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THE EFFECT OF ARTICULATE STORYLINE-BASED INTERACTIVE LEARNING MEDIA ON THE CHEMISTRY CLASS XI STUDENTS LEARNING OUTCOMES

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ABSTRACT

The aim of this research is to determine whether there is an influence of articulate storyline-based interactive learning media on students' cognitive learning outcomes and affective learning outcomes in class XI chemistry learning. This research uses a quasi-experimental quantitative approach and a non-equivalent control group research design. The population of this study was all class XI IPA. The technique used for sampling was saturated sampling, class XI IPA I with a total of 36 students as the control class and class XI IPA II with a total of 41 students as the experimental class. Data collection uses multiple choice questions for cognitive learning outcomes and questionnaires for affective learning outcomes. Hypothesis testing uses the non-parametric Mann-Whitney test for univariate tests and Kruskal Wallis for multivariate tests. Based on the results of the hypothesis test, the following conclusions were obtained: 1) There is an influence of articulate storyline-based interactive learning media on students' cognitive learning outcomes in Class XI chemistry learning on a univariate basis, with a value of Sig. 0.002<0.05. 2) There is an influence of articulate storyline-based interactive learning media on students' affective learning outcomes in Class XI chemistry learning univariately, with a value of Sig. 0.000<0.05. 3) There is an influence of articulate storyline-based interactive learning media on students' cognitive learning outcomes and affective learning outcomes in Class XI chemistry learning in a multivariate manner, with a value of Sig. 0.000<0.05.

ABSTRAK

Tujuan penelitian ini adalah untuk mengetahui apakah ada pengaruh media pembelajaran interaktif berbasis *articulate storyline* terhadap hasil belajar kognitif dan hasil belajar afektif siswa pada pembelajaran kimia kelas XI. Penelitian ini menggunakan pendekatan kuantitatif quasi-eksperimen dan desain penelitian non equivalent control group desain. Populasi penelitian ini adalah seluruh kelas XI IPA. Teknik yang digunakan untuk pengambilan sampel adalah sampling jenuh, kelas XI IPA I dengan jumlah 36 siswa sebagai kelas kontrol dan kelas XI IPA II dengan jumlah 41 siswa sebagai kelas eksperimen. Pengumpulan data menggunakan soal pilihan ganda untuk hasil belajar kognitif dan angket untuk hasil belajar afektif. Uji hipotesis menggunakan uji non-parametrik uji Mann-Whitney untuk uji univariat dan kruskal Wallis untuk uji multivariat. Berdasarkan hasil uji hipotesis diperoleh kesimpulan sebagai berikut 1) Ada pengaruh media pembelajaran interaktif berbasis articulate storyline terhadap hasil belajar kognitif siswa pada pembelajaran kimia Kelas XI di secara univariat, dengan nilai Sig. 0,002<0,05. 2) Ada pengaruh media pembelajaran interaktif berbasis articulate storyline terhadap hasil belajar afektif siswa pada pembelajaran kimia Kelas XI secara univariat, dengan nilai Sig. 0,000<0,05. 3) Ada pengaruh media pembelajaran interaktif berbasis articulate storyline terhadap hasil belajar kognitif dan hasil belajar afektif siswa pada pembelajaran kimia Kelas XI secara multivariat, dengan nilai Sig. 0,000<0,05.

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INTRODUCTION

Chemistry is a science that emphasizes mastery of concepts. In the learning process, concepts are things that students need to understand, study and master. Chemical concepts are formed in students gradually through their experiences and interactions with the natural surroundings (Muksin, 2015). Learning chemistry is still a big challenge for teachers, because students experience many difficulties in learning chemistry material. In essence, the teaching and learning process is two concepts that cannot be separated. This concept is combined in one interaction activity between teacher and student, student and student during learning. The interaction between teachers and students is the main meaning in the learning process which plays an important role in achieving effective teaching goals. In conveying messages or material to students, a teacher needs to use models and media as communication intermediaries so that it runs optimally. The teaching and learning process is a communication process, namely the delivery of messages from the introducer to the recipient (Pratama, 2019). Therefore, to facilitate the delivery and interpretation of the material given by teachers to students, learning media is needed.

Learning media are tools that can help the teaching and learning process so that the meaning of the message conveyed becomes clearer and educational or learning objectives can be achieved effectively and efficiently. Learning outcomes are the results given to students in the form of assessments after following the learning process by assessing students' knowledge, attitudes and skills with changes in behavior. Learning media functions as a learning resource for students to obtain messages and information provided by the teacher so that learning material can be further improved and form knowledge for students. One of the reasons for using media in the teaching and learning process is related to students' level of thinking related to learning outcomes. Human levels of thinking follow levels of development, starting from concrete to abstract thinking, starting from simple to complex thinking.

