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Using Adobe Animated CC in Designing Interactive Multimedia Based on Cognitive Conflict on Parabolic Motion Materials

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Parabolic Motion

ABSTRACT
In reality, most students still do not understand the concepts that have been taught, giving rise to misconceptions. One solution to overcome this problem is to design interactive multimedia based on cognitive conflict. The purpose of this study is to describe the characteristics and validity of interactive multimedia based on cognitive conflict. This type of research is development research using the Plomp development model. The research is limited to two stages, namely the preliminary research stage and the prototyping phase at the validity test stage by experts. The data collection instruments in this study were teacher questionnaire sheets, journal analysis sheets, self-evaluation sheets, and validity test sheets. The data analysis technique used the percentage technique and the V Aiken formula. Based on the preliminary research, the problem of understanding students' concepts was low, the learning model used was still teacher-centered, and interactive multimedia was not yet available. In the development or prototyping phase, interactive multimedia has been designed with the following characteristics: Using Adobe Animated CC, interactive multimedia is based on four syntaxes of cognitive conflict learning models. The results of self-evaluation were obtained with very good criteria. The validity test yielded an average of 0.75 with a valid category. So it can be concluded that interactive multimedia based on cognitive conflict in the parabolic motion material has been valid in terms of material substance, learning design, visual communication display, and software utilization.

INTRODUCTION

The purpose of learning physics as contained in the 2013 curriculum framework is to master concepts and principles and have the skills to develop knowledge and self-confidence as a provision to continue education at a higher level and develop science and technology [1]. Based on the objectives of

learning physics, the implementation of physics learning should be able to train students to master the concepts taught by the teacher. The success of students in learning physics is determined by the understanding of the concepts they achieve. Understanding the concept of physics refers to students' ability to re-express physics concepts and principles [2].But in reality, the understanding of physics concepts, especially parabolic motion, is still low. Low concept understanding is one of the causes of students' misconceptions and difficulty understanding nearly identical new concepts [3].One of the causes of misconceptions is the use of textbooks or other teaching materials [4].

21st century learning is marked by changes, developments, and rapid advances in information and communication technology. This development and progress require changes in the way students learn and the way teachers teach in education [5]. The biggest change that must be undertaken is to provide learning media, learning resources, and ICT-based teaching materials in learning activities. Therefore, the teaching materials used by the teacher should be able to integrate ICT into them. One of the ICT teaching materials is interactive multimedia [6]. Interactive multimedia has several characteristics, such as being on the web or a CD/DVD, and is usually arranged in the form of a menu. Moving from one piece of information to another via interactive multimedia allows complex information to be simplified [7].Interactive multimedia will present a new atmosphere in the learning process and also have great potential to stimulate students so that they can respond positively to the learning materials presented.

However, in reality, the researchers found in the first preliminary study of several journals that students' conceptual understanding of the parabolic motion material was lacking. Based on research conducted by Tamara et al. (2021), there are misconceptions, with a large percentage of misconceptions on average (41.75%) [8]. According to Rahayu (2015), there are 56.25 percent misconceptions that occur in parabolic motion [9]. According to Fauziah et al. (2019), there are 63.6% misconceptions among class X students on the parabolic motion material at SMAN 1 Padang [10]. The second preliminary study was conducted through the distribution of questionnaires to two teachers at SMAN 1 X Koto, which aimed to find out what the teachers at SMAN 1 X Koto were learning about the parabolic motion material. Based on a preliminary study on the distribution of questionnaires, it was found that (1) the physics learning model used was still teacher-centered, (2) IT-based teaching materials were not yet available, and (3) interactive multimedia was not yet available.

