Development of Learning Media Based on Android Games for Children with Attention Deficit Hyperactivity Disorder

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Abstract—This is a learning media with the scope of ADHD (Attention Deficit Hyperactivity Disorder) for children of age 7 – 8 years. The study aims is to education learning media for children with ADHD with existing games. The Dick and Carey instructional model that has been used is a model of development engaging steps of procedural approaches. The achieved results are going to be used to design a teaching and learning media through the Bible Warrior Adventure Games. This research brings out teaching material products that can be accessed by Android application. By using this learning media, the Sunday School Children with ADHD will be able to learn Christian education easily through Android. The results of the field trial found the fact that after testing the use of instructional media was able to facilitate and increase the knowledge and competence of children with special needs ADHD and can create effective learning, and motivate students in learning.

Keywords—Learning media, ADHD, Christian Education

1 Introduction

Children who are categorized as special needs include various kinds of children who experience physical disorders. One of them is Attention Deficit Hyperactivity Disorder (ADHD) [1][2][3]. Then, children with this category experience attention disorders in such a way that they cannot function with concentration in learning. ADHD is a medical condition that includes brain dysfunction, where individuals have difficulty controlling impulses, inhibiting behavior, and not supporting their attention. If this happens to a child, the child experiences various learning difficulties, behaviors and difficulties related to social relations. There are approximately 3-5% of school-aged children suffering from ADHD. Estimates of worldwide prevalence are 5% and 7.2% [4] . ADHD is increasingly known as a long-term disorder in many countries [5], although far fewer studies have focused on adult ADHD. Data shows that global consumption of the most prescribed psychostimulant medications for ADHD is also developing [6].

ADHD is one of the most common psychiatric disorders, which affects around 8% or 9% of schools. Children and 4.4-5.2% of adults in the US.2-5 Worldwide prevalence of ADHD has been reported to be 5.3% .6 The impact of ADHD on the health care system and community is also surprising, costing tens of billions of dollars each year other than personal and family expenses [7].

The growth of early childhood education (PAUD) in Indonesia is quite encouraging. Based on data from the Sapulidi Research Center (SRC) as of January 2016 the number of PAUD institutions throughout Indonesia reached 190,238 institutions. Consisting of: Kindergarten (TK) 80,140 institutions, Play Group (KB) 78,056 institutions, Child Care Center (TPA) 3,473 institutions, and the PAUD Similar Unit (SPS) 28,569 institutions, including Sunday Schools. The number of Sunday schools for the Indonesian Christian Church in West Java is 29,347 children (West Java Regional Synod: 21781 Central Java Regional Synod: 7566 children). There are approximately 0.2% of children aged 6-8 years who suffer from moderate ADHD, 0.4% of children aged 6-8 years who are likely to suffer from ADHD (Initial study results: at 204 people, with informed consent: 75 people, Possible ADHD: 31 children, ADHD Moderate 17 children). Based on the results of preliminary research through surveys, observations, and interviews at Sunday school for the Indonesian Christian Church in Jakarta, it is found that the learning process for children with special needs is still traditional or conventional in nature, learning that has not been supported by learning media and learning resources, only relies on the teacher as a source of learning. Learning activities should be able to optimize all potential students to improve the expected cognitive abilities.

2 Literature Review

Attention deficit / hyperactivity disorder (ADHD) is a common neuro developmental condition marked by developmentally inappropriate levels of attention, and / or impulsivity and hyperactivity that is significantly impaired functioning across multiple domains and places of risk for a variety of adverse outcomes [8] . ADHD, the acronym for attention deficit hyperactivity disorder, is a neuro developmental problem that can result in discrimination, forgetfulness, impulsivity, and in some cases excessive, restless physical movement, from fidgeting to pacing [9] . The diagnosis of ADHD arises from diagnostic categories related to "hyperactivity" and "minimal brain dysfunction." The most recent of ADHD is the diagnostic category of "attention deficit disorder (ADD: with or without hyperactivity)" from American Psychiatric 1980 Asosia [7] (APA) Diagnostic and Statistical Disorders Manual (DSM-III) [10], which describes the disorder characterized by hyperactivity, impulsivity, and lack of attention (see chapter 2 for details.) The 1987 revision of this manual (DSM-III-R) have changed the name of the condition of "Attention Deficit / Hyperactivity Disorder" or "ADHD". This term has been used in subsequent revisions and has become a popular designation. Attention deficit / hyperactivity disorder (ADHD) is a frequent occurrence, brain-based, neuro developmental disorder with substantial negative consequences for individual and public health. Once viewed as childhood condition, it is

