

THE INFLUENCE OF COMPUTER-BASED INTERACTIVE MEDIA AND STUDENTS' CRITICAL THINKING SKILLS ON LEARNING OUTCOMES OF PHYSICS MATERIAL ELASTICITY OF CLASS XI IPA STUDENTS AT SMA PAKUSARI

Pungkasaningsih Sri¹, Muis Abdul²

SMAN 1 Pakusari, Jember, Indonesia

Universitas PGRI Argopuro Jember, Jember, Indonesia

sripungkasaningsih@gmail.com ¹ muisuhammad416@gmail.com ³

Article History: Received: Juni, 5, 2022; Accepted: Juni, 10 2022; Published:juni, 30 2022

ABSTRACT

The influence of computer-based interactive media has an influence on critical thinking skills and learning outcomes of physics material Elasticity. Respondents of this study were students of class XI IPA SMAN Pakusari, With a total of 76 students in Class XI IPA 4 with computer-based interactive learning with the MS team application in the 2020 school year, the research area was determined using the purpose sampling area method. This research is a quantitative research with causal quantitative design. Data collection tools using observation, interviews, documentation and tests. Test Analysis of the instrument using: 1) normality test 2) homogeneity test. Data analysis used multiple linear regression using the product moment. Based on the hypothesis test, it is proven that: (1) the results of the 1-Sample Kolmogorov Smirnov analysis above, obtained the data sig = 0.088. Because the obtained sig > 0.05, then H0 is accepted, Ha is rejected. That is, the experimental class = control class.2). Based on the "Paired Sample Correlation" table above, the correlation value is 0.209 with a significance of 0.220. Because the significance value is > 0.05, it can be said that there is no relationship between the pretest variable and the posttest variable. Based on the table "Paired Sample t-test", it was found that the significance value (2-tailed) was 0.00. Because the significance value is <0.05, then H0 is rejected and Ha is accepted. So it can be said that there is an average difference between the pretest and posttest scores, which means that the use of Ms. Teams can improve student learning outcomes and critical thinking skills on physics material.

Keywords: Computer Based Interactive Media, Critical Thinking Ability, Learning Outcomes



Copyright © 2021 The Author(s)

This is an open access article under the [CC BY-SA](#) license.

Introduction

The developments and changes that occur in the life of society, nation and state in Indonesia cannot be separated from the influence of global changes, the development of science and technology, as well as arts and culture. This continuous change demands the need for improvement of the national education system, including the improvement of the curriculum to create a society that is able to compete and adapt to changing times. For this reason, efforts to improve the quality of education must be carried out comprehensively which includes the development of the Indonesian human dimension as a whole, namely aspects of morals, morality, character, knowledge, skills, arts, sports, and behavior. The development of these aspects leads to the improvement and development of life skills which are realized through the achievement of the curriculum of students to survive, adapt, and succeed in the

future. Thus, students have toughness, independence, and identity that is developed through learning and or training that is carried out gradually and continuously (HALFFTER et al., 2003).

One of the quality improvements in the various aspects above is influenced by the quality of thinking skills. Especially for science, it has a different pattern of thinking from everyday thinking patterns (common sense), a scientific thinking pattern based on philosophy, certain theories and terminology, which must be studied first (Zhang, 2018).

Especially for learning physics which is full of abstract concepts, of course, it is hoped that it can develop students' thinking skills. Whether it's the ability to think basic ways that make a picture of the process of thinking that contains a number of simple steps to the complex, as well as complex thinking which is also called higher order thinking.

In general, physics learning in secondary schools places more emphasis on basic thinking patterns, while complex thinking patterns are often neglected, so that the quality of mastery of physics material is not in line with expectations. The learning model developed by teachers in the field of study does not condition students to engage in complex thinking patterns. Students' mastery of chemical concepts as an indicator of the success of a teaching and learning process from various studies is generally still shallow. (Lestari, 2014)

One of the reasons for the shallow mastery of physics concepts is that there are not many students involved in constructing a concept in their mind. Learning is generally more teacher-centered. Students are not involved in asking or finding things, but rather listening and repeating the expected answers. (Exline, 2004). This fact leads students to always memorize facts and information even though in the modern world it is not the most important skill. Changes in facts and information can be read while the most important thing is understanding how to get and interpret the data and information collection itself.

Computer-based learning is the use of a computer to prepare learning materials for students, see their learning progress or choose additional learning materials that suit the learning needs of students personally or is a form of application and use of computers that are applied in direct student learning to deliver lesson content. , provide student learning exercises.