The solution to overcome the problems found is to develop interactive multimedia in which an integrated cognitive conflict-based learning model can improve students' conceptual understanding. Interactive multimedia is an effective teaching material for attracting interest in learning and increasing students' understanding of physics [11]. This is in line with research conducted by Supardi (2014), who found that the use of interactive multimedia as teaching materials in the learning process can foster learning motivation and increase student interest in learning [12]. This interactive multimedia will be integrated with a cognitive conflict-based learning model, where the application of cognitive conflict-based learning in the learning process can provide an understanding of the inappropriateness of the cognitive structure of students to understand the concept more precisely [13]. This interactive multimedia is structured using the syntax of a cognitive conflict-based learning model consisting of four syntaxes, namely: 1) activation of preconceptions and misconceptions; 2) presentation of cognitive conflicts; 3) discovery of concepts and similarities; and 4) reflection [14].

There are many pieces of software that can be used to create interactive multimedia. One of them is Adobe Animated CC. Adobe Animate CC is the right application to use for creating interactive learning media. The advantage of Adobe Animated CC is that the features in the Adobe Animate CC application can make it easier for educators to create learning media, accompanied by the ActionScript 3.0 programming language that can be learned easily [15]. Adobe Animate is a graphic design application that designers frequently use to create professional work, particularly in the field of animation [16].This is in line with research conducted by Rahayu et al. (2020), which found that interactive multimedia designed with Adobe Animate is effective and feasible to use in the learning process [17]. Therefore, using Adobe Animate can create interesting interactive multimedia that can be operated on a smartphone. This cognitive conflict-based interactive multimedia will assist teachers

and students in increasing their conceptual understanding of the parabolic motion material created using the Adobe Animated CC application.

The limitation of the problem in this study is that researchers make interactive multimedia products based on cognitive conflict in parabolic motion material. The Plomp model was used to create this interactive multimedia, which was limited to the validity test stage.This study has two objectives, namely, to describe the characteristics of interactive multimedia and to find out the validity of an interactive multimedia based on cognitive conflict that is able to improve students' concepts of parabolic motion material designed using Adobe Animate CC.

METHOD

This type of research is development research using the Plomp development model. The Plomp development model has three stages, namely: 1) the preliminary research stage consisting of needs analysis and literature review; 2) the design and development stage, namely the stage of designing interactive multimedia; and 3) the assessment stage, namely the testing and evaluation stage [18]. Experts limit the research to the develop or prototype phase during the validity test phase.The development process in the research is shown in Figure 1.

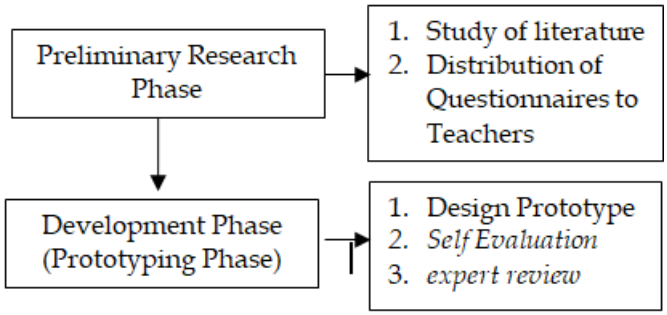

Fig 1. *Research Stage*

The preliminary research stage consists of two stages: the needs analysis stage and the literature review stage. The first stage, the needs analysis, was carried out in two stages, namely, a literature study on students' conceptual understanding and giving a questionnaire to two physics teachers at SMAN 1 X Koto. A literature study was conducted by analyzing three journals to determine the percentage of students' understanding of the concept of parabolic motion material. Furthermore, the needs analysis of the teacher was carried out on two physics teachers at SMAN 1 X Koto by giving them a questionnaire containing questions about the learning activities carried out by the teacher on the parabolic motion material. The second stage is the literature review stage. This stage aims to find solutions to the problems that have been identified from the results of the needs analysis, starting with literature studies and providing questionnaires. Design or development stage This stage is carried out based on the initial analysis stage that will be used in designing interactive multimedia. The software used in making interactive multimedia is Adobe Animate CC. Interactive multimedia is designed to work on smartphones, allowing users to type answers, select answers, and perform virtual experiments. After the interactive multimedia is designed, a self-evaluation is carried out with the aim of re-examining the multimedia that has been made. The validity test was then performed by three experts, one of whom was a physics lecturer at FMIPA.

