



## EFFECTIVENESS OF THE APPLICATION OF INTERACTIVE MULTIMEDIA IN THE ASSESSMENT OF 4C SKILLS IN PHYSICS LEARNING: LITERATURE STUDY

Fina Afriani Putri<sup>1</sup>, Fatni Mufit<sup>2,\*</sup>

<sup>1</sup>Program Studi Magister Pendidikan Fisika, Universitas Negeri Padang, Indonesia

<sup>2</sup>Departemen Fisika, Universitas Negeri Padang, Indonesia

Corresponding author email: [fatni\\_mufit@fmipa.unp.ac.id](mailto:fatni_mufit@fmipa.unp.ac.id)

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### Abstract :

This research aims to analyze the effectiveness of implementing interactive multimedia in assessing 4C skills in physics learning. This effectiveness is evaluated from the 4C skills (Critical thinking, Creativity, Collaboration, and Communication). This research was conducted because there are still many physics lessons that prioritize mastery of concepts only, which causes a lack of interest in students' learning. Therefore, interactive multimedia is needed, which can make students more enthusiastic about participating in learning through pictures, videos, and moving animations. The method used is a literature study with a quantitative approach. This research is limited to the effect of using interactive multimedia on physics material at the elementary, middle school, high school, and university levels. Researchers obtained 20 references from 2012-2022 from Sinta, Google Scholar, Garuda, and others. From the analysis of the literature study that has been carried out, it is concluded that interactive multimedia significantly influences the assessment of 4C skills (Critical thinking, Creativity, Collaboration, and Communication). The significant influence is on critical thinking skills.

Keywords: 4C Skills, Interactive Multimedia, Literature Study, Physics

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## INTRODUCTION

21st-century learning directs students' abilities to explore knowledge from various places, solve problems, think at a higher level, and work together and collaborate in dealing with problems (Redhana, 2019). The Industrial Revolution is an issue that increased the nation's competitiveness and economic growth in this revolutionary era, including in the field of education, which requires more innovative learning preparation and increasing the generation's ability with 21st-century skills (Zubaidah, 2018).

In 21st-century learning, skills are needed that require students to be able to practice skills in learning activities that deal with various things, critical thinking skills, innovation and overcoming problems through negotiation analysis, the ability to communicate effectively and collaborate, known as 4C skills (Alfiani et al., 2017). 21st-century skills include the 4Cs, namely Critical thinking,

Creativity, Collaboration, and Communication (Setuju et al., 2022). Physics subjects are also responsible for providing learning that can improve 21st-century skills (Novitra et al., 2021).

Physics learning aims to develop students' knowledge, skills, and analytical power towards society and the surrounding environment. Learning physics cannot be separated from mastering basic concepts and theories or new questions that need to be answered by understanding physics learning concepts (Sari et al., 2022). However, physics teaching in schools tends to emphasize mastery of concepts alone to the exclusion of students' 4C skills and analytical problem-solving abilities.

Also, in schools, several textbooks are given to students that specifically do not comply with the demands of the existing curriculum. Some texts in schools cannot meet curriculum standards that can develop students' 4C skills so they can think critically, creatively, innovatively, communicatively, and collaboratively. If the textbook cannot develop 4C skills, then the skills expected in the independent curriculum will not be achieved. To overcome this problem, the texts must have sections that follow the demands of a separate curriculum that can develop the skills that students need in the 21st century, where 4C skills are the skills required by students to be successful in the 21st century.

Teaching materials consist of several types, including printed teaching materials, listening teaching materials, visual viewing teaching materials, web-based teaching materials, and interactive multimedia teaching materials (Mufit & Fauzan, 2019). Interactive multimedia teaching materials are one form of teaching material to increase students' interest in learning and improve the assessment of students' 4C skills. Interactive multimedia is collaboration in using computers to create and collect text, graphics, sound, and moving images (video and animation) by combining link addresses and tools that make it easier for users to navigate and interact, giving full play to creativity and communication (Haqih et al., 2022).

The use of interactive multimedia will help students understand concepts or material that are less tangible because the material can be realized through interactive multimedia. By learning through interactive multimedia images and videos, students can be more enthusiastic about participating in learning (Pramuji et al., 2020). Multimedia learning models can be practical and evaluation models, tutorials, games, simulations, discovery, and problem-solving.

