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The Validity of Contextual-Based Physics Learning Videos to Improve Students' 4C Skills

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***Abstract*—21st century learning has had a rapid impact, especially in the world of education. 4C skills are skills that exist in the 21st century. The purpose of this study was to determine the validation results of contextual-based physics learning videos to improve students' 4C skills. Validation was carried out by 3 physics lecturers at the State University of Padang who are experts in their fields. Two learning expert lecturers and 1 physics expert lecturer. Validation of learning videos is carried out to get valid and quality learning videos before being used in school. The aspects that are assessed are the aspects of the feasibility of the construct / presentation, the aspects of the feasibility of the material / content, the aspects of language and aspects of graphics. This study uses the ADDIE development model. Contextual-based learning videos that are made according to events in students' daily lives. Instructional videos are a medium that can provide a place for teachers and students to apply temperature and heat material in the learning process. Contextual-based physics learning videos to improve students' 4C skills that are valid can be used in school.**

Keywords — Validation, 21st Century Learning, Learning Videos, Contextual, 4C Skills.

I. INTRODUCTION

Education in the 21st century provides new challenges in the world of education. To be able to face the challenges of the 21st century a teacher must have good strategies, skills and creativity in teaching [1]. Learning in the 21st century is designed and adapted so that students are ready to face the challenges of 21st century development, so that students must be equipped with 21st century skills or abbreviated as 4C, namely, Creativity and Innovation, Collaboration, Critical Thinking and Problem Solving and Communication [2]. In addition, education is currently expected to produce human resources who have strong communication and collaboration skills, expertise in using technology, creative and innovative thinking skills and the ability to solve problems [3]. The human resources needed must be able to compete globally, namely those with high skills, critical thinking, systematic, logical, creative, and willingness to work together effectively [4]. Quality human resources can be formed through education, so that the government makes various efforts to improve the quality of education, including by providing educational facilities and infrastructure and improving the curriculum. The curriculum is a means of providing education. The current curriculum used is the 2013 curriculum. The 2013 curriculum emphasizes the competence of graduates who have character, and have skills and knowledge that are integrated in learning materials [5].

One of the subjects that plays an important role in improving human resources is learning physics. Physics is the study of natural studies which are closely related to human life. Learning physics is learning that is very feared by students. In addition, learning physics is one of the lessons that is often considered difficult by some students [6]. Where students think physics learning is identical

to formulas and calculations. To solve this problem, we need a learning media that can increase students' interest in learning physics.

Media is one of the tools used by the teacher to explain learning material. The purpose of this learning media is to change the way students learn and also motivate students to learn. Learning media must be able to assist teachers in building good interactions with students so that they are able to understand learning material and be creative in solving problems [7]. In addition, learning media can also generate new desires and interests, increase motivation and stimulation of learning activities, and bring about changes in student learning [8]. The use of instructional media is an effort to make learning more enjoyable and quality [9]. Along with technological developments at this time, teachers are expected to use media that can increase student creativity in learning. Teachers and students are expected to interact using media that can improve student learning outcomes, so that the objectives of learning can be achieved. Students must be able to use IT-based learning media [10]. Learning media that can be used to achieve the expected learning objectives are instructional videos.

Instructional videos are an effective medium for use in learning [11]. Instructional videos can improve the quality of teaching and learning activities, build interest and build concrete knowledge [12]. Videos also have the potential to increase encouragement to learn, memorize, and perform specified teaching skills [13]. Videos help teachers in learning activities to deliver learning material and make learning meaningful [14]. Videos are used to facilitate learning, not hinder the learning process [15]. There are many types of videos that are used in the context of learning [16]. One of the learning videos used in learning activities to connect learning material with students' daily events is contextual-based learning videos.

Contextual is a learning concept that helps teachers to associate learning with the real world of students and supports students to make connections between their knowledge by applying it in everyday life [17]. Contextual learning aims to increase the motivation of students to take what they have learned and apply it, making it meaningful in the context of actions and interactions in their daily situations [18]. Contextual learning is active learning that helps students connect with the world of learning [19]. Contextual learning motivates students to take responsibility for their learning and to make connections between knowledge and its application in various contexts of their lives [20].

CTL learning is learning designed to connect the knowledge they have acquired and build new knowledge from the learning process [21]. Contextual Teaching and Learning helps teachers connect subject matter content to real-world situations [22]. Learning material is related to what students experience in their daily lives. The problems that exist in everyday life have a lot to do with learning materials. So that CTL can generate meaning from learning designed by connecting academic content with the context of students' daily lives [23]. CTL is carried out in a natural teaching and learning process [24]. CTL does not require students to memorize formulas, students are guided to be able to relate the material being studied with its application in real life [25]. Therefore, CTL learning can be used in physics learning, in order to improve students' 4C skills.