The data collection instruments in this study were teacher questionnaire sheets, journal analysis sheets, self-evaluation sheets, and validity test sheets. The data analysis technique used the percentage technique and the V Aiken formula. With the Aiken validity index equation:

$$V = \frac{\sum s}{n\,(c-1)} \quad (1)$$

$$s = r - l_0 \quad (2)$$

After obtaining the results from the rater agreement index, the category of the assessment that has been obtained using Aiken's V index, as shown in Table 1, can be determined.

Table 1. Aiken's V Index [18]

Interval	Category
≤ 0,4	Invalid
0,4 < V ≤ 0,8	Valid
0,8 < V	Very Valid

RESULTS AND DISCUSSIONS

In the preliminary study, an initial study was conducted in the form of an analysis of the understanding of the concept of parabolic motion and an analysis of the physics learning process on the parabolic motion material. The first initial study, namely the analysis of students' conceptual understanding, was carried out by analyzing articles related to students' conceptual understanding of the parabolic motion material in order to determine the understanding of concepts and misconceptions in the parabolic motion material. Considering the results obtained in the analysis of articles on the parabolic motion material, it is known that there are misconceptions in the parabolic motion material. This is in line with research conducted by Rahayu (2015), who found that indicators or sub-topics that experience misconceptions in two-dimensional motion kinematics studies (parabolic motion and circular motion) are found in indicators of analyzing position vectors, velocity, and acceleration of parabolic motion, and indicators formulate the relationship between position, velocity, and acceleration of parabolic motion [9]. The second study is an analysis of the physics learning process on the parabolic motion material obtained from the questionnaire of the learning process on the parabolic motion material, namely: (1) the physics learning model used is still teacher-centered; (2) IT-based teaching materials; and (3) the unavailability of multimedia interactive. Based on the problems obtained, an interactive multimedia based on cognitive conflict is needed that is able to overcome students' misconceptions about the parabolic motion material.

In the development phase, interactive multimedia was designed using Adobe Animated CC as a solution to the problems found in the preliminary research. This prototype was created using Adobe Animated CC software. This prototype was developed based on guidelines for developing ICT-based teaching materials. The parts of interactive multimedia design developed by researchers include the following: The cover design is the front page of the interactive multimedia containing the title, identity, class, semester, author's name, name of the supervisor, and the start button. The title on the cover is *Interactive Multimedia Based on Cognitive Conflict Parabolic Motion Class X SMA/MA* in Figure 2.

Design of the preconception and misconception activity stagebeginning with learning instructions and pressing the start button to start the preconception and misconception activity stages. Furthermore, students are given a phenomenon that exists in their daily lives, and they are asked to choose one answer (true, wrong, or don't know) to the statement given. Furthermore, students are instructed to press the check button to see the results of their understanding.

Fig 2. *Interactive Multimedia Cover Design*

Fig 3. *Preconception and Misconception Activity Design*

The design stage of the presentation of cognitive conflict involves giving students questions about the phenomenon of parabolic motion in their daily lives, then asking them to provide temporary hypotheses or guesses for each of the questions given.

Fig 4. *Cognitive Conflict Presentation Design*

The design stage of the discovery of concepts and equations contains learning materials that are independently found by students by interacting directly with interactive multimedia. Students are asked to carry out experiments in the virtual laboratory (Phet) called Projectile Motion. Then students will fill in the data obtained and answer several questions about the experiment so that concepts and similarities can be found.

