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Original Article

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Effect of Powtoon Based Animated Media on Biology Student Learning Outcomes at SMAN 2 Langsa

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Abstract. Powtoon based animated media is a learning medium that is very easy to use as teaching material for teachers. It can be created online and has many attractive animation features that can increase students' interest so that they do not get bored during the learning process. This study aims to determine the effect of Powtoon-based animation media on the learning outcomes of biology students at SMAN 2 Langsa. This study uses a quantitative research design with a quasi-experimental method and a pretest-posttest control group design using two sample classes, namely the experimental class and the control class. The research sample consisted of 28 students in the experimental class and 28 students in the control class. The results of the test instrument showed that the average pretest score for the experimental class was 44.64 (low) and for the control class was 43.75 (low), so the difference between the two classes was (0.89), while the average posttest score for the experimental class was 78.92 (moderate) and for the control class was 69.82 (moderate), resulting in a difference between the two classes of 9.1 (low). With a hypothesis test value of tcount > ttable or 4 > 1.673, it can be concluded that Ha is accepted and Ho is rejected.

Keywords: Animation Media; Powtoon; Student Learning Outcomes.

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INTRODUCTION

Education in this modern era continues to undergo significant transformation along with technological developments. The biggest challenge in education is how to create learning methods that empower every student, especially those who face obstacles in learning, such as low learning independence. Learning independence plays a crucial role in character development and academic success (Suciati, 2016). Independent students tend to be more responsible, disciplined, and take the initiative to overcome challenges in the learning process (Desvian et al., 2021).

The goal of education is human beings. Education aims to help students develop their human potential. The essence of human nature is inseparable from its characteristics and dimensions. The manifestations of human nature include the capacity for existence, self-awareness, morality, conscience, a sense of freedom (independence), the capacity for responsibility, the willingness to fulfill obligations, the awareness of rights, and the ability to experience happiness. The dimensions include morality, sociality, individuality, and religiosity (Tirtarahardja & Sulo, 2021).

Students with low learning independence may face a number of negative impacts that could potentially impact their academic and personal development. Students with low learning independence tend to be highly dependent on external guidance, particularly from teachers. (Hidayah, 2022).

Education is a crucial aspect of fostering critical and idealistic thinking in individuals. It can also be considered a vital link in the chain of life. If education does not function as it should, it will significantly impact the life of the nation (Salsabila et al., 2021). Education is a teaching and learning process that involves interaction between educators and students to develop knowledge, skills, and attitudes (Kurniawan et al., 2024).

Teaching and learning activities are a process of interaction between educators and students aimed at transferring knowledge, developing skills, and shaping attitudes and values (Nugraha, 2018). In this process, the educator acts as a facilitator who guides, provides direction, and creates a conducive learning environment, while students actively absorb information, ask questions, and develop understanding (Hakim, 2024). The teaching and learning activities carried out by teachers and students in schools are referred to as instruction (Jayawardana, 2017).

The role of media in learning components is crucial, even on par with learning methods. The methods used in the learning process typically require that the media used be integrated and adapted to the conditions encountered. Therefore, the role of media in learning is crucial and decisive (Maimunah, 2016). Media is a factor that influences the classroom learning process. This is because learning media are tools used to convey learning material. Therefore, the selection of appropriate learning media can support teachers in delivering material. Consequently, the teaching and learning process becomes more effective, and students can fully understand the material being explained. Consequently, students can effectively absorb learning materials, resulting in optimal learning outcomes. Learning media can prevent students from being passive in the teaching and learning process, resulting in improved learning outcomes. Various media are used for learning activities, including print/text media, exhibition/display media, audio-visual media (motion pictures), multimedia, and web-based or internet-based media (Syamsiah, 2023).

Learning quality is optimized when the instructional process is student-centered, not teacher-centered. The learning process should also be conducted in an enjoyable manner, including in biology instruction (Jayawardana, 2017; Fatiqin, 2023). The perception that Biology is a difficult and tedious subject due to its extensive material needs to be corrected. In the current digital era, teachers should adopt a new paradigm toward Biology instruction. It is time for educators to utilize technological advancements and the internet as tools for teaching Biology (Jayawardana, 2017). As time progresses, instructional media have become increasingly sophisticated. The use of such media helps students absorb material uniformly, ensuring consistent perception among learners and maximizing learning outcomes (Andriani et al, 2019).

Instructional media play a vital role in supporting the teaching and learning process, particularly in efforts to enhance student learning outcomes (Murtado, 2023). Media can be categorized as follows: visual media, which includes both projectable and non-projectable media such as still and moving images; audio media, which engages the mind, emotions, attention, and motivation of learners through auditory messages like radio programs; and audiovisual media, which combines audio and visual elements, such as instructional television programs (Dewi et al., 2021). Today, numerous applications can be utilized as multimedia learning tools. One such application is Powtoon, which excels in its animation features, including hand-drawn animations, cartoons, transition effects, and an intuitive timeline (Andriani, 2019).