Using learning media appropriately is important in the learning process, because media has several advantages, including making abstract and complex concepts into something real, simple, systematic and clear. Fajrina also stated that collaborative learning supported by computers for studying science obtained a significant increase from pretest to posttest (Fajrina, 2020). The use of media also has an important role in the chemistry learning process. The important role of media in the chemistry learning process is to increase students' interest in learning. Especially students whose understanding process is in the lower class. This means students whose understanding process takes a long time. Basically, students have different grasping powers. There are those who understand quickly, moderately and there are also those who take a long time. Chemistry is an abstract and complex concept that requires a deep understanding to study it. Thus, students who need a long time to understand are unable to think abstractly. So that by using learning media the material to be taught by the teacher can be visualized in a more real or concrete form.

One of the problems in choosing media is the different ways students learn. Some people learn faster through visual media, some prefer print media, others through audio-visual media, and so on. Therefore, to overcome this problem, it is

necessary to use multimedia in learning activities. According to Ivers and Barron, multimedia elements consisting of text, graphics, animation, images and sound in learning are expected to meet the learning needs of children who have different cognitive abilities. The current 21st century learning which prioritizes information and technology is very different from conventional learning which is text book in nature and only uses the lecture method in delivering the material. Mastery of material is one of the important things for students in the 21st century. For this reason, it is necessary to create effective and innovative learning conditions where interaction occurs between teachers and students so that it can create situations and conditions for an active and enjoyable learning environment.

Learning is an activity carried out by someone which results in a process of change in behavior, both in the form of knowledge, skills and attitudes. Learning involves relatively permanent behavioral changes in a person's knowledge or behavior due to experience. Learning outcomes can be explained by understanding the two words that form them, namely "outcomes" and "learning". The definition of outcomes indicates an acquisition as a result of carrying out an activity or process which results in changes in functional input (Dimyanto & Mujiono, 2014).

Learning outcomes are a process of change in intellectual (cognitive) abilities, interest or emotional (affective) abilities from fine and gross (psychomotor) abilities in students (Afandi, *et al*, 2013). Changes in students' abilities in the learning process, especially in education units, are expected to be in accordance with the development stage, namely at the concrete operational stage. Furthermore, Setiawan in his research drew the conclusion that learning outcomes are changes in behavior that occur after following the teaching and learning process in accordance with educational goals. Potential human behavior can be educated and changed in behavior which includes cognitive, affective and psychomotor domains. Where learning seeks changes in behavior in these domains so that learning outcomes are changes in behavior in the cognitive, affective and psychomotor domains (Setiawan, 2019).

Based on the results of observations at MA Putri Al-Ishlahuddiny Kediri, when chemistry learning took place, most students were not enthusiastic about learning. Chemistry is a material that is difficult and is not liked by students. So when the teacher explains chemistry learning, students tend to be less interested and have difficulty understanding the content of the lesson. Apart from that, many students' learning outcomes are still below the Minimum Completeness Criteria. Judging from the Midterm score, 57% of student learning outcomes are below the Minimum Completeness Criteria. This is because in the chemistry learning process teachers tend to present learning using a lecture method which seems boring. In fact, the school has provided an LCD to be used as fully as possible in the teaching and learning process. This less than optimal use of facilities also affects the enthusiasm and learning outcomes of students at MA Putri Al-Ishlahuddiny Kediri. Low numerical ability is one of the factors causing low student chemistry learning outcomes. This is because when studying chemistry, numerical ability is one of the basic abilities that students must master. Every part of chemistry always requires numerical skills, so the lack of students' level of understanding regarding chemical calculation formulas is mostly due to students not knowing the numerical basics

well. The next causal factor is the low ability of students to understand material. The level of students' ability to understand material greatly influences the achievement of learning objectives. If students are not able to understand the material well then it can be considered that the learning process implemented has not been successful, so to overcome this problem the teacher must be able to design new learning strategies. With this problem, it is necessary to apply learning media with a more interesting and interactive presentation that can involve students directly. One way is by using interactive learning media based on an articulate storyline.

Articulate Storyline is a program that can support modern digital-based learning designers ranging from beginners to professionals. Articulate Storyline is an application program supported by Smart Brainware in a simple way with an interactive tutorial procedure that helps users format CDs, personal websites and word processing, through templates that are published both offline and online. Articulate Storyline is software that is used as a presentation or communication medium. Articulate Storyline is a multimedia authoring tool used to create interactive learning media with content in the form of a combination of images, text, sound, graphics, video and animation (Pratama, 2019).