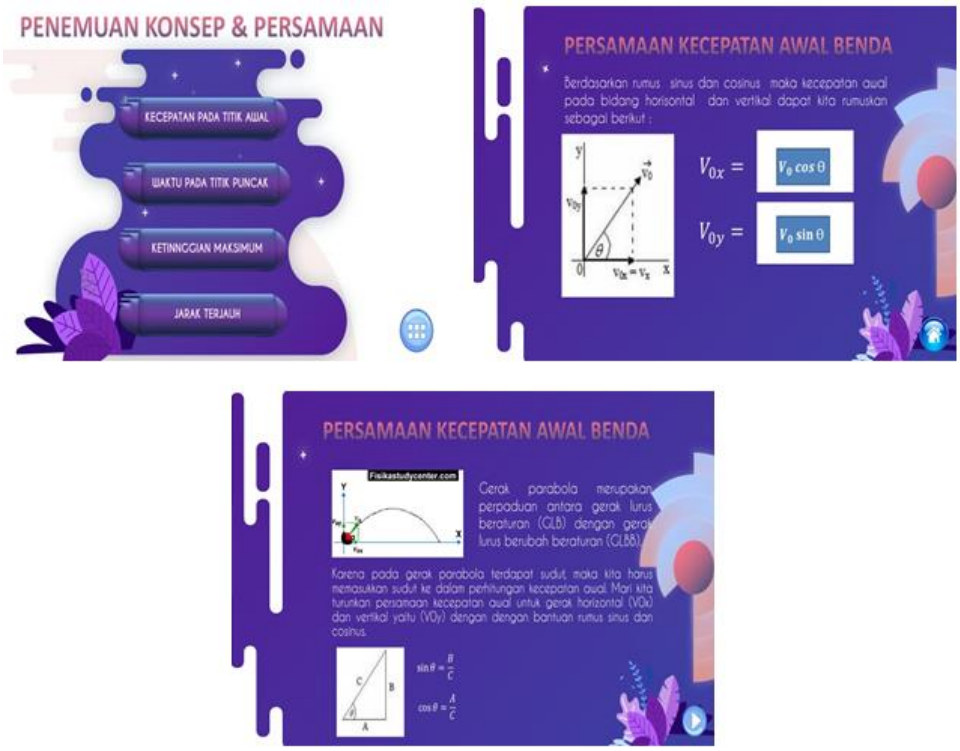

Fig 5. *Concept and Equation Discovery Design*

The reflection stage contains the stage of strengthening the material from the stages of the cognitive conflict model that have been carried out. Before entering the reflection stage, the teacher asks students to revisit their answers from the preconception and misconception stages, the stage of presenting cognitive conflicts, and the stage of finding concepts and similarities. There are 10 questions, and students are asked to choose one of the available answers. At the end of this stage, students can find out the assessment of the evaluation that has been done.

After completing the interactive multimedia design, a self-evaluation is carried out by the researcher himself to check the results of the multimedia that has been made, see the shortcomings in the multimedia that has been made, check the completeness of the prototype, improve the navigation buttons on interactive multimedia, correct typos in writing, and add the part that is still deemed not to be in accordance with the guidelines for developing ICT-based teaching materials before being validated by a team of experts. The results obtained are shown in Figure 6.

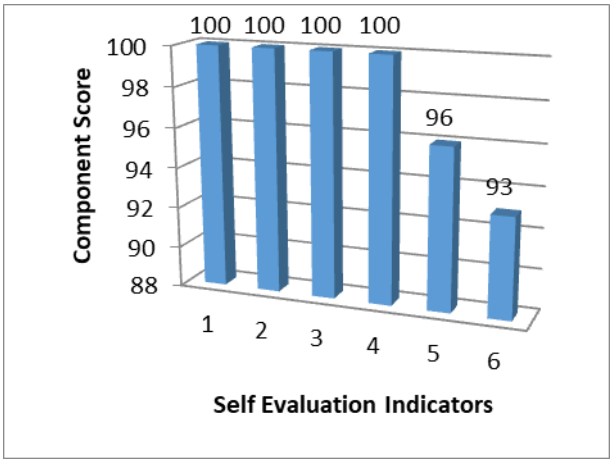

Fig 6. *Self Evaluation Results*

Based on Figure 6, it can be seen that the self-evaluation ranges from 93 to 100, which are classified as very good indicators. The average value on the self-evaluation indicator is 98.3, thus the self-evaluation value is included in the very good category. Furthermore, FMIPA UNP has provided the results of an expert review by three Physics lecturers.consisting of four indicators, namely material substance, learning design, visual communication display, and software utilization [19].