Learning Computer-Assisted Instruction or Computer Assisted Learning or (PBK) as a direct teaching process that makes computers to present teaching materials in a learning model that takes action to provide and control the learning environment individually for each student (Splittgerber and Stirzaker, 1984).

This meaning is in line with Steinberg who explains that PBK forms all acts of applying computers for learning that have individual, interactive, and directive aspects (Steinberg, 1991). The definition of PBK is individual learning, because the computer provides services as a tutor for a student rather than as an instructor for a group of students.

In computer-assisted learning, there is an intensive two-way communication between students and the computer system. This is interpreted as interactive PBK. In addition to this, PBK allows 6 students to ask questions, give responses and the computer system provides feedback as quickly as possible after students respond. The feedback given by the computer is expected so that students can always encourage and improve their abilities.

Definisi ini selaras dengan Tailor dalam Merrill (1996), yang menyatakan bahwa semua aplikasi komputer dalam pendidikan dapat diklasifikasi sebagai tutor, tool atau tutee. Dalam hal ini terdapat 3 fungsi Komputer dalam pembelajaran:

1. Komputer sebagai Subjek
2. Komputer sebagai tenaga pengajar
3. Tujuan Media Pembelajaran berbasis Komputer

Thinking is a cognitive process, mental activity to gain creative knowledge and experience (Presseisen, 1985). In the process of thinking can be divided into basic and complex thinking. Basic thinking is thinking logically which consists of remembering, describing in the mind, classifying, generalizing, comparing, evaluating, analyzing, synthesizing, deducing and concluding (Novak, 1979).

Complex thinking which is also called higher order thinking consists of problem solving, decision making, critical thinking, and creative thinking (Costa, 1985).

According to (Ennis, 1995; Pramusinta, Setyosari, & Kuswandi, 2019) critical thinking is the process and ability involved in making rational decisions about what to do and what to believe. With good critical thinking skills, they can provide good recommendations for taking an action. The essence of critical thinking is an attitude used by someone to give an assessment of something.

Improving complex thinking skills, especially critical thinking, is highly recommended to improve students' mental abilities. Some psychologists believe in the importance of teachers helping students to develop their mental abilities (Lohman in Haladyna, 2000). Mental ability is more complex than what is known as knowledge and skill, because it also contains affective components such as motivation and attitude, so it takes a longer time to develop.

The measure of mental ability is still being developed by science. So what is more likely to be measured is achievement. Achievement refers to cognitive development that changes from simple (Mawaddah, Suyitno, & Kartono, 2015; Nugraha, Suyitno, & Susilaningih, 2017) and facts to more complex types of thinking in the presence of correct answers. Achievement occurs over a short period of time, such as after learning. There are two basic types of Achievements: knowledge and skills. Knowledge presents a series of content that is remembered or understood. A skill is a set of developments that lead to resu).

The development of the SMA/MA Physics Curriculum is carried out in order to achieve the dimensions of knowledge competence, scientific work, and scientific attitudes as daily behavior in interacting with society, the environment and the use of technology, as illustrated in Figure 2. Below:



Figure 2. To the framework of Natural Science Development

Figure 2. above shows that students are able to apply the Natural Science competencies learned in school into behavior in people's lives and utilize society and the environment as learning resources.

The framework for developing Basic Competencies (KD) in Natural Sciences refers to Core Competencies (KI) as an organizing element for KD vertically and horizontally. The KD vertical organization in the form of KD linkages between NKS classes must meet the learning principle, namely there is a continuous accumulation of competencies learned by students. Horizontal organization in the form of linkages between the KD of a subject with the KD of other subjects in the same class so that a mutually reinforcing process occurs. The development of basic competencies is based on the principle of accumulative, mutually reinforcing (reinforced) and enriched (enriched) between subjects and levels of education (horizontal and vertical organization). All basic competencies and learning processes are developed to achieve KI. The 2013 curriculum develops two learning processes, namely the direct learning process and the indirect learning process. The direct learning process is a learning process that develops students' knowledge, thinking skills, and psychomotor skills through direct interaction with learning resources designed in the syllabus and lesson plans in the form of activity-based learning

activities. Characteristics of activity-based learning include: interactive and inspiring; fun, challenging, and motivates students to participate actively; contextual and collaborative; provide sufficient space for the initiative, creativity, and independence of students; and in accordance with the talents, interests, abilities, and physical and psychological development of students.

In direct learning, students learn to see, ask questions, collect information, associate or analyze, and communicate what has been obtained in analyzing activities. The direct learning process acquires direct knowledge and skills or what is called the instructional effect.