now recognized that a majority of cases persist throughout adolescence and adulthood. This means that Attention Deficit / Hyperactivity Disorder (ADHD) are a common, brain-based neurodevelopment disorder with large negative consequences for individual and public health [11]. After being seen as a childhood condition, it is now recognized that the majority of cases persist throughout adolescence and adults. Web-based learning media provides learning materials for students to learn independently. The use of learning media can guide participants in independent. Game-based learning media is designed to enjoy learning [12] along with intervening content into games, and allowing students to play to gain knowledge through playing games, can help them create knowledge at the level of retention and understanding, and help motivate students to learn, and interact in the learning process, until they can learn on their own. Digital game-based learning media can increase learning interest and produce cognitive effects to help students learn. Game-based learning improves the learning process and its performance [13]. New media technology introduces changes in new learning methods and becomes the basis for designing a quality education process. The use of media allows interaction without constraints of space and time. Interaction offers learning that is not limited to classrooms. That learning through new media offers many things, efficiency, cost effectiveness, practicality, standardization, and different learning performance. An important aspect of learning through new media is the development of individuality in learning [14] [15]. Character education for early childhood in Korea is designed to compensate for the excessive focus on the academic field. There are six values developed, namely caring, respect, cooperation, willingness to share, orderly and devoted. These values are educated through reading, discussion, role playing, cooking demonstration, collaborative play, activity experiences, writing poems and inviting community leaders to give advice.

3   Methodology / Materials

This study uses a mix method with research and development methods (Research and Development). The products developed in this study were bible learning media through the Android War Warriors Adventures media game. As explained above, this study uses mix methods approach with three main methods, namely descriptive, development and experimental methods. Descriptive method is used to collect the initial data in the analysis of objective needs and conditions, namely to collect data about the condition of the products that have been compared for products to be developed, the condition of the users, students, teachers and schools, as well as inhibiting factors and supporting product development. Development methods are used in conducting expert experts in the development of a product. Before the product is used, the learning media design will be validated by experts to obtain a design that is truly valid and reliable. Meanwhile, in this study the experiment was used to determine the effectiveness of small-scale tests to ensure the functioning of instructional media developed.

4 Results and Findings

Based on the problems found at the needs analysis stage, to overcome this problem, design and development of instructional media is needed in order to improve the quality of achieving the objectives to be achieved, both process objectives and objectives.

Field trials were conducted with 19 Sunday class students in West Java representing the actual target population. The purpose of this evaluation is not just to get information from respondents about the assessment or responses about the quality and shortcomings of learning products developed, but also to find out the effectiveness of the product when used in conditions similar to actual field conditions. The product results from this revision are called final products.

The field trial is to carry out tests to see the results of the learning process by conducting initial tests and final tests. Likewise, the response of students are learn to use learning media to follow developing learning according to the learning media that has been done starting from the initial step.

The comparison of the results of the pretest and post test results of this field trial can be seen in table 1

Table 1. Pre Test Results and Post Test of Field Trials

No.	Respondent	Pretest score	Letter	Posttest score	Letter
1	Respondent 01	80,12	A	91,30	A
2	Respondent 02	74,20	B	82,30	A
3	Respondent 04	60,45	C	78,20	B
4	Respondent 04	59,46	D	71,12	B
5	Respondent 05	66,73	C	79,20	B
6	Respondent 06	63,65	C	76,68	B
7	Respondent 07	72,78	B	80,15	A
8	Respondent 08	78,30	B	85,67	A
9	Respondent 09	68,40	C	77,35	B
10	Respondent 10	67,40	C	77,50	B
11	Respondent 11	69,23	C	79,99	B
12	Respondent 12	78,54	B	81,25	A
13	Respondent 13	77,67	B	80,97	A
14	Respondent 14	70.35	B	79,99	B
15	Respondent 15	73,78	B	81,13	A
16	Respondent 16	67,50	C	78,99	A
17	Respondent 17	68,78	C	79,80	B
18	*Respondent 18*	78,50	B	81,22	A
19	*Respondent 19*	75,89	B	80,10	A
	Average Score	67,01	B	80,04	A