Based on the background above, the researcher wants to analyze further interactive multimedia's influence or effectiveness in assessing 4C skills in elementary, middle, high school, and university students' physics learning.

## **RESEARCH METHOD**

This type of research is literature study research (Jaelani et al., 2020). Sampling in this study used a purposive sampling technique. This is a sampling technique by selecting a sample from the population according to the researcher's wishes (goals and problems in the research) so that the selection can represent previously known characteristics of the population (Nursalam, 2015). The data collection technique is a literature study by collecting articles and then researching and analyzing them without any field observations by the researcher. The grouped literature studies are in the form of the use of interactive multimedia in physics learning. Literature collected during 2012-2022. The approach used in this research is quantitative.

The literature studies used and analyzed are research obtained by previous researchers published in proceedings and journals. Literature sources were analyzed in the form of titles, abstracts, and keywords used. The research instrument is a roster sheet for sorting literature related to the research topic. The research steps carried out are 1) determining the title and research topic to be analyzed; 2) collecting articles to be analyzed according to the title and research topic; 3) dividing the articles obtained based on the title and research topic; 4) analyzing articles based on title and research topic; 5) organize and write articles from the analysis obtained (Saprudin et al., 2021).

## **RESULTS AND DISCUSSION**

Researchers chose the population and sample based on articles that have been published in national journals at elementary, middle school, high school, and university levels that use interactive multimedia in physics learning. This research is viewed from 21st-century skills, namely 4C skills (Critical thinking, Creativity, Collaboration, and Communication).

Furthermore, Table 1 shows the effect of using interactive multimedia on physics learning. The effect of this implementation is seen in improving 21st century skills, namely 4C skills (Critical thinking, Creativity, Collaboration, and Communication).

Table 1. Application of Interactive Multimedia in Physics Learning

No	Physics Concept	4C Skills	Research Earnings	Reference
1.	Temperature and Heat	Critical Thinking Skills	Interactive multimedia with temperature and heat material at SMA Negeri 1 Alas in the 2013/2014 class X academic year influences students' critical thinking skills.	(Husein et al., 2017)
2.	Newton's Law of Gravity	Critical Thinking Skills	Physics interactive multimedia with SETS insight obtained valid results in the medium category that significantly improved students' critical thinking abilities.	(Hidayaturrohman et al., 2017)
3.	Straight Motion	Critical Thinking Skills	Interactive multimedia with a PBL model that is valid, practical, and effective can be used to improve social skills in experimental classes and enhance students' critical thinking abilities.	(Oktaviani et al., 2017)
4.	Dynamic electricity	Critical Thinking Skills	Guided inquiry-based interactive multimedia in science subjects is obtained effectively to improve students' critical thinking skills.	(Ma'rifah et al., 2014)
5.	Movement and Style	Critical Thinking Skills	Interactive multimedia with a contextual approach improves junior high school students' critical thinking abilities and social skills.	(Zulham, 2020)
6.	Impulse and Momentum	Critical Thinking Skills	Android-based interactive multimedia on impulse and momentum material can affect improving students' critical thinking skills and learning outcomes.	(Yuliana et al., 2020)
7.	Environmental pollution	Critical Thinking Skills	STEM-based interactive multimedia for junior high school students with environmental pollution material effectively influences students' critical thinking skills.	(Pramuji et al., 2020)
8.	Static Fluid	Critical Thinking Skills	Interactive multimedia with physical simulation in the experimental class experienced a higher increase in students' learning gains and critical thinking skills than in the control class with conventional learning.	(Zahara et al., 2015)
9.	Optics	Critical Thinking Skills	Interactive multimedia used by students can increase their understanding of concepts by	(Harjono et al., 2016)