The Articulate Storyline learning media is a comprehensive learning media because in one application there are images accompanied by writing, quizzes and videos (Indasah *et al.,* 2021). The character of today's students is digital native because currently it is the industrial revolution 4.0, so students prefer to learn using IT-based learning media. Amiroh further stated that various interesting templates are completely available in the Articulate Storyline 3 program. Even with this program we can create a new template that suits what we want. The simple interface of this application means that we as novice users can understand it quite easily. The operation of Articulate Storyline is quite easy to use, this is because before running the application, the media developer first creates several sequences starting with competency achievements, materials, evaluation, and instructions for using the media (Mumlahana, 2020).

Based on previous research, it shows the influence of interactive learning media based on Articulate Storyline in its use to improve learning outcomes (Setyaningsih, *et al*., 2020). Articulate Storyline is worthy of being used as an interactive learning medium and can support teaching and learning process activities. Apart from that, research conducted by Siti Mughimatun Ulya suggests that student learning outcomes in the cognitive and affective domains using Articulate Storyline-based learning media have more influence than conventional learning outcomes (Siti, 2022). According to Yumini & Rakhmawati, it is stated that interactive learning media based on Articulate Storyline is very suitable for use to support teaching and learning activities in the classroom (Yumini & Rakhmawati, 2015).

The presence of interactive learning media based on Articulate Storyline can attract students' attention. This application not only presents material but can also present simulations and videos. The task of educators is to convey lesson material to students. The success of educators in delivering material depends on the interaction between educators and students. When the interaction between educators and students does not run smoothly, the information regarding the material presented cannot be absorbed by

the students. Thus, in the learning process it is necessary to provide interactive learning media such as Articulate Storyline to make it easier for students to understand the material.

METHODS

This type of research is a type of quantitative research with a quasi-experimental approach (Sugiyono, 2017). In this research, the population will be class XI IPA MA Putri Al-Ishlahuddiny Kediri, totaling 77 students. Determining the experimental class and control class uses a lottery system. The selected samples were class XI IPA 2 as the experimental class and XI IPA 1 as the control class. In this research, the independent variable is the use of interactive learning media based on Articulate Storyline, while the dependent variable is student learning outcomes which consist of cognitive learning outcomes and affective learning outcomes. In this study, using a non-equivalent control group research design, the instruments used in this research were multiple choice questions to measure students' cognitive learning outcomes and a questionnaire to measure students' affective learning outcomes. The data analysis technique used is hypothesis testing analysis (Mann Whitney test, independent sample t-test and Kruskal Wallis test)

RESULT AND DISCUSSION

Cognitive Learning Outcome Data

Table 1. Data on Student Cognitive Learning Results

Description of Cognitive Learning Outcome Data	N	Minimum	Maximum	Mean	Std. Deviation
Experimental Pretest Cognitive Learning Results	41	0	57	27.54	13.002
Experiment Posttest	41	0	93	75.49	22.321
Control Pretest Cognitive Learning Results	36	14	57	31.53	13.417
Control Posttest Cognitive Learning Results	36	21	93	57.00	27.336
Valid N (listwise)	36				

Affective Learning Outcome Data

Table 2. Data on Student Affective Learning Results

Description of Affective Learning Outcome Data	N	Minimum	Maximum	Mean	Std. Deviation
Experimental Pretest Affective Learning Results	41	62	87	73.10	4.898
Experimental Posttest Affective Learning Results	41	72	95	81.76	6.115
Control Pretest Affective Learning Results	36	55	88	75.03	7.803
Control Posttest Affective Learning Results	36	64	87	76.64	5.415
Valid N (listwise)	36				

Data analysis technique Normalized N-Gain Test

Table 3. N-Gain Score Calculation Results

No	Experimental Class N-Gain Score		Control Class N-Gain Score	
	Cognitive	Affective	Cognitive	Affective
Mean	66.3411	31.1713	35.5976	0.8214
Min	-26.58	-12.00	-42.00	-91.67
Max	92.47	82.14	91,86	46.67
Kriteria	Effective enough	Ineffective	Ineffective	Ineffective

Hypothesis testing

Table 4. Mann Whitney Test of Student Cognitive Learning Results

Test Statistics[a]	
	n_Gain
Mann-Whitney U	436.000
Wilcoxon W	1102.000
Z	-3.085
Asymp. Sig. (2-tailed)	.002
a. Grouping Variable: kelas	

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
				t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.						Lower	Upper
n_Gain	Equal variances assumed	1.441	.234	5.248	75	.000	30.34992	5.78281	18.82997	41.86987
	Equal variances not assumed			5.157	64.924	.000	30.34992	5.88539	18.59572	42.10412