Based on table 1, the presentation of the results of the field trial pre-test can be seen in Figure 1 below.
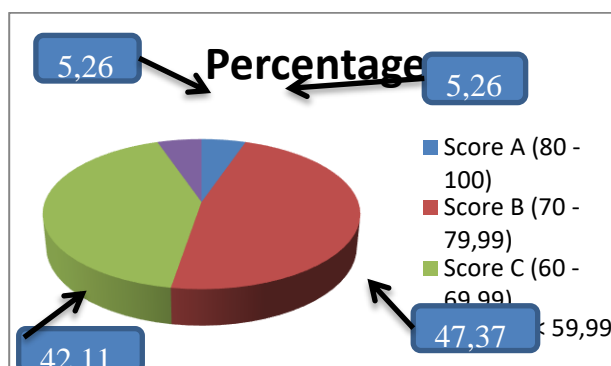
Fig. 1. Pre Test Results Field Test

Based on figure 1 above, the results of field trials on 19 students showed that students who scored 80-100 (A) as much as 5.26%, students who scored 70 -79.99 (B) were 47.37%, students who gained 60-69.99 (C) were 42.11% while those of 50-59.99 (D) were 5.26%. It can be concluded that almost 50% of students get a C value, this indicates an incomplete understanding of the material.

Based on table 1 above, the presentation of the results of the post-test field trials can be seen in Figure 2 below.
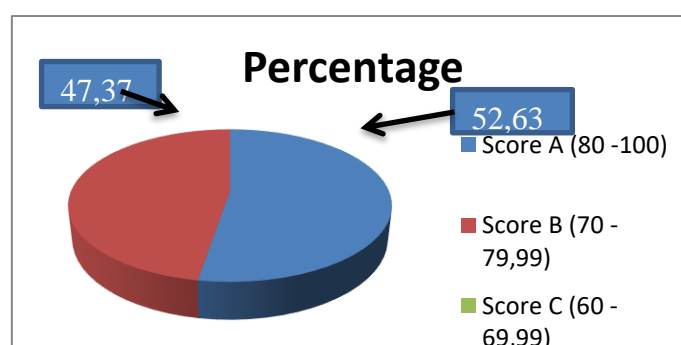

Fig. 2. Post Test Results of Field Test

Based on table 1 above, the results of the field trial test on 19 students showed that students who scored 80-100 (A) were 52.63%, students who obtained 70 - 79.99 (B) were 47.37% , students who get 60-69.99 (C) as much as 0%, and students who get <59.99 (D) as much as 0%, it can be concluded that all 100% students get the values A and B show the completeness understanding of material.

Based on the results of the pre-test and post-test in the field trials showed an increase in post test results, so it can be concluded that learning with learning media can improve students' knowledge and skills and the feasibility of learning media to be used in children with special needs in West Java. Research supported by researchers Sousa and Rocha [16] Digital learning can be a driver for skills development [16].

Also supported by researchers Hawlitschek and Joeckel [17] Digital media can motivate students to improve skills [17], and Participants improve their performance and satisfaction with performance in digital media [18]. Students increasingly need to study content and perspectives that are not given as part of the curriculum, students need to build additional forms of support for learning with digital media [19]. Digital media learners who manage to deal with disruptions in the form of social-cognitive conflict resolution and productive friction are needed for learning and knowledge construction [20].

Media increases efficiency in the use of study time, especially short breaks during workdays, new strategies for reading subject matter and costs [21]. The learning experiences of the previous participants and how they play a role in their responses to the e-learning experience [22]. Objects using text, images, audio, and video elements make stories more interesting [23], and effective learning, can improve students' interest, achievement, and confidence in learning [24] Hypermedia to find the content set that is most suitable for each student profile and we prove its effectiveness in some real cases [25].

5 Conclusion

Based on the results of the research and discussion on the development of game-based learning media for children with special needs ADHD, the following conclusions can be drawn:

a. Conceptually the development of game-based learning media has been carried out through needs analysis that takes into account methodological aspects in its development. Next is the design by developing learning materials in the design. Then, the results of the prototypes were validated by material experts, learning design experts, and learning media experts. Next, it is tested with prospective users through field testing so that the final product was produced from the development of game-based learning media.
b. Procedure in developing learning media based on this game uses Hannafin and Peck's learning development model, while conducting research using modified Borg and Gall procedures and evaluating procedural Dick and Carey.
c. The product results from this development are game-based learning media for children with special needs ADHD.
d. The results of the validation carried out by the expert team concluded that the product development had been carried out correctly following the methods, procedures, principles, and developments that were guided, starting from needs analysis, planning, design, evaluation, and testing. The expert team recommends that the learning media developed is very feasible to use.
e. The results of the field trial found the fact that after testing the use of instructional media was able to facilitate and increase the knowledge and competence of children with special needs ADHD and can create effective learning, and motivate students in learning.

6   Acknowledgements

7   References

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