Indirect learning is a process that occurs during learning but is not designed in special activities. Indirect learning is generally concerned with developing values and attitudes. The types of values and attitudes that will be developed are not taught directly in lessons, but are still designed and planned in the syllabus and lesson plans. Indirect learning relates to learning related to KD which was developed from KI-1 and KI-2. In the process of learning Physics with a scientific approach based on science, the domain of attitude is intended so that students know about the 'why'. The skill domain is intended so that students know about 'how'. Meanwhile, the realm of knowledge is intended so that students know about 'what'.

The final result of learning Physics is an increase and balance between the ability to become good human beings (soft skills) and humans who have the skills and knowledge to live properly (hard skills) from students which include aspects of attitude, skills, and knowledge competencies. By developing these three aspects of competence, it is expected to form productive, creative, and innovative students.

METODE

This study used an experimental method with a control class or "The randomized Pretest - Posttest control group design" (Fraenkel & Wallen, 1990) whose determination was made at random. Experiments were carried out by providing learning with computer-based interactive media with the Ms. team in the experimental group with a systematic and agreement-based learning in the control group. Both groups were given pre-test and post-test which were expected to measure critical thinking skills in both groups before and after receiving instruction.

The table of experiments to be carried out is as shown in table 3.

Tabel 3.1 Disain grup kontrol pretest-posttest

Kelompok eksperimen	O	X ₁	O
Kelompok control	O	X ₂	O

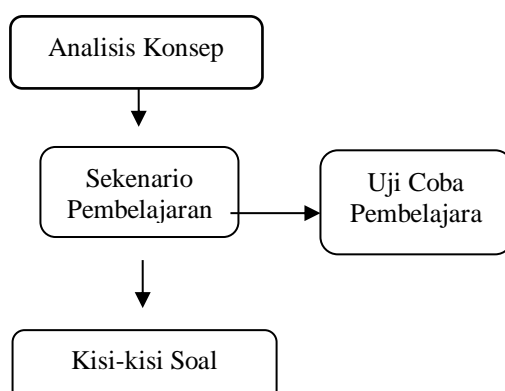
Keterangan:

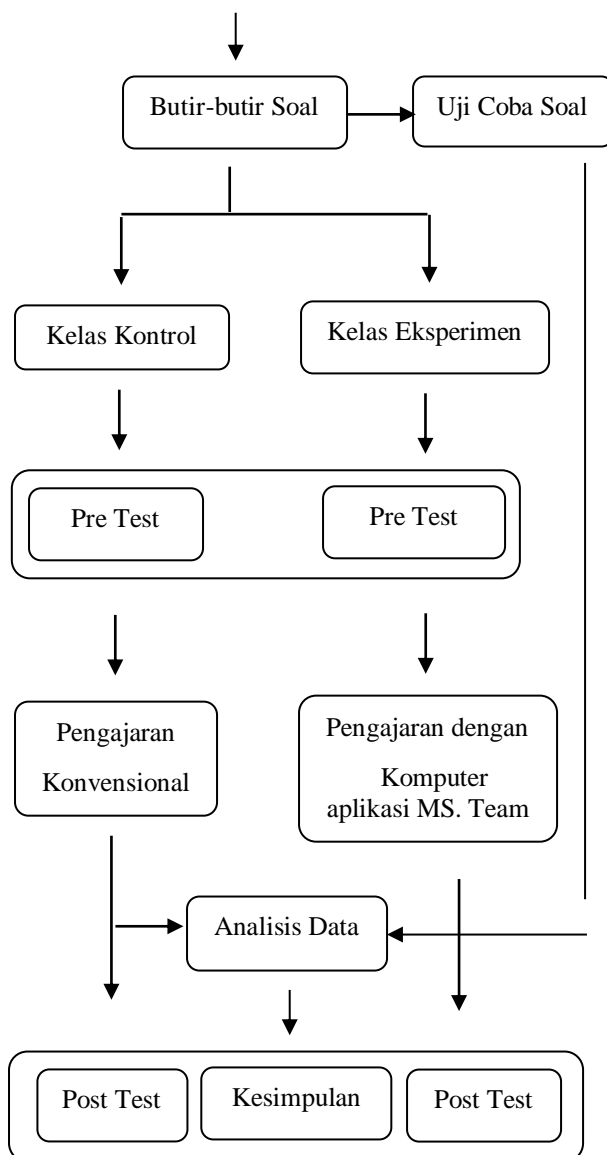
O = Pretest-posttest

X₁ = The treatment is in the form of learning using computer media with the Ms. application. team

X₂ = Treatment in the form of conventional learning

Desain Studi





Gambar 3.1 Desain studi

Based on the research objectives in pad I, the data needed from this research are:

- The results of the pre-test of the control and experimental groups before getting teaching on the topic of elasticity and Hooke's law.
- The results of the post-test of the control and experimental groups after learning the topic of elasticity and Hooke's law.