The skills required in the 21st century are known as 4C skills, namely critical thinking, communication, collaboration, and creativity [26]. Creative thinking skills are someone's skills to generate new ideas [27]. Creative thinking skills consist of 4 indicators, namely 1) Fluency (ability to generate many ideas), 2) Flexibility (ability to generate various ideas), 3) Originality (ability to generate new ideas or ideas that previously did not exist), and 4) Elaboration (ability develop or add to ideas so as to produce detailed ideas). These four indicators are used as benchmarks for a person's creative thinking ability [28]. Furthermore, critical thinking skills are efforts to think rationally and reflectively that prioritize decision making based on something that must be believed and can be done [29]. Critical thinking skills are related to activities, such as analysis, synthesis, making considerations, creating, and applying new knowledge in the real world that can be learned, trained, and mastered [30] [31]. Critical thinking skills are very important skills we have. Critical thinking skills need to be developed and familiarized by each individual [32]. The characteristics of people who think critically: (a) have the ability to think realistically in facing problem solving, (b) have the ability to make correct decisions in problem solving, (c) have the ability to analyze, organize, (d) has the ability to draw conclusions about problem solving and formulate opinions accurately and systematically [33].

The next skill that students must have is collaboration skills. Students are trained to be able to collaborate and discuss with their friends. Collaboration skills are the ability to participate in every activity to foster relationships with others, respect for relationships and teamwork to achieve the same goals [34] [35]. Indicators that show collaboration skills are actively contributing, working productively, showing flexibility and compromise, showing responsibility, and showing respect [36]. Students really need to have collaboration skills, because students can gain new knowledge not only from the teacher but also from their friends. So that students have these abilities, then can train it by giving challenging problems that exist in real life [37]. In addition, communication skills

are also the most important thing for students to build interactions with teachers who share knowledge and exchange ideas. Communication plays a very important role in teaching and learning activities, which aim to transfer knowledge and exchange ideas or ideas [38]. There are two communication skills, namely oral and written communication skills. Aspects of communication include oral, verbally, and writing [39]. Oral communication skills are basically the ability to think logically, systematically, and analyze using language as a tool to express ideas [40]. Oral communication can measure students' listening skills and convey messages, whereas written communication can only measure students' ability to convey messages [41].

A contextual-based physics learning video has been developed. With this learning video, it is hoped that it can improve students' 4C skills. Before this contextual-based physics learning video is used in school, it is first validated by experts in order to obtain a valid and quality learning video. Validity comes from the word validity which means the extent to which the accuracy and accuracy of a measuring instrument in carrying out its measurement function [42]. Validity is a condition where an instrument can measure a situation that must be measured precisely [43]. Validity relates to the ability to measure precisely what will be measured [44].

II. METHODS

The research carried out refers to the research and development (R&D) design. Research and Development (R&D) is a process or steps to develop a new product or improve an existing product, which can be justified [45]. This study aims to develop learning media, namely instructional videos. The learning media developed were contextual-based learning videos to improve students' 4C skills which had valid criteria.

The development model used is the ADDIE development model. The ADDIE development model consists of five stages, namely: 1) analysis, 2) design, 3) development, 4) implementation, and 5) evaluation. At the development stage, product validation is carried out by experts. The instrument used was a product validation instrument. Validation is used to obtain a valid product. Products are assessed based on 4 aspects, namely aspects of construct / presentation feasibility, material / content feasibility, language feasibility and graphic feasibility. The data will be analyzed and then given a scoring using a Likert scale with the following steps:

a) Give a score for each answer item with a score (5) for very good answers, a score (4) for good answers, a score (3) for sufficient answers, a score (2) for poor answers, and a score (1) for very poor answers.

b) Add up the total score of each validator for all indicators.

c) The validity value is given by using the Aiken's V formula, namely:

$$V = \frac{\sum S}{[n(c-1)]} \quad \text{..... (1)}$$

Information :
v = Validity Value
s = r – lo
lo = the lowest number of validity assessments (in this case = 1)
c = the highest number of validity assessments (in this case = 4)
r = Number given by the validator

The validity assessment is determined based on the interpretation criteria of the scores obtained. The validity value classification used in this study is if it lies in the range of values ≥ 0.61-1.00. The validity category based on the Aiken's V coefficient can be seen in the Table1.

Table 1. Product Validity Category

Score	Criteria
≥ 0.6	Valid
<0.6	Invalid

Source : [46]

III. RESULT AND DISCUSSION

The data obtained is the result of product validation assessments from several validators. Data obtained from 3 validator lecturers, namely 2 physics education lecturers and 1 physics lecturer at Padang State University. The validators in this study were Dr. Amali Putra, M.Si and Dra. Yenni Darvina, M.Si as an expert lecturer in learning and Dr. Yulkifli, M.Si as a physics expert lecturer. After validating the contextual-based physics learning video by the validator lecturer, several suggestions were given by the validator lecturer. Some suggestions from the validator can be seen in Table 2.