The first is the material substance component, which consists of five indicators: 1) The suitability of the material with the 2013 curriculum; 2) The suitability of the material with basic competencies (KD); 3) The suitability of indicators with KD; 4) Language compatibility with EYD; and 5) Clarity of Language. The results obtained are shown in Figure 7.

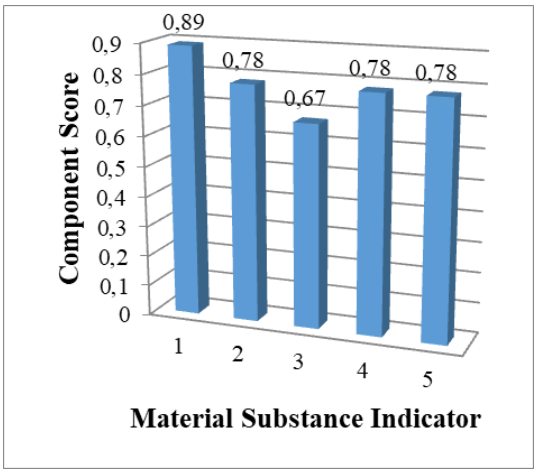

Fig 7. *Material Substance Validity Results*

Based on Figure 7 above, it can be seen that the indicators for the substance of the material are in the range of 0.67 to 0.89 out of 5 indicators. One indicator is classified as very valid with a value of 0.89, and four indicators are classified as valid with a value range of 0.67 to 0.78. Thus, the validation of the substance of the material in interactive multimedia is valid. This shows that the material contained in interactive multimedia has fulfilled the 2013 Curriculum. In accordance with Khairunnisa's research (2018), the teaching materials developed must be in accordance with the curriculum used and in accordance with educational goals [20].

The second component is learning design, which consists of 13 indicators, namely: 1) The title presented in MI is in accordance with the material, 2) Include KI and KD. 3) Learning Objectives are in accordance with KD; 4) Material in interactive multimedia is in accordance with learning objectives;5) The learning objectives in MI are in accordance with the indicators, 6) There is a stage of presenting cognitive conflicts in interactive multimedia; 7) There is a stage of discovering concepts and similarities in interactive multimedia; 8) According to the material, there is a reflection stage in interactive multimedia. 9). There is literacy data in interactive multimedia; 10). There is technological literacy in interactive multimedia; 11). There is human literacy in interactive multimedia. 12) In interactive multimedia, there is the identity of the compiler.13) Writing citations of other people's works as references The results of the value data plot for each graphic indicator can be seen in Figure 8.

