding the scope of learning / training, (2) easy implementation, (3) cost efficient, (4) maximum results obtained, (5) adjusting to the needs of students , (6) increasing learning attractiveness. Besides the advantages, the learning model using blended learning also has disadvantages. According deficiencies in blended learning: (1) the media needed is diverse, so it is difficult to apply if the facilities and infrastructure are inadequate, (2) uneven facilities owned by students, for example computers / laptops and the internet, ( 3) lack of public understanding of the use of technology.

The results of the needs analysis using questionnaires conducted on 80 students in SMA 1 Gondanglegi, SMA Negeri 1 Turen, SMA Negeri 1 Kepanjen, SMA Negeri 1 Bululawang in March 2018 obtained the results: (1) 25% stated PJOK learning varied and 75% stated does not vary, (2) 16% stated the material presented by the teacher was easy and 84% stated it was difficult, (3) 79% stated that they really needed a new game in PJOK learning and 21% said it needed, (4) 19% stated the learning media previously used the teacher is interesting and 81% states it is not interesting, (5) 69% states it is necessary to develop interactive multimedia and 31% states it needs to be developed, (6) 25% states the teacher rarely

recommends using online learning and 75% states never, (7) 100 % stated they never knew learning using blended learning, (8) 100% stated strongly agree if learning was developed using blended learning PJOK learning.

Research to be conducted, researchers first conduct a study of previous research to obtain information about similar research. From the results of previous research studies on instructional media, researchers found a similar study conducted [9] entitled "the development of teaching materials based on blended learning in learning physical education, sports, and health of class X vocational high school (SMK) students", the results obtained in individual aspects of attractiveness testing (95%); convenience (86.11%); clarity (87.50%), small group aspects of attractiveness testing (95%); convenience (86.46%); clarity (86.98%), large group aspects of attractiveness test (86.83%); convenience (85.28%); clarity (85.69), and overall average results (86%) with a very valid category. From the results of previous research studies on game modification, researchers found a similar study conducted [9] entitled "the development of softball sports games through the modification of the students' self-improvement of SMAN 1 Limbangan", the results obtained indicate the existence of psychomotor, cognitive, and affective aspects improvement (88.7%) with very good category

Modification of the game uses blended learning that will be applied to physical education learning (PJOK) using 3 media consisting of: face to face, offline and online. Face to face using textbooks to deliver material in class, while offline will use autoplay media studio 8.0 which can be accessed by students, and when online using edmodo for the learning process. The use of these media researchers determined after conducting a needs analysis, so that the media used could be useful. The use of game modifications that are made and packaged using blended learning media can be useful for students senior high school and can be used to facilitate and innovate in learning physical education, sports, and health at the level of high school (SMA), and technological developments in education are expected to bring renewal in the learning process.

## II. METHOD

The development of PJOK subject game modification using blended learning for high school students refers to the design model based on blended learning aimed at getting learning outcomes from problem solving. [8] Learning design model consists of 3 stages and 9 steps, namely: 1) Needs analysis consists of: (1) analysis of problem solving needs, (2) identification of learning resources and constraints, (3) identification of student characteristics , 2) The design phase includes: (1) setting the objectives of learning, (2) selecting and determining learning strategies (organizing content, delivery and management), (3) developing learning resources (face to face, offline, online and mobile), 3) The evaluation phase includes: (1) trials, (2) revisions, (3) prototypes of game modification designs in PJOK learning using blended learning for high school students.

Research and development using quantitative research. [24] grouped three types of research designs commonly used

in pre-experimental design methods, namely one shot case study, one group pretest-posttest design, and intact-group comparison. In this design research one-shot case study with this design only a single group was given the treatment, and then the results were observed. [24] explains "one-shot case study is a design of a study consisting of a single group that is given treatment then observes the results". The data analysis technique used in this study is qualitative and quantitative data analysis techniques. Regarding learning outcomes, all can be used using value indicators on the use of learning methods under different conditions. Indicators include: 1) effectiveness, 2) efficiency, 3) learning attractiveness [6]. Effectiveness has indicators that are used to determine the effectiveness of a learning. Learning Efficiency measures learning efficiency, the indicator refers to the time, personnel, and learning resources used. Learning Attraction as learning outcomes related to the attractiveness of the field of study.

The final results seen from the minimum completeness of the performance that has been achieved is formulated in the percentage formula according to [1] as follows.

$$V = \frac{TSEV}{S - \max} \times 100 \%$$

Note:

V	= validity
TSEV	= Total score of empirical validator validator
S - max	= Maximum expected score
100%	= Constant

If the data is in the form of a percentage, then conclusions can be drawn, adjusted to the problem [1], while the classification of the percentage in question is as follows.