Table 2. Validator Suggestions and Comments

No.	Validator Name	Suggestions and Comments	Follow-up
1.	Dr. Amali Putra, M.Si	Give instructions before video 1, video 2, and so on so that students are focused.	Instructions have been made before video 1, video 2, and so on
2.	Dra. Yenni Darvina, M.Si	Replace the recorded voice instructions for using the video by emphasizing in the delivery and the original voice of the video maker.	The voice instructions for using the video have been emphasized and replaced with the original voice of the video maker.
3.	Dr. Yulkifli, M.Si	Replace the recorded voice instructions for using video with the original sound of the video maker.	Voice recording instructions use of videos already replaced by sound original video maker.
		Before videos 1, 2, and so on, the preface “video1”, and the preface should be made So on.	Preface "video1", "video 2" and so on have been made, before video 1, 2, and so on are shown.

After the revision was made according to the suggestions of the validator, the validation results were obtained from the contextual-based physics learning video from the validator lecturer. The results of the validation of the contextual-based learning video are as follows:

1. Learning Expert Validation

The learning expert validates 3 aspects of the assessment, namely the feasibility aspect of the construct / presentation, the aspect of language feasibility and the aspect of graphics which are developed into 26 assessment indicators. The results of the validation of the contextual-based physics learning video according to learning experts can be seen in Table 3.

Table 3. Learning Expert Validation Analysis

Aspect	Score	Information
Construct / serve feasibility	0.84	Valid
Language Eligibility	0.87	Valid
Graphics	0.84	Valid

Based on Table 3 it can be seen that the contextual-based physics learning video is valid. The feasibility aspect of the construct /presentation consists of seventeen components, namely: 1) Instructional videos facilitate interaction between students and teachers, 2) Instructional videos facilitate interaction between students, 3) Learning videos facilitate interaction between students and learning media, 4) Presentation of instructional videos can foster student learning motivation, 5) Presentation of instructional videos can increase student creativity, 6) Presentation of instructional videos foster students 'curiosity, 7) Analysis of recorded events in videos can train students' critical thinking skills., 8) Analysis of various recording activities events in the video can train students' creative thinking skills, 9) Video-based group analysis activities can train students' collaboration skills, 10) Video-based group analysis

activities can train students' communication skills, 11) Learning activities using this learning video can train students' Problem Solving skills, 12) Illustration and description contained in the learning video support each other, 13) The presentation of the learning video is arranged systematically, starting from the title, identity, video examples and case examples, 14) The learning video has a short and dense duration. Each component is assessed by experts. The results of the assessment for each component can be seen in Figure 1.

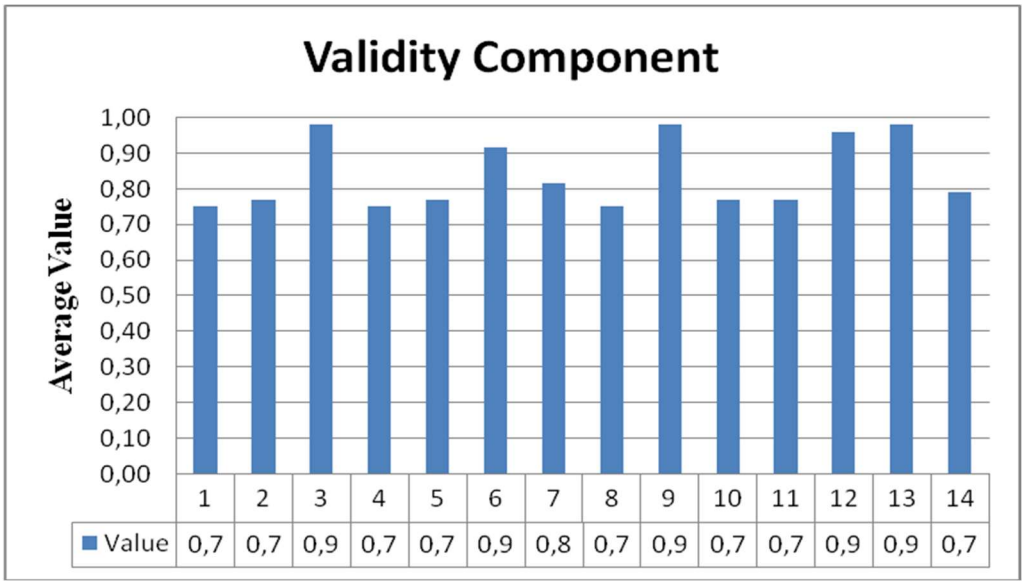

Figure 1. Result of Assessment of Constructure / Presentation Feasibility Components

Based on Figure 1 it can be stated that the range of values in the construct / presentation feasibility component is 0.75 to 0.98 in the valid category. The average component value is 0.84. This shows that the contextual-based physics learning video on the feasibility aspect of the construct / presentation is valid.

The language feasibility aspect consists of 4 components, namely: 1) The language used in the learning video is easy to understand, 2) The language used in the learning video is short and dense, 3) The language used is in accordance with the correct Indonesian rules, and 4) The language used used is the standard language.