Table 5. Kruskal Wallis Test

Test Statistics[a,b]	
	n_Gain
Kruskal-Wallis H	24.532
df	2
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: class	

The first hypothesis states that there is an influence of interactive learning media based on Articulate Storyline on students' cognitive learning outcomes. Based on Sig data analysis. Cognitive learning results are 0.002 or 0.002 < 0.05, meaning that Ha is accepted. The learning process for the experimental class uses interactive learning media based on Articulate Storyline while the control class uses a conventional learning model assisted by learning videos. Articulate Storyline-based interactive learning media is a learning technology used to create interactive and easily accessible learning materials. Articulate Storyline is e-learning development software that allows users to create interactive and multimedia learning content such as video, images, text, animation and interactives (Amiroh, 2020). Interactive learning media based on Articulate Storyline in the experimental class really helps students in improving cognitive learning outcomes. This is in accordance with Sanjaya's statement that learning media is a tool that can be used to convey learning messages. In this case, the message in question is teaching material, and everything related to the process of transferring knowledge from teachers to students (Sanjaya, 2015).

The learning process is carried out using interactive learning media based on Articulate Storyline to present all material. In learning media, Articulate Storyline provides material in different and interesting styles, such as simulations, videos or

images. This will provide stimulation to students and help improve cognitive abilities. Apart from that, the learning process uses interactive learning media based on Articulate Storyline which provides quizzes as an evaluation of learning outcomes. Thus, Articulate Storyline can help teachers to evaluate student learning outcomes effectively. This learning media can be equipped with tests or quizzes along with answer keys that they can check for correctness, so that teachers can find out the extent of students' understanding of the learning material. This can also help students to improve cognitive abilities. In the learning process in class that uses the Articulate Storyline learning media, the teacher can act as a learning facilitator. Thus, Articulate Storyline can help improve students' cognitive learning outcomes in class.

The use of interactive learning media based on Articulate Storyline is supported by learning theories. One theory that supports the use of interactive learning media is cognitive learning theory. Cognitive learning theory explains that learning occurs through mental processes, where students process information and organize new knowledge with the knowledge they already have (Zulfan, 2010). Therefore, interactive learning media based on Articulate Storyline can help students process information and organize new knowledge. The use of interactive learning media based on Articulate Storyline can help students process information more effectively because it is equipped with interactive features that can increase students' attention and involvement in the learning process. Another supporting theory is multimedia theory. This theory focuses on the influence of media use in learning (Surjono, 2017). Multimedia theory shows that appropriate use of media can enhance students' learning experiences, facilitating understanding and remembering the information presented. In the context of using interactive learning media based on Articulate Storyline, this multimedia theory shows that this media can help students gain a more interactive learning experience, thereby improving cognitive learning outcomes.

In statistical analysis, interactive learning media based on Articulate Storyline does influence learning outcomes. However, there are several indicators in learning that have low scores. There is an indicator in the material that few of them can answer correctly, namely calculating the pH of the buffer solution. This is due to a lack of numerical ability and a lack of student motivation to learn. The use of interactive learning media Articulate Storyline can be less effective if students do not have sufficient learning motivation to study the Buffer Solution material. Although interactive learning media can attract students' attention, if they do not have sufficient motivation, then they may not be interested in studying the material in depth. Another factor is technical difficulties. Articulate Storyline-based interactive learning media requires technical skills in its use. If students are not used to using technology, they will have difficulty understanding and using the media effectively.

The learning process in the control class uses a conventional learning model where this learning model has been used previously by teachers at the school. In the control class the teacher uses lecture, discussion and assignment methods. Based on previous research, students who are taught using this conventional learning model tend to be very passive because they only look and listen. This is because the method used can make students easily bored

where the teacher is the center of learning which makes the classroom atmosphere monotonous and students become inactive. Students' enthusiasm during discussions was also lacking because they were considered less interesting. Learning in the control class also does not use interactive learning media based on Articulate Storyline, so students are not actively involved in learning. Apart from that, there is a lack of interaction between teachers and students. The teacher only gives directions and the students just obey without any more intense interaction or dialogue between the teacher and students. This is in line with Hasnunidah's research which states that current learning is still teacher-centered, where students' learning styles follow the teacher's learning styles, especially in chemistry learning (Hasnunidah *et al.*, 2018). This is the reason why student learning outcomes are low and cannot be improved. This is in line with Mbagho's research which states that using conventional learning causes students to get bored quickly and student learning outcomes are low (Mbagho & Tupen, 2021).