## III. RESULT AND DISCUSSION

The results of the effectiveness test showed that from 3 (three) face-to-face meetings, it was found that after testing the effectiveness of 80 students and the results experienced development during implementing the learning process of PJOK through game modification using blended learning both in terms of effectiveness, efficiency, and attractiveness.

After going through the stages that have been formulated related to research and development of game modifications in physical education, sports, and health learning (PJOK) using blended learning for high school students (SMA) in an effort to facilitate students to understand basic competencies (KD) big ball, small ball, athletics, and physical fitness through an easy way to use game modifications that are packaged using blended learning . Products that have been designed and produced consist of: (1) printed books that are equipped with QR code scans for face-to-face learning media, (2) interactive multimedia for offline learning media , and edmodo for online learning media . Based on data from the results of research on the development of game modifications in physical education, sports, and health learning (PJOK) using blended learning for high school students (high school) for attractiveness criteria obtained a percentage of (90.06%), for the convenience criteria obtained a percentage of (91.35%), for clarity criteria a

percentage was obtained (92.58%), for effectiveness criteria a percentage was obtained (90.83%). The average total (91.18%) with very valid criteria, so that a modified game development product for physical education, sports, and health (PJOK) is obtained using blended learning for high school students who are ready to use. Based on the products that have been developed through the research process, there are several advantages, namely: (1) there has never been and has never been applied to blended learning in high school students (high school) with game modifications, (2) physical education, sports, and health learning (PJOK) using blended learning with game modifications can improve learning outcomes and the application of game modifications in the basic competencies (KD) of big balls, small balls, athletics, and physical fitness in high school (high school), (3) can add references and insights about game modifications for students and also teachers who teach at high school (high school).

Product development of game modification in physical education, sports and health (PJOK) learning using blended learning for high school students (SMA) is divided into 3 products, namely: (1) printed books equipped with QR codes, (2) interactive multimedia, and (3) edmodo. In printed book products that are equipped with QR codes consist of materials, namely: (1) concept and design of learning based on blended learning; (2) play, games, and sport; (3) The principle of the game (games); (4) teaching games for understanding (TGfU); (5) game modifications in physical education; (6) basic competencies (KD) of senior high school (SMA); (7) the characteristics of high school (high school) youth; (8) various game modifications which are all packed into 8 chapters. The advantage of printed books is that the material is printed, there are comic illustration images from game modifications that can also function online with a QR code scan of each game that has been packaged in a book. At the end of each chapter material there are evaluation questions in the form of multiple choices that serve to measure the achievement of the material that has been presented each chapter that has an impact on the success of learning the basic competencies (KD) of big balls, small balls, athletics, and physical fitness. Learning is the interaction between instructors, students and learning resources. Learning resources by using learning books are considered effective in increasing the achievement of learning outcomes. The results of research conducted show that learning outcomes of students in the context of grades before using the book results show a percentage of 64% -70%, and after using books student learning outcomes increase by 89% - 92%. explained the benefits of textbooks as a source of learning is very diverse including 53.33% of respondents stated strongly agree that learning by using books can increase understanding, 16.67 agree, and 47.78% evaluation of learning can be improved by using books, 51.11% were evaluated as effective learning material and 1.11% disagreed.

Researchers also developed an offline game- modification product for PJOK learning using blended learning for high school students which is packaged with interactive multimedia using Studia Media Autoplay 8.0 software. The material contained in interactive multimedia are: (1) play, games, and sports; (2) The principle of the game (games); (3) teaching games for understanding (TGfU); (4) game modifications in

physical education; (5) basic competencies (KD) of senior high school (SMA); (6) the characteristics of high school adolescents (SMA); (7) various game modifications, (8) tools used in game modification, (9) evaluation questions in the wondershare quiz creator software, (10) developer profiles. Interactive multimedia is also equipped with electronic books in the kvisoft flipbook maker software. Interactive multimedia that was developed also contained operating instructions outside the packaging. The main purpose of utilizing interactive multimedia is to increase learning motivation in students (students). Leser, et al (2011) revealed that in sports interactive multimedia material has been used to teach practical aspects of the course such as motor skills. [21] describes advised educators to develop interactive multimedia involving experts so it can produce compelling multimedia products and can improve the quality of learning. Learning methods with multimedia approaches were found to be more appropriate in paying attention to the achievement of learning objectives [29] [22].