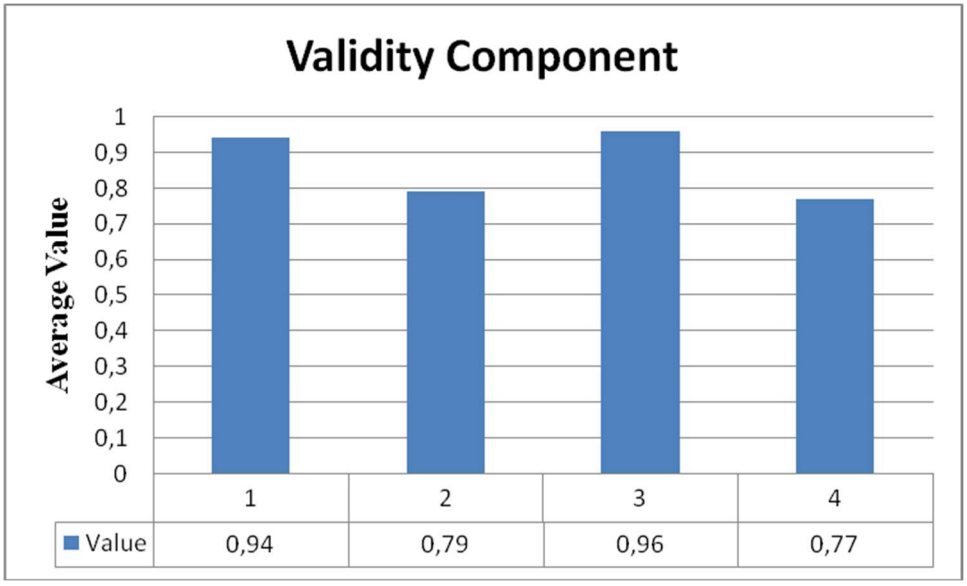

Figure 2. Language Feasibility Component Assessment Results

Based on Figure 2 it can be stated that the range of values in the language eligibility component is 0.77 to 0.96 in the valid

category. The average component value is 0.87. This shows that the contextual-based physics learning video on the feasibility aspect of the language is valid.

While the graphic aspect consists of 8 components, namely: 1) The learning video evokes a response to the examples shown, 2) The type of letters used in the learning video is clearly legible, 3) The font size used in the learning video is clearly legible, 4) The buttons are use is clearly visible, 5) The navigation system for using the video is easy to recognize, 6) The layout of the learning video display is regular and systematic, 7) The colors used in the learning video are compatible, and 8) The display of the learning video is attractive.

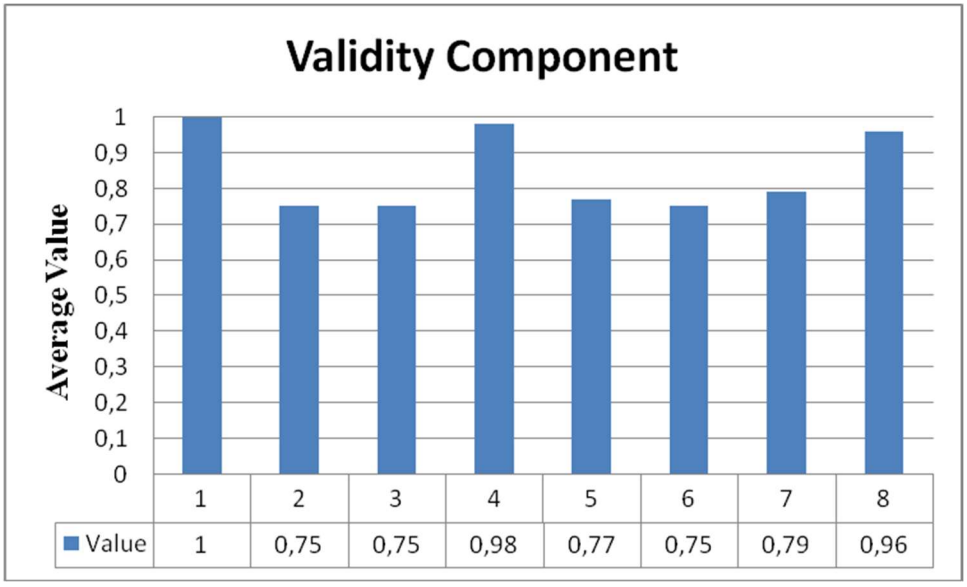

Figure 3. Results of the Graphing Component Assessment

Based on Figure 3 it can be stated that the range of values in the graphic components is 0.75 to 1 in the valid category. The average component value is 0.84. This shows that the contextual-based physics learning video on the graphic aspect is valid.

2. Physicist Validation

Physicists validate 3 aspects of the assessment, namely the feasibility aspect of the material / content, the aspect of language feasibility and the aspect of graphics which are developed into 24 assessment indicators. The results of the validation of the contextual-based physics learning video according to physicists can be seen in Table 4.