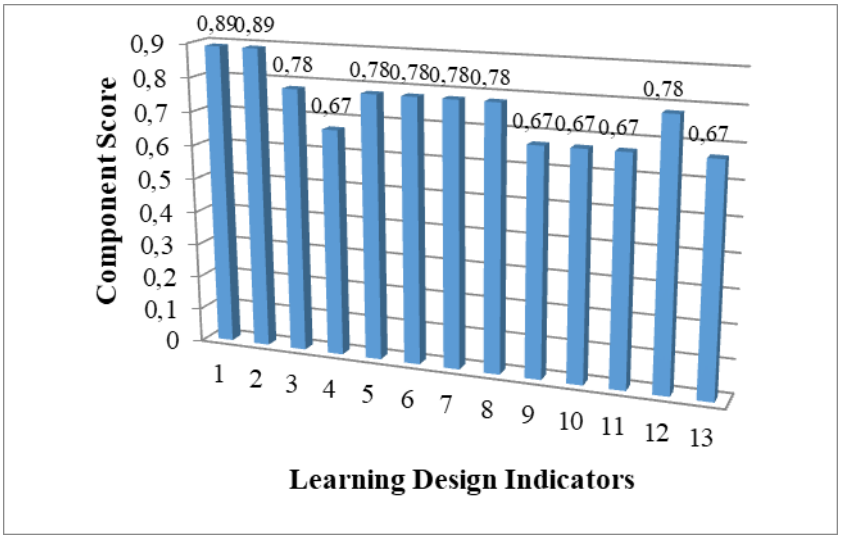

Fig 8. *Learning Design Validity Results*

Based on Figure 8 above, it can be concluded that the range of validity values for the learning design is 0.67 to 0.89. Of the 13 indicators being assessed, there are 2 indicators that are classified as very valid with a value of 0.89, and 11 indicators are classified as valid with a value range of 0.67 to 0.78. The average value of validation in the learning design is 0.75. The results of the validation of the learning design indicators are categorized as valid because the cognitive conflict learning model has been well integrated.

The third indicator is the visual communication display, which consists of six indicators: 1) interactive multimedia using basic navigation and hyperlinks that function properly, 2) Fonts in interactive multimedia are legible, proportional, and attractive. 3) Interactive multimedia uses images, animations, and sounds. 4) The color combination on the cover and each slide is harmonious and attractive; 5) The layout of the design is proportional and attractive; Instructions for use in interactive multimedia are clear and precise, and the validity results are shown in Figure 9.

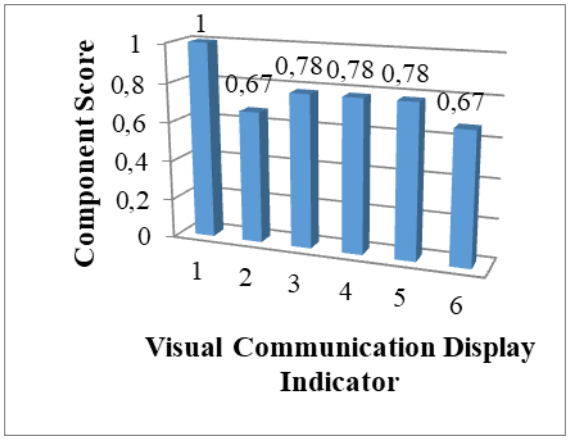

Fig 9. *Visual Communication Display Validity Results*

Based on Figure 9 above, it is found that the validity value of the visual communication display has a value range of 0.67 to 1. Of the 6 indicators assessed, there is one that is classified as very valid with a value of 1. while the other 5 indicators are valid with a value range of 0.67 to 0.78. The average value for the visual communication display is 0.78.

The fourth indicator is the use of software, consisting of three indicators: 1) MI is interactive in

providing feedback to users, 2) MI uses supporting software, and 3) MI is original work. The results of the software utilization components can be seen in Figure 10.

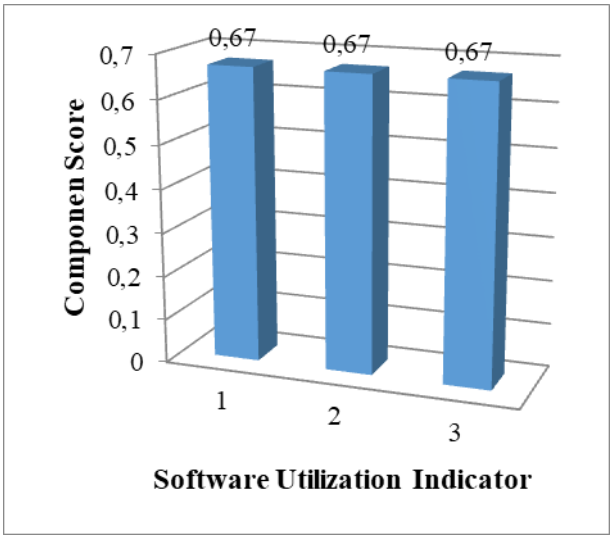

Fig 10. *Software Utilization Validity Results*

Based on Figure 10, it can be seen that the indicator value for software utilization is 0.67. Of the 3 indicators on the use of software, the validation value obtained is the same, namely 0.67, and is included in the valid category. Thus, the value of the validation of the use of software is included in the valid category.