Researchers also developed a product line by utilizing social networking Edmodo as a learning resource for school students menengah above (SMA) which can be accessed at any and where else to connect to internet networks. The advantages of edmodo products consist of: (1) self-managed profiles, (2) media for sharing documents / file material and assignments to other users both teachers and students, (3) ease of access, (4) interaction processes that can done anywhere and anytime. [25] shows that learning with edmodo is effective in increasing students' level of thinking. The use of Edmodo successfully facilitates student participation in discussions and online assignments and can also increase students' interest and motivation in efforts to improve skills.

#### IV. CONCLUSION

PJOK learning at SMAN 1 Gondanglegi, SMAN 1 Kepanjen, SMAN 1 Bululawang, and SMAN 1 Turen is only done in the field through face-to-face methods and learning is done formally and is less varied in the process of learning each basic competency (KD). The right thing to do is to modify in the form of games that are packaged into digital age learning that divides learning time face-to-face, offline, online so that all domains of competency can be achieved proportionally. The conclusion obtained is that the learning model using blended learning is one of the solutions to overcome the problems of learning in physical education, sports, and health (PJOK).

The overall results of this study apply the learning model of blended learning that combines face-to-face between the use of printed books that include QR code, offline menggunakan interactive multimedia and online using social networking Edmodo. Blended learning is proven to increase motivation, interest, and student learning outcomes in learning physical education, sports, and health (PJOK) which includes the effectiveness, efficiency, and attractiveness of learning. The results of this study are in line with [14] which explains blended learning to provide effective learning outcomes through the learning process of web based technologies that are developing at this time in the learning environment. The results of other studies that support are [17] showing that there is a

significant and positive effect of learning with a blended learning approach on achieving value student academics.

Blended learning efficiently can create flexibility in time, place and acceleration of learning access and provide independence for students who are consistent with interesting [11]. [29] shows that blended -based learning is more effective than traditional learning both verbally and motivated. Based on the results of the pen elitian and opinions -pendapat that described above, it can be pulled into a knot late if the learning process by utilizing the approach of blended learning will increase both the value of learning outcomes, use of time, and attractiveness.

TABLE I. PERCENTAGE, CATEGORY, AND EXPLANATION QUANTITATIVE ANALYSIS

Percentage (%)	Category	Explanation
81-100	Very Valid, very effective, very complete Quite valid	Can be used without repair
61-80	Valid enough, effective enough, complete enough	Can be used with minor repairs
41-60	Invalid, less effective or incomplete	Needs major repairs, it is recommended not to use it
21-40	Invalid, ineffective, incomplete	Can not be used
0-20	Very Invalid, very ineffective, very incomplete	Can not be used

TABLE II. EFFECTIVENESS TEST USING ONE SHOT CASE STUDY

Subject	Treatment (X)	Observation (O)
High School Students (SMA) consisting of Gondanglegi 1 High School, Turen 1 High School, Bululawang 1 High School, 80 Kapanjen High School 1 Students	Application of game modifications to physical education, sports, and health learning using blended learning groups to become research subjects (3x meetings)	The results obtained from the final test to measure the achievement of learning outcomes (effectiveness, efficiency, and attractiveness)

TABLE III. TESTS OF EFFECTIVENESS, EFFICIENCY, ATTRACTIVENESS

Component	Results
Effectiveness	<p>Evaluation results for 3 meetings obtained results</p> <p>a. scores obtained by students at the first meeting for the material in chapter II obtained values, namely: (1) the lowest score of 80, (2) the highest score of 100, (3) the average value of 89.25. Chapter III obtained values, namely: (1) the lowest value of 80, (2) the highest value of 100, (3) the average value of 90.5. Chapter IV obtained values, namely: (1) the lowest value of 80, (2) the highest value of 100, (3) the average value of 91. Overall, at the first meeting obtained: (1) the highest value of 100, (2) the lowest value of 80, (3) the average value is 90.25 with a percentage of 90.25% including the very complete category .</p> <p>b. values obtained by students at the second meeting for the material in chapter V obtained values, namely: (1) the lowest score of 80, (2) the highest score of 100, (3) the average value of 90.75. Chapter VI</p>