The second hypothesis is that there is an influence of interactive learning media based on Articulate Storyline on students' affective learning outcomes. Based on Sig data analysis. Affective learning results are 0.000 or 0.000 <0.05, meaning Ha is accepted. Articulate Storyline media not only influences cognitive learning outcomes, but also influences students' affective learning outcomes in learning. Affective learning outcomes relate to changes in attitudes, emotions and values experienced by students as a result of learning. This is supported by social learning theory. According to this theory, students learn through direct experience and observation of what they see (Lesilolo, 2018). Media Articulate Storyline can provide an interactive learning environment for students to learn social skills such as teamwork, empathy, and problem solving. In a structured learning environment, students can develop positive attitudes such as self-confidence, optimism and self-confidence which can improve students' affective learning outcomes.

One indicator of affective learning outcomes is organization (managing or organizing). Good learning media can help students organize and connect the information learned with previous experiences, values and knowledge. In research conducted by Anwar & Anis, it was stated that the use of technology-based learning media, including Articulate Storyline, can improve students' affective learning outcomes in terms of organization (Anwar & Anis, 2020). This is because this media can help students organize and connect the information learned with experiences, values and previous knowledge more easily and interestingly. The least affective learning outcome indicators are organizational indicators related to self-regulation in the learning process. However, this indicator is considered a less effective indicator because good self-management skills are not always the main determining factor in learning success. However, the ability to self-regulate in the learning process is still important in increasing learning effectiveness. The ability to self-regulate can help students to focus on learning goals, manage time effectively and complete assignments well.

The third hypothesis is that there is an influence of interactive learning media based on Articulate Storyline on students' cognitive learning outcomes and affective learning outcomes. Based on Sig data analysis. students' cognitive learning outcomes and affective learning outcomes are 0.000 or 0.000 < 0.05, meaning that Ha

is accepted. This proves that there is an influence of Articulate Storyline-based interactive learning media on students' cognitive learning outcomes and affective learning outcomes in a multivariate manner.

Based on the N-Gain score calculation, it is known that the average N-Gain score for the cognitive learning outcomes of the experimental class is 66%, which is in the quite effective category and for the cognitive learning outcomes of the control class, it is 36%, which is included in the ineffective category. So it can be concluded that the effect of using interactive learning media based on Articulate Storyline in the experimental class is quite effective and the use of conventional learning models assisted by learning videos in the control class is not effective in improving students' cognitive learning outcomes in the Buffer Solution material for class XI MA Putri Al-Ishlahuddiny Kediri in 2022/2023 teachings. Then, the average N-Gain score for the affective learning outcomes of the experimental class was 31%, which was in the ineffective category and for the affective learning outcomes of the control class, it was 0.8214%, which was included in the ineffective category. So it can be concluded that the effect of using interactive learning media based on Articulate Storyline in the experimental class and using conventional learning models assisted by learning videos in the control class are both ineffective in improving students' affective learning outcomes in the Buffer Solution material for class XI MA Putri Al-Ishlahuddiny Kediri 2022/2023 academic year.

The n-gain of affective learning outcomes for the experimental class is not effective. This is caused by psychological factors of students who are not ready to accept learning, such as students' inability to focus attention or lack of motivation which can affect affective learning outcomes. N-Gain on learning outcomes refers to the difference between pretest and posttest scores, which shows how much increase in knowledge and skills achieved by students after participating in learning. However, the increase in affective learning outcomes cannot always be measured quantitatively using the N-Gain value. This is because affective learning outcomes involve changes in students' attitudes, values and emotions which are difficult to measure quantitatively. Although Articulate Storyline media can influence students' affective learning outcomes, the changes that occur may not always be significant in terms of quantity or size.

CONCLUSION

Based on the results of the research that has been carried out, the following conclusions can be drawn: (1) There is a significant influence of interactive learning media based on Articulate Storyline on the cognitive learning outcomes of class XI Science students at MA Putri Al-Ishlahuddiny Kediri for the 2022/2023 academic year. This is aimed at the results of the univariate Mann Whitney test with a sig value. 0.002. (2) There is an influence of interactive learning media based on Articulate Storyline on the affective learning outcomes of class XI Science students at MA Putri Al-Ishlahuddiny Kediri for the 2022/2023 academic year. This is aimed at the results of the univariate Mann Whitney test with a sig value. 0,000. (3) There is an influence of interactive learning media based on Articulate Storyline on the cognitive learning outcomes and affective learning outcomes of class XI Science students at MA Putri Al-Ishlahuddiny Kediri for the 2022/2023 academic year. This is aimed at the results of the Kruskal

Wallis test in a multivariate manner with a sig value. 0,000.

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