To improve students' understanding of the concept of parabolic motion material, the last step is to calculate the average value for each component of a cognitive competition-based interactive multimedia assessment. The interactive multimedia created includes four components of developing ICT-based teaching materials: 1) material substance; 2) learning design; 3) visual communication display; and 4) software utilization. The results of the validity value plot can be seen in Figure 11.

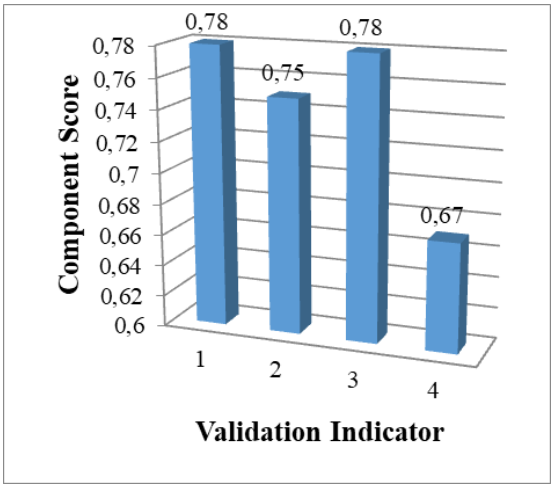

Fig 11. *Interactive Multimedia Validity Results*

The results of the validation of the four indicators on interactive multimedia as a whole are categorized as valid because interactive multimedia based on cognitive conflict in the parabolic motion material has met the substance of the study according to the guidelines for developing teaching materials, including valid in terms of material substance, learning design, visual communication display, and

software utilization. This is in accordance with the research conducted by Dhanil et al. (2021) on the design and validity of interactive multimedia based on cognitive conflict in static fluid material [21]. The research of Yuli et al. (2021) on interactive multimedia based on cognitive conflict has shown the validity of its content, appearance, language, and construct [22].

CONCLUSION AND SUGGESTION

Based on the results of the development process and the validity test phase, it can be concluded that interactive multimedia based on cognitive conflict is declared valid in terms of material substance, learning design, visual communication display, and software utilization. This interactive multimedia based on cognitive conflict includes the following features:1) Interactive multimedia consists of titles, competency standards, and basic competencies; indicators of competency achievement; materials; practice questions; competency tests; summaries; author identities; and references. 2) Learning models in interactive multimedia consist of four stages: preconception activities and misconceptions; presentation of cognitive conflicts; discovery of concepts and equations; and reflection. Interactive multimedia based on cognitive conflict is made to improve students' conceptual understanding of parabolic motion material.

REFERENCES

[1] Ministry of Education and Culture. (2014). *Technical Guide for Learning and Assessment*. Jakarta: Ministry of Education and Culture.

[2] Mufit, F., Asrizal, A., & Puspitasari, R. (2020). Meta-Analysis of the effect of cognitive conflict on physics learning. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *6*(2): 267-278.

[3] Zayyinah, Z., Munawaroh, F., & Rosidi, I. (2018). Identifikasi Miskonsepsi Siswa SMP Dengan Certainty Of Response Index (CRI) Pada Konsep Suhu dan Kalor. *Natural Science Education Research*, *1*(2): 78-89.

[4] Suparno, P. (2013). Misconception & Concept Changes in Physics Education. *Jakarta: PT. Gramedia Widiasarana*.

[5] Yulianisa, Y., Rizal, F., Oktaviani, O., & Abdullah, R. (2018). Tinjauan Keterampilan Abad 21 (21st Century Skills) Di Kalangan Guru Kejuruan (Studi Kasus: Smk Negeri 2 Solok). *CIVED*, *5*(3).