Table 4. Physicist Validation Analysis

Aspect	Score	Information
Feasibility of the material / content	0.79	Valid
Language Eligibility	0.81	Valid
Graphics	0.72	Valid

Based on Table 4, it can be seen that the contextual-based physics learning video is valid. The aspect of the feasibility of the material / content consists of twelve components, namely: 1) Show learning videos according to the topic of the material, 2) Examples of video shows related to temperature and heat in everyday events., 3) Examples of video shows related to the application of temperature and heat in technology., 4) Examples in video shows have a novelty side, 5) Video shows can be used to carry out exploration, 6) Examples in original presented video shows, 7) Examples in shows videos from other sources include sources, 8) Illustrations in learning videos are presented in accordance with the material topic, 9) Examples on video shows related to natural phenomena, daily events, and technology according to the material topic, 10) Learning videos can be describe the topic of the material appropriately, 11) The symbols in the learning videos are presented according to the material topic, and 12) Numbers / values / sizes in the learning videos that are serve is accurate.

Each component is assessed by experts. The results of the assessment for each component can be seen in Figure 4.

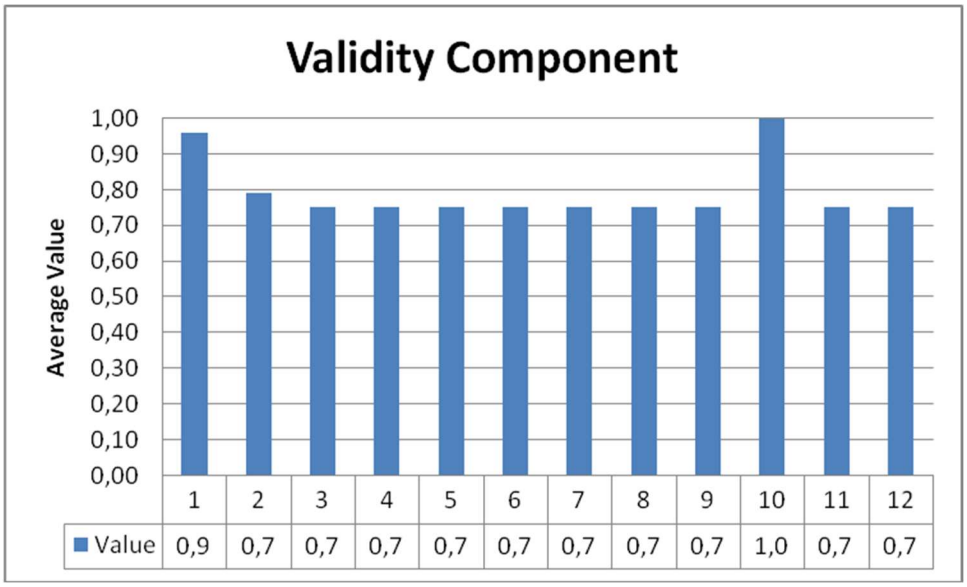

Figure 4. Material / Content Feasibility Component Assessment Results

Based on Figure 4, it can be stated that the value of each material / content eligibility component is 0.75 to 1 in the valid category. The average component value is 0.79. This shows that the contextual-based physics learning video on the feasibility of the material / content is valid.

The language feasibility aspect consists of 4 components, namely: 1) The language used in the learning video is easy to understand, 2) The language used in the learning video is short and compact, 3) The language used is in accordance with correct Indonesian rules, and 4) The language used used is the standard language.

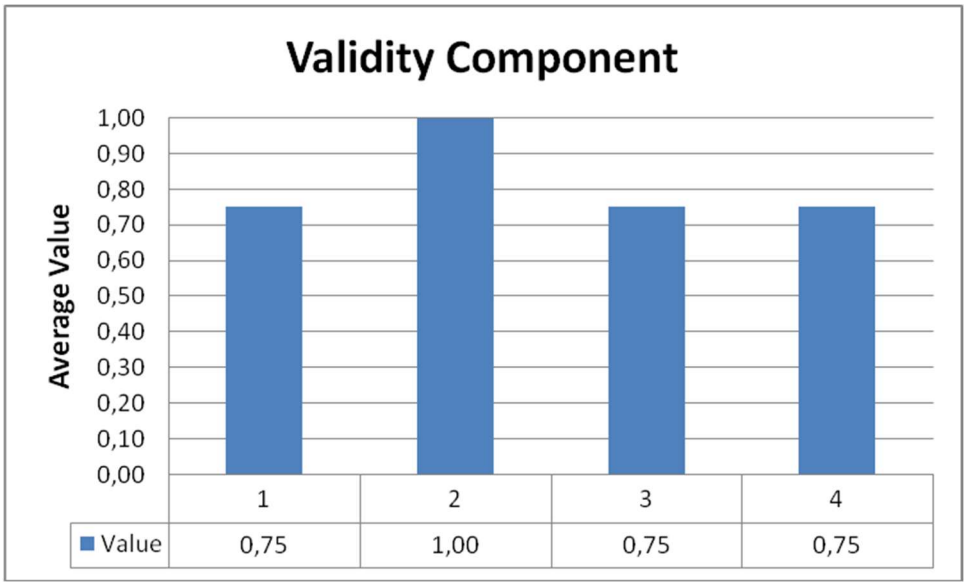

Figure 5. Results of the Language Feasibility Component Assessment

Based on Figure 5 it can be stated that the value of each language eligibility component is 0.75 to 1 in the valid category. The average component value is 0.81. This shows that the contextual-based physics learning video on the feasibility aspect of the language is valid.