Compare the effectiveness of computer-based learning models using applications with conventional learning.

The implementation of the research began by giving a pre-test to both the experimental and control groups. The pre-test questions for both groups are the same as the time allotted to do them for 2 hours of lessons (2 x 45 minutes). This activity aims to measure students' initial abilities before being given treatment.

The second stage is to give treatment to the two groups, namely to teach the topic of elasticity and Hooke's law to the experimental group and conventional learning models to the control group for

5 hours (5 x 45 minutes). Teaching in the experimental group was carried out by researchers, while for the control group by field teachers who taught physics in the class concerned.

The implementation of learning in the control group by the subject teacher in the class concerned aims to reduce bias towards learning outcomes, so that the learning process is expected to run normally.

After carrying out learning in both groups, then a post-test was given to both groups with the same questions given at the pre-test. This activity aims to see the extent of the impact resulting from learning on students' abilities.

Another purpose of implementing this pre-test is also to see how far the differences in learning outcomes with application-based computer media with conventional ones.

After carrying out the three stages above, then students in the experimental group were given a questionnaire related to students' responses to Physics lessons, the type of basic physics competencies that were most liked or interested in, responses to computer learning media and difficulties when studying the topic of elasticity and Hooke's law. Quantitative data were taken from the pre and post test scores of the control and experimental groups. The pre and post test scores for both groups were calculated. The normalized gain was calculated from the scores using the formula:

$$Ng = \frac{\text{Skor post test} - \text{skor pre test}}{\text{skor maksimum} - \text{skor pre test}}$$

(Meltzer, 2002)

The resulting quantitative data was processed using the statistical comparison of the mean of the two groups to determine the significance level of normalized gain (Ng) that occurred between the control class who was given teaching based on agreement and the experimental class that was given a computer-based learning model with the Ms. application. team. In this quantitative data test, the test is carried out by testing the level of normality of the data using the one-sample Kolmogorov-Smirnov test (One-Sample Kolmogorov-Smirnov Test) followed by the average test. The average test is done parametrically, this is considering the data is normally distributed.

Considering that the two data are not dependent on each other, then the normalized average gain (Ng) test is carried out using an independent T test (Independent Sample Test). To see the difference between the two groups by comparing the significance value with a significant level ($\alpha = 0.05$), where if the significance value < 0.05 indicates there is a difference, while if > 0.05 there is no difference.

Meanwhile, to see the effect of treatment for each group, a paired sample test was carried out which was processed from the pre and post test data for each group separately. The use of this test remembers that the pre and post tests are data that are mutually dependent.

The research subjects were students of class XI IPA 3 and IPA 4 of SMAN Pakusari, which at the time of the study, students in both the control and experimental groups had not received any learning on the topic of Elasticity and Hooke's law. The control class is 36 students and the experimental class is 36 students

RESULTS AND DISCUSSION

In this section, we will discuss the effect of implementing computer-based interactive learning on students' critical thinking skills in class XI science students at SMA Negeri Pakusari on the material of elasticity in the experimental class and control class. During the research at SMAN Pakusari, 3 meetings were held in 3 weeks, 1 hour for 45 minutes, each meeting 2 hours of lessons. The two groups were given different treatment in class XI IPA 3 applied computer-based interactive learning using the Ms. Team. which was carried out 3 times and class XI IPA 4 applied the conventional learning model which was carried out 3 times. The discussion of the research results is carried out based on data

analysis and data findings in the field. Thinking is a symbolic representation of some event or item. According to another definition, thinking is a process in which new mental representations are formed through information and complex interactions of attributes such as judgment, abstraction, logic, imagination, and problem solving. A person's thinking skills cause a person to have to move so that it is beyond the information he hears, for example a person's thinking ability to find new solutions to a problem at hand. (Ford, Wilson, Foster, Ellis, & Spink, 2002)

According to Halpen, Thinking in a crisis is also an activity of assessing and thinking carefully to determine the conclusions that will be drawn when determining several supporting factors to make decisions. Thinking in a crisis is also an activity of assessing, thinking carefully to determine the conclusions that will be drawn when determining several supporting factors for making decisions. To see the achievement of students' critical thinking skills in each aspect will be discussed a. Give a simple explanation, b make further explanation, c conclude, and d. Strategy and Tactics (Mar'atus Sholihah, Sugeng Utaya, 2016; Priawasana & Waris, 2019)

CONCLUSIONS AND SUGGESTIONS

Conclusion

Based on the results of data analysis and discussion, several conclusions were obtained as follows:

1. There is an effect of the use of computer-based interactive media on the physics learning outcomes of students in class XI science at SMAN Pakusari.
2. There is an effect of critical thinking skills on the learning outcomes of Physics material for Class XI Science students at SMAN Pakusari.
3. There is an effect of the use of computer-based interactive media and critical thinking skills together on learning outcomes of Physics material for Class XI Science Students at SMAN Pakusari.