No	Physics Concept	4C Skills	Research Earnings	Reference
			giving them lots of practice analyzing a problem and can improve students' critical thinking skills.	
10.	Environment	Critical Thinking Skills	The use of interactive multimedia with the Problem-Based Learning (PBL) model for grade 4 students at SD Negeri Dukuh 03 can affect improving students' learning outcomes and critical thinking abilities.	(Ardyanto et al., 2018)
11.	Solid State Physics	Critical Thinking Skills	Interactive multimedia can improve students' critical thinking skills because it is suitable for use in abstract and macroscopic physics material.	(Wiyono et al., 2012)
12.	Vector	Critical Thinking Skills	The developed interactive multimedia based on articulate storyline software is included in the high category in the pretest and posttest acquisition of creative thinking skills, which is calculated by Normalized gain and can affect improving creative thinking skills.	(Sari et al., 2022)
13.	Geometric Optics	Critical Thinking Skills	The interactive multimedia developed can improve students' thinking skills, which are classified as valid, effective, and efficient in class 11 high school students, and enhance creative thinking skills.	(Ridwan et al., 2021)
14.	Kinetic Theory of Gases and Laws of Thermodynamics	Collaboration Skills	Interactive multimedia based on Trait Treatment Interaction (TTI) by integrating Adobe Flash with material on the kinetic theory of gases and the laws of thermodynamics XI SMA/MA can affect improving collaboration skills and is classified as very valid.	(Fahmi et al., 2020)
15.	Electrical Concept	Communication Skills	The interactive multimedia developed can support student communication through text, audio, video, images, animation, and graphics and influence students' communication skills.	(Gunawan et al., 2017)
16.	Angle Measurement	Communication Skills	This interactive multimedia is very effective in improving students' mathematical abilities and can improve students' communication skills.	(Hotimah et al., 2021)
17.	Simple Plane	Communication Skills	Interactive multimedia that combines learning from home	(Handayani et al., 2021)

No	Physics Concept	4C Skills	Research Earnings	Reference
18.	State of Substances and Solubility	4C Skills	between Google Classroom and Phet simulation after using LMS can improve students' communication skills. Interactive multimedia with project-based CD-O (Compact Disk-Online) can improve students' 4C abilities and grow students' motivation in learning.	(Siswanto, 2012)
19.	Simple Harmonic Waves	4C Skills	Cognitive conflict-based interactive multimedia can improve students' understanding of concepts and students' 4C skills in simple harmonic wave material, which is classified as valid.	(Putri et al., 2019)
20.	Straight Motion	4C Skills	Interactive multimedia based on cognitive conflict is classified as valid in linear motion material and can improve students' understanding of concepts and 4C skills.	(Aini & Mufit, 2022)

Based on Table 1, it can be seen the influence of interactive multimedia on increasing students' 4C skill assessment in each physics learning material. There are several materials implemented in interactive multimedia analysis, namely temperature and heat, Newton's law of gravity, rectilinear motion, vectors, geometric optics, kinetic theory of gases and the laws of thermodynamics, electrical concepts, angular measurements, states of matter and solubility, fluid dynamics, mechanical waves, dynamic electricity, motion and force, impulse and momentum, environmental pollution, static fluids, solid state physics, and simple machines at elementary, middle school, high school and college levels. This material is implemented in interactive multimedia to help increase students' interest and talents in physics and improve their' 4C skills. Especially abstract concepts that students cannot observe directly, such as physics material, kinetic theory of gases, and thermodynamics.

Based on previous research, it appears that the design of the teaching materials being developed can make people who use them want to try and be interested in trying them (Annisa et al., 2020). This is also in line with the research of Divine et al. (2021), who also developed interactive multimedia based on cognitive conflict on mechanical and thermodynamic wave material.

Likewise, in Anggraini & Mufit (2022), interactive multimedia teaching materials developed using the cognitive conflict model have practical value under the researchers' teaching materials. Likewise, in Yanto's research (2019), if the reasonable value of interactive multimedia is interpreted through tables and graphs, then the practicality of the teaching materials assessed by students is in the convenient category. Aini & Mufit's research (2022), the teaching materials developed in the form of mobile learning integrated with Android in class and efficiency.

## CONCLUSION

Based on the results of a literature study of 20 articles, it can be concluded that the use of interactive multimedia in physics learning can improve the assessment of students' 4C skills, namely, critical thinking skills, creative thinking skills, communication skills, and collaboration skills at an elementary, middle school, high school, and college levels. The skills that influence the use of interactive multimedia are critical thinking skills.

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