Component	Results
	<p>obtained values, namely: (1) the lowest value of 80, (2) the highest value of 100, (3) the average value of 90.75. Chapter VII obtained values, namely: (1) the lowest value of 80, (2) the highest value of 100, (3) the average value of 90.38. Overall in the second meeting obtained: (1) the highest value of 100, (2) the lowest value of 80, (3) the average value of 90.63 with a percentage of 90.63% including the category of very complete .</p> <p>c. scores obtained by students at the third meeting for the material in chapter VIII obtained values, namely: (1) the lowest score of 70, (2) the highest score of 100, (3) the average value of 91.88. Overall at the third meeting obtained: (1) the highest score of 100, (2) the lowest score of 70, (3) the average value of 91.88 with a percentage of 91.88 including the category of very complete .</p> <p>d. Each meeting obtained an increase in value, namely: (1) between the first meeting and the second meeting the increase in value obtained an average increase of 0.38 with a percentage increase of 0.48%, (2) between the second and third meeting an increase in value obtained by an average average increase of 1.25 with a percentage increase of 1.56%.</p>
Efficiency	<p>Evaluation results for 3 meetings obtained results.</p> <p>a. time required for students at the first meeting for Chapter II material is obtained time: (1) the fastest time 00:23:15 or twenty-three minutes fifteen seconds (2) the longest time 00:23:40 or twenty-three minutes forty seconds. Chapter III obtained time: (1) the fastest time 00:21:02 or twenty one minutes two seconds (2) the longest time 00:21:55 or twenty one minutes fifty-five seconds. Chapter IV obtained time: (1) the fastest time 00:23:05 or twenty-three minutes and five seconds (2) the longest time is 00:23:40 or twenty-three minutes and forty seconds. Overall, at the first meeting time is obtained: (1) the fastest time 01:07:46 or one hour seven minutes forty-six seconds (2) the longest time 01:09:00 or one hour nine minutes.</p> <p>b. time required by students at the second meeting for Chapter V material is obtained time: (1) the fastest time is 00:27:10 or twenty-seven minutes ten seconds (2) the longest time is 00:27:50 or twenty-seven minutes and fifty seconds . Chapter VI obtained time: (1) the fastest time 00:19:00 or nineteen minutes (2) the longest time is 00:19:55 or nineteen minutes fifty-five seconds. Chapter VII obtained time: (1) the fastest time 00:16:10 or sixteen minutes ten seconds (2) the longest time is 00:19:55 or nineteen minutes fifty-five seconds. Overall, the second meeting obtained time: (1) the fastest time 01:02:49 or one hour two minutes and forty nine seconds (2) the longest time 01:07:10 or one hour seven minutes ten seconds.</p> <p>c. time required for students at the third meeting for Chapter VIII material is obtained time: (1) the fastest time 01:04:10 or one hour four minutes ten seconds (2) the</p>

Component	Results
	<p>longest time 01:05:52 or one hour five minutes fifty-two seconds. Overall, the third meeting obtained time: (1) the fastest time 01:04:10 or one hour four minutes ten seconds (2) the longest time 01:05:52 or one hour five minutes fifty-two seconds.</p> <p>d. amount of time each student receives in 3 meetings is obtained the fastest time 03:16:26 or three hours sixteen minutes and twenty-six seconds and the longest time is 3:20:44 or three hours and twenty minutes forty-four seconds.</p> <p>e. amount of time obtained in each meeting are: (1) the first meeting is 91:22:49 or ninety-one hours twenty-two minutes and forty-nine seconds and the average time is 1:08:32 or one hour eight minutes thirty-two seconds, (2) the second meeting is 88:04:58 or eighty-eight hours four minutes and fifty-eight seconds and the average time is 1:06:04 or one hour six minutes and four seconds, (3) the third meeting is 86:34:24 or eighty-six hours thirty-four minutes and twenty-four seconds and the average time is 01:04:56 or one hour four minutes and fifty-six seconds.</p> <p>f. Each time efficiency meeting is obtained namely: (1) between the first and second meeting is obtained 00:02:28 or two minutes and twenty eight seconds, (2) between the second and third meeting is obtained 00:01:08 or one minute eight seconds. The total time obtained from three meetings is 266: 02: 11 or two hundred sixty-six hours two minutes eleven seconds and the average obtained is 03:19:32 or three hours nineteen minutes thirty-two seconds. So that it can be concluded that the efficiency of time obtained in studying the material and working on the problems in each meeting.</p>
Attractiveness	<p>percentage of attractiveness of game modification products in physical education learning (PJOK) using blended learning for high school students (high school) is obtained from the results of questionnaires at the meeting of each effectiveness test meeting with the number of instrument items: (1) 5 items for meeting I ( face to face), (2) 7 items for meeting II ( offline ), (3) 5 items for meeting III ( online ) items and from these results indicate the acquisition of the percentage of attractiveness of game modification products in physical education learning using blended learning for: (1 ) 92.88% meeting I (face to face), (2) 93.48% meeting II ( offline ), (3) 93.69% meeting III ( online ) with very valid criteria</p>

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