References

- Cheong, (2000), *The Power of Questioning*. San Francisco: Synergy Learning International, Inc.
- Dahar, R.W. (1990), *Teori-teori belajar*. Jakarta: Erlangga.
- Ennis. (1995). *Critical Thinking (ROBERT H. ENNIS).pdf*. New York: Nuw York Times Compeny.
- Esler dan Esler, (1993), *Teaching Elementary Science*, sixth edition. California: Wadsworth Publishing Company Belmont.
- Exline, (2004), *Workshop: Inquiry-based Learning*, http://www.thirteen.org/edonline/concept2class/inquiry/index_sub2.html
- Ford, N., Wilson, T. D., Foster, A., Ellis, D., & Spink, A. (2002). Information seeking and mediated searching: Part 4. Cognitive styles in information seeking. *Journal of the American Society for Information Science and Technology*, 53(9), 728–735. <https://doi.org/10.1002/asi.10084>
- HALFFTER, G., Zikán, W., Wygodzinsky, P., Castillo, C., Boucher, S., Salazar, K., ... Postal, A. (2003). Undang Undang Republik Indonesia Nomor 20 tahun 2003 tentang sistem pendidikan. *The Coleopterists Bulletin*, 1(1), 1–11. Retrieved from <http://dx.doi.org/10.1016/j.cretres.2011.11.017> <http://www.conabio.gob.mx/www.unal.edu.co/icn/publicaciones/caldasia.htm> https://pdfs.semanticscholar.org/9bb8/973866467bf10fef937356ac16349c35874b.pdf?_ga=2.109558917.1250767975.1574828256-287221478.1
- Haladyna, T. M. (2000), *Writing Test Items to Evaluated Higher Order Thinking*. Boston: Allyn & Bacon A Viacom Company.
- Hasan, H., dkk, (2004), *Pedoman Penulisan Karya Ilmiah*. Bandung: Universitas Pendidikan Indonesia.
- Howe, et.al. (1989), *Teaching Critical Thinking Though Environmental Education*, <Http://ericae.net/edo/ED324193.htm>.
- Lestari, S. L. (2014). Analisis Konsepsi dan Perubahan Konsep suhu dan Kalor pada Siswa SMA Kelas Unggulan. *Unnes Physics Education Journal*, 3(3), 77–83.

- Mar'atus Sholihah, Sugeng Utaya, dkk (Universitas N. M. (2016). Pengaruh Model Experiential Learning Terhadap Kemampuan Berpikir Siswa Sma. *Jurnal Pendidikan*, 2096–2100. Retrieved from <http://journal.um.ac.id/index.php/jptpp/article/view/7869>
- Mawaddah, N., Suyitno, H., & Kartono. (2015). Model Pembelajaran Discovery Learning dengan Pendekatan Metakognitif Untuk Meningkatkan Metakognisi. *Unnes Journal of Mathematics Education Research*, 4(1), 10–17.
- Nugraha, A. J., Suyitno, H., & Susilaningsih, E. (2017). Analisis Kemampuan Berpikir Kritis Ditinjau dari Keterampilan Proses Sains dan Motivasi Belajar melalui Model PBL. *Journal of Primary Education*, 6(1), 35–43. <https://doi.org/p-ISSN 2252-6404 e-ISSN 2502-4515>
- Pramusinta, Y., Setyosari, P., & Kuswandi, D. (2019). Exploring Metacognitive and Critical Thinking Skills of Pre-Service Elementary School Teachers through Discovery Learning Method by Integrating Various Cognitive Styles. *Journal for the Education of Gifted Young*, (December), 999–1017.
- Priawasana, E., & Waris, W. (2019). Peningkatan Kemampuan Berfikir Kritis Dengan Pendekatan Problem Based Learning. *Madrosatuna: Journal of Islamic Elementary School*, 3(1), 49. <https://doi.org/10.21070/madrosatuna.v3i1.1975>
- Zhang, L. (2018). “Hands-on” plus “inquiry”? Effects of withholding answers coupled with physical manipulations on students’ learning of energy-related science concepts. *Learning and Instruction*, (December 2017), 0–1. <https://doi.org/10.1016/j.learninstruc.2018.01.001>