Whereas in the graphic aspect it consists of 8 components, namely: 1) The learning video evokes a response to the examples

shown, 2) The type of letters used in the learning video is clearly legible, 3) The buttons used are clearly visible, 4) The navigation system for using video is easy recognized, 5) The size of the letters used in the learning video is clearly legible, 6) The layout of the learning video display is regular and systematic, 7) The colors used in the learning video are compatible, and 8) The display of the learning video is attractive.

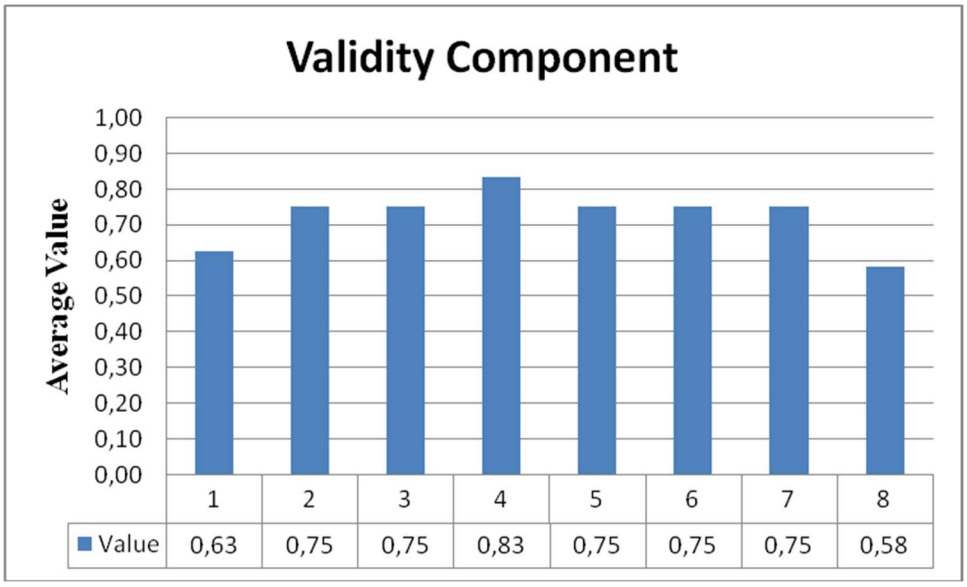

Figure 6. Results of the Assessment of the Graphics Component

Based on Figure 6 it can be stated that the value of each graphic component is 0.50 to 0.75 in the valid category. The average component value is 0.72. This shows that the contextual-based physics learning video on the graphic aspect is valid.

Based on the mean obtained from each aspect of the assessment is in the valid category. This is in accordance with the product criteria which is said to be valid if ≥ 0.6, so that the contextual-based learning video product is valid in terms of construct, material / content, linguistic and graphic aspects. So that learning videos can be used in learning activities at school.

IV. CONCLUSION

Based on the results and discussion, it can be concluded that contextual-based physics learning videos to improve students' 4C skills are in the valid category and can be used in school learning.

REFERENCES

[1] Asrizal, Desnita, Yenni Darvina, and Esti Aprilia Usman, " Modul Gelombang Mekanik Berbasis CTL untuk Meningkatkan Literasi Lingkungan Siswa," International Journal of Progressive Sciences and Technologies (IJPSAT), ISSN: 2509-0119, 2020.

[2] Trisnawati, WW, and Sari, AK, "Integrasi 21 st Century Skills dalam Sociolinguistics Module: 4C Keterampilan (Kolaborasi, Komunikasi, Berpikir Kritis, dan Kreativitas)," Jurnal Muara Pendidikan, 4 (2), 455-466, 2019.

[3] Jeremy A. Miller, and Pham Dinh Sac, "Landscape Biodiversity Of Tropical Forest Spider Communities In Vietnam (Arachnida: Araneae)," Treubiaa Journal On Zoologyof The Indo-Australian Archipelago, Vol. 38, pp. 1-186, 2011.

[4] Asrizal, and Amra Ahmad, "Hasil Analisis Pengembangan Multimedia Interaktif Kinematika Dan Dinamika Partikel Untuk Pembelajaran Fisika Siswa R-SMA-BI Kelas X Semester 1," Prosiding Seminar Nasional Fisika Universitas Andalas (SNFUA), ISBN 978-979-25-1953-2, 2011.

[5] Usmeldi, R. Amini, and S. Trisna.," Pengembangan Model Pembelajaran Berbasis Penelitian Dengan Pendekatan Ilmu Pengetahuan, Lingkungan, Teknologi, Dan Masyarakat Untuk Meningkatkan Pikiran Kritis Mahasiswa," Jurnal Pendidikan IPA Indonesia (JPII), 6 (2), 318-325, 2017.