[6] Hamdi, H. (2013). Pembuatan Multimedia Interaktif Menggunakan Moodle Pada Kompetensi Mengamati Gejala Alam Dan Keteraturannya Untuk Pembelajaran Siswa Sma Kelas XI Semester I. *Pillar of Physics Education*, *1*(1).

[7] Liyanthy, M. (2009). *Konsep dan Penerapan Multimedia Interaktif*. Bandung: Teknik Informatika, Universitas Pasundan.

[8] Tamara, T., & Arsyid, S. B. (2020). Identifikasi Miskonsepsi Peserta Didik Pada Materi Gerak Parabola Di SMA Taruna Bumi Khatulistiwa. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, *10*(4).

[9] Rahayu, S. (2015). Pengembangan Tes Diagnostik Pilihan Ganda Dua Tingkat untuk Mengidentifikasi Miskonsepsi pada Konsep Gerak Dua Dimensi.

[10] Fauziah, A., & Darvina, Y. (2019). Analisis miskonsepsi peserta didik dalam memahami materi gerak lurus dan gerak parabola pada kelas X SMAN 1 Padang. *Pillar of Physics Education*, *12*(1).

[11] Smaragdina, A. A., Nidhom, A. M., Soraya, D. U., & Fauzi, R. (2020). Pelatihan pemanfaatan dan pengembangan bahan ajar digital berbasis multimedia interaktif untuk menghadapi Era Revolusi Industri 4.0. *Jurnal Karinov*, *3*(1): 53-57.

[12] Supardi, A. (2014). Penggunaan Multimedia Interaktif Sebagai Bahan Ajar Suplemen Dalam

Peningkatan Minat Belajar. *Jurnal Ilmiah Pendidikan Dasar*, *1*(2): 161-167.

[13] Wiranata, A. (2016). Pengaruh Strategi Pembelajaran Konflik Kognitif terhadap Peningkatan Pemahaman Konsep Siswa Pada Materi Gerak Parabola. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, *6*(9).

[14] Mufit, F. (2018). Model Pembelajaran Berbasis Konflik Kognitif (PbKK) untuk Meningkatkan Pemahaman Konsep dan Meremediasi Miskonsepsi. *Padang: UNP*.

[15] Chun, R. (2017). *Adobe Animate CC Classroom in a Book*. Adobe Press.

[16] Fikri, M., & Musril, H. A. (2021). Perancangan Media Pembelajaran Matematika Menggunakan Aplikasi Adobe Animate Di SMKN 1 Bukittinggi. *J. Inform. Upgris*, *7*(2): 59-63.

[17] Rahayu, P., & Ratna, S. (2020). Peran Pembelajaran STEM Dalam Penerapan Adobe Animate Terhadap Hasil Belajar Siswa SMK Tata Busana. *Jurnal Online Tata Busana*, *9*(3).

[18] Plomp, T. (2013). Educational design research: An introduction. *Educational design research*, 11-50.

[19] MoNE. (2010). *Guidelines for the Development of ICT-Based Teaching Materials*. Directorate General of Primary and Upper Secondary Education.

[20] Khairunnisa, H., & Kamus, Z. (2018). Analisis Efektivitas Pengembangan Bahan Ajar Fisika dengan Konten Kecerdasan Sosial pada Materi Gerak Parabola, Gerak Melingkar dan Hukum Newton untuk Kelas X SMA. *Pillar of Physics Education*, *11*(2): 121-128.

[21] Dhanil, M., & Mufit, F. (2021). Design and Validity of Interactive Multimedia Based on Cognitive Conflict on Static Fluid Using Adobe Animate CC 2019. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *7*(2): 177-190.

[22] Yuli, F., & Mufit, F. (2021). Disain dan Validitas Bahan Ajar Berbasis Konflik Kognitif Mengintegrasikan Virtual Laboratory pada Materi Optik untuk Meningkatkan Pemahaman Konsep Siswa SMA/MA. *Jurnal Penelitian Pembelajaran Fisika*, *7*(1).