[6] Yosa Aulya Putri, and Yohandri," Validitas Bahan Ajar Berbasis Problem Based Learning Menggunakan Pendekatan Contextual Teaching and Learning untuk Meningkatkan Kemampuan Berpikir Kritis," Jurnal Internasional Ilmu Pengetahuan dan Teknologi Progresif (IJPSAT), Vol. 23 No. 1, hlm.63-70, 2020.

[7] Gunawan, Sahidu, H., Harjono, A., and Suranti, N.M," The Effect of Project Based Learning with Virtual Media Assistance on Student's Creativity in Physics," Cakrawala Pendidikan, No. 2, 2017.

[8] Buchori, A, and Setyawati, R. D," Development Learning Model Of Charactereducation Through E-Comic In Elementary School," International Journal of Education and Research, Vol. 3 No. 9, 2015.

[9] Yulianti, Buchori, A, and Murtianto, Y. H," Pengembangan Media Presentasi Visual Dengan Pendekatan Kontekstual Dalam Pembelajaran Matematika Di SMP," Journal of Mathematics Education, Science and Technology, Vol. 2, No. 2, Hal. 231 – 242, 2017.

[10] Marsa, P.B, and Desnita," Analisis Media, Sumber Belajar, dan Bahan Ajar Yang Digunakan Guru Fisika SMA Materi Gelombang Di Sumatera Barat Ditinjau Dari Kebutuhan Belajar Abad 21," JEP | Volume 4 | Nomor 1|, 2020.

[11] Hamida, S, and Desnita," Analisis Kebutuhan Video Pembelajaran Fisika Berbasis Kontekstual Materi Suhu dan Kalor Untuk Pembelajaran Abad 21," Jurnal Pendidikan Fisika. Vol.9, No.1, 2020.

[12] Agommuoh, P. C., and Nzewi, U. M," Effects of videotape instruction on secondary school students achievement in physics," Journal of STAN, *38* (1&2), 88-93, 2003.

[13] Gaudin, C., and Chaliès, S," Video viewing in teacher education and professional development: A literature review," Educational Research Review, *16*, 41-67, 2015.

[14] Sherin, M. G., and van Es, E. A," Using video to support teachers' ability to notice classroom interactions," Journal of Technology and Teacher Education, *13* (3), 475-491, 2005.

[15] Ronald A. Berk," Multimedia Teaching with Video Clips: TV, Movies, YouTube, and mtvU in the College Classroom," International Journal of Technology in Teaching and Learning, *5*(1), 1–21, 2019.

[16] Superfine, A, and Bragelman, J," Analyzing The Impact of Video Representation Complexity on Preservice Teacher Noticing of Children's Thinking," EURASIA Journal of Mathematics, Science and Technology Education,14(11), 2018.

[17] Ch. Krisnandari Ekowati, Muhammad Darwis, H. M. D. Pua Upa, and Suradi Tahmir," The Application of Contextual Approach in Learning Mathematics to Improve Students Motivation At SMPN 1 Kupang," International Education Studies. Vol. 8, No. 8, 2015.

[18] Ilhan, N., Yildirim, A., and Yilmaz, S.S," The Effect Of Context-Based Chemical Equilibrium On Grade 11 Students' Learning, Motivation And Contructivist Learning Environment," International Journal of Environment & Science Education, *Vol. 11, No. 9*, 3117-3137, 2016.

[19] Wishler, V.R," Contextual teachingand learning for practioner," Educational Journal. 6(4),161-172, 2013.

[20] Asrizal, and Wahyuni Satria Dewi," Development Assistance of Integrated Science Instructional Material by IntegratingReal World Context and Scientific Literacy on Science Teachers," Pelita Eksakta. Vol.01, No.02, 2018pp. 113-120, 2018.

[21] Hutson, C.C," Contextual teaching and learning for practioners," Systemics, Cybernetics and Informatics. 6(4),54-58, 2011.

[22] Smith, B.P," Instructional strategies in family and consumer sciences: Implementing the contextual teaching and learning pedagogical model," Journal of Family and Consumer Science Education. 28(1):23-38, 2010.

[23] Firdaus, and Dewi, F," Application of Contextual Teaching and Learning (CTL) Components In Telecommunication Network Design and Optimization Course," International Journal of Chemistry Education Research , Vol. 2 (1), 2018.

[24] Nursanti, Y. B., Rochsantiningsih, D., Joyoatmojo, S, and Budiyono," Mathematics Education Model In Indonesia Through Inquiry-Based Realistic Mathematics Education Approach To Improve Character," International Journal Of Education And Research. Vol. 4 No. 9, pp. 323-332, 2016.

[25] Melsa Arvia, and Dony Permana," Pengembangan Media Pembelajaran Matematika Berbasis Contextual Teaching And Learning (CTL) Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika Siswa Kelas VIII SMP," Jurnal Internasional Ilmu Pengetahuan dan Teknologi Progresif (IJPSAT) ISSN: 2509-0119. Vol. 23 No. 2 November 2020,

[26] Mahanal, S," Peran Guru dalam Melahirkan Generasi Emas Berprestasi Abad 21," Dalam Seminar Nasional Pendidikan HMPS Pendidikan Biologi FKIP Universitas Halu Oleo (hlm. 1-16), 2014.

[27] Tiara Heldina, and Heffi Alberida," Keterampilan Berpikir Kreatif Siswa SMAN 1Basa Ampek Balai," Jurnal Internasional Ilmu Pengetahuan dan Teknologi Progresif (IJPSAT) ISSN: 2509-0119. Vol. 24 No. 2 Januari 2021, hlm.472-475, 2021.

[28] Arnyana, PIB," Pengaruh Penerapan Strategi Pembelajaran Inovatif dalam Pembelajaran Biologi terhadap Kemampuan Berpikir Kreatif Siswa SMA," Jurnal Pendidikan dan Pengajaran Sekolah Pelatihan Guru Negeri Singaraja. Vol. 3, 496–515, 2006.

[29] Windi Febriatika, and Heffi Alberida," Kemampuan Berpikir Kritis Siswa SMAN 7 Tebo," Jurnal Internasional Ilmu Pengetahuan dan Teknologi Progresif (IJPSAT), Vol. 24 No. 2, hlm. 476-479, 2021.

[30] Walker, GH, "Berpikir Kritis dalam Diskusi Asinkron," Jurnal Internasional Teknologi Instruksional dan Pembelajaran Jarak Jauh. 2 (6): 19–21, 2005.

[31] Hidayah, R., M. Salimi, and TS. Susiani," Keterampilan Berpikir Kritis: Konsep dan Indikator Penilaian," Jurnal Taman Cendekia. Vol. 1, No. 2: 127-133, 2017.

[32] Sulistiani, Eny, and Masrukan, "Pentingnya Berpikir Kritis dalam Pembelajaran Matematika untuk Menghadapi Tantangan MEA, " Seminar Nasional Matematika X Universitas Semarang 2016. 605–12, 2016.

[33] Le, H., Jeroen, J., and Theo.,W," Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration," Cambridge Journal Of Education,48(1), 110, 2017.

[34] Sari. K. Arum., Zuhdan. Prasetyo, H., and Setiyo," Pengembangan Lembar Kerja Peserta Didik IPA Berbasis Model Project Based Learninguntuk Meningkatkan Keterampilan Kolaborasi dan Komunikasi Peserta Didik Kelas VII," Jurnal pendidikan dan Sains. 6(8), 1-7, 2017.

[35] Greenstein, L," Assessing 21st Century Skills: A Guide to Evaluating Mastery and Authentic Learning. California: Corwin, 2012.

[36] Trinova, Z," Hakikat Belajar dan Bermain Menyenangkan Bagi Peserta Didik," Jurnal Al-Ta'lim. 1(3), 209-215, 2012.

[37] Zubaidah, S," Keterampilan Abad Ke-21: Keterampilan yang Diajarkan Melalui Pembelajaran. STKIP Persada Khatulistiwa Sintang Kalimantan Barat: Seminar Nasional Pendidikan dengan tema "Isu-isu Strategis Pembelajaran MIPA Abad 21, 2016.

[38] Sharifirad, G. R., Rezaeian, M., Jazini, A., and Etemadi, Z. S," Knowledge, attitude and performance of academic members regarding effective communication skills in education," Journal of Education and Health Promotion, 1(42), 8–13, 2012.

[39] Ostlund, and Keren, L," Science Process Skills Assesing Hands-on Student Performance. N/A: Addison-Wesley Publishing Company, 1992.

[40] Suharto," Pengembangan Ketrampilan Bicara Anak Usia Dini," Jakarta: Depdiknas, 2005.

[41] Depdiknas," Panduan Pengembangan Bahan Ajar," Jakarta: Direktorat Jenderal Manajemen Pendidikan Dasar dan Menengah, 2008.

[42] Noor Aziah Alias, and Hasyim," Penelitian, Desain, dan Pengembangan Teknologi Instruksional. Amerika: IGI Global, 2011.

[43] Rahayu, C, and Festiyed," Validitas Perangkat Pembelajaran Fisika SMA Berbasis Model Pembelajaran Generatif Dengan Pendekatan Open-Ended Problem Untuk Menstimulus Keterampilan Berpikir Kritis Peserta Didik," Jurnal Pendidikan Fisika. Vol. 7. No. 1, 2019.

[44] Purwanto," Instrumen Penelitian Sosial dan Pendidikan," Yogyakarta: Pustaka Belajar, 2012.

[45] Sukmadinata, and Nana Syaodih," Metode Penelitian Pendidikan. Bandung," : Remaja Rosdakarya, 2019.

[46] Azwar, S," *Reliabilitas dan Validitas*," Yogyakarta: Pustaka Belajar, 2015.