One of the several types of audio-visual learning media that can be used in the learning process is PowToon. PowToon is an online service-based animation software that allows users (educators) to quickly

and easily create animated presentations by manipulating objects, inserting images, music, and even adding voice recordings. PowToon was chosen as the audio-visual learning medium due to its easy creation process and its diverse animation features, including handwriting animation, cartoon animation, and vibrant transition effects, as well as a user-friendly timeline. Furthermore, PowToon offers advantages such as being interactive, engaging with all senses, practical, and collaborative (Suhendra, 2018). The focus of this research is digital learning media because it is considered more engaging and up-to-date. Digital learning media, such as PowToon, will facilitate students' understanding of the material, particularly in biology.

Powtoon can be considered an exceptionally user-friendly application for teachers to create teaching materials. Its online creation process and extensive, engaging animation features can boost student interest, preventing boredom during learning. Several studies indicate that Powtoon-based animation media can enhance student attention and motivation. According to Yulia (2017), research results demonstrate that the use of Powtoon learning media significantly influences the growth of learning motivation compared to conventional methods. This finding forms the background for the present study. The objective of this research is to determine the effect of Powtoon-based animation media on the learning outcomes of Biology students at SMA 2 Langsa.

MATERIALS AND METHODS

Research Type

This type of research is quantitative research using the quasi-experimental method. The design used in this study is a pretest-posttest control group design. An overview of the research design can be seen in Table 1.

Table 1. Pretest-Posttest Control Group Design Research Design

Kelompok	Pre-Test	Treatment	Post-Test
Experimental	O_1	X	O_2
Control	O_3		O_4

(Source: Sugiyono, 2022)

Description:
X : Treatment in the experimental class using animation-based media (Powtoon)
Y: Treatment in the control class using chart media
O1: Pre-test results of the experimental class group
O2: Post-test results of the experimental class group
O3: Pre-test results of the control class
O4: Post-test results of the control class

Time and Place of Research

This research was conducted in November of the 2024/2025 academic year. It was conducted during the odd semester in the 11th grade science class at SMA 2 Langsa, Jln. Medan-Banda Aceh KM-4 Langsa, Sungai Lueng. Langsa Timur District, Langsa City, Aceh Province.

Population and Sample

The population in this study comprised all eleventh-grade science students at SMAN 2 Langsa, totaling 4 classes with 124 students. The sampling technique employed was purposive sampling. The sample for this study consisted of class XIB (28 students) as the experimental group and class XIC (28 students) as the control group.

Research Procedure

*Preliminary observation a*t this stage, the researcher observed the school environment and conducted direct interviews with the biology teacher for grade XI, *Developing research instruments* in this phase, the researcher determined the research objectives and the types of data required. Activities included creating Powtoon animation media, developing teaching modules, and constructing Pretest-Posttest question instruments. *Instrument validation* Instrument validation aims to ensure that the instruments developed and used in the research or evaluation accurately measure what they are intended to measure and produce reliable

data. In a research context, instrument validation is essential to ensure that the obtained results are trustworthy and relevant to the research objectives. Instrument validation includes the following types:
a) Question Validation

The questions were validated by a biology lecturer specializing in cell biology, in accordance with the material covered in the researcher's questions.
b) Powtoon Media Validation

Media The media validation was conducted by Mr. Khalil, M.Pd., a biology lecturer with expertise in instructional media. ContentThe content validation was performed by a biology lecturer recognized for their in-depth knowledge, effective communication skills, and reputable experience in mentoring.

Conducting the Research

After the instruments were developed and validated, the researcher proceeded with the research activities. Data collection was carried out according to the research plan. The steps included: Collecting data from respondents or students using the prepared instruments. Recording and storing data properly to prevent loss or errors. Ensuring research ethics were upheld, including obtaining approval from the school.

Drawing Conclusions

Drawing conclusions is the final stage of the research process. Here, the researcher interpreted the results of the data analysis to answer the research objectives, derived conclusions based on the findings, and compared them with the research hypotheses.

Data, Instruments, and Data Collection Techniques

The instrument used in this study was a learning outcomes test. All instruments were first analyzed using validity and reliability tests. The data collection technique employed was testing, which consisted of pretest and posttest questions to measure student learning outcomes.

Data Analysis

The analysis methods used in this study included descriptive analysis and inferential analysis. Inferential analysis was conducted by performing normality tests, homogeneity tests, and hypothesis testing. Data analysis was carried out using Excel, with the following hypotheses: H_0: There is no significant effect on student learning outcomes after the implementation of Powtoon-Based Animation learning media with Charts between the experimental and control classes. H_a: There is a significant effect on student learning outcomes after the implementation of Powtoon-Based Animation learning media with Charts between the experimental and control classes.

Formula used:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n1-1)s1^2 + (n2-1)s1^2}{n1_{+n_2}{}^{-2}}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

RESULTS AND DISCUSSION

Average Pretest and Posttest Scores for Learning Outcomes of Students in the Experimental Class

Based on the objectives formulated above, the collected data included the pretest and posttest scores of 28 students from the experimental group and 28 students from the control group. The results are as follows: Data on Biology learning outcomes in the Cell Biology topic, which were given different treatments: learning using Powtoon animation media and chart media.Average Pretest and Posttest Scores of Student Learning Outcomes in the Experimental Class Based on the calculation of the Pretest data from multiple-choice questions, the highest score obtained was 70 and the lowest score was 10, resulting in an average score of 44.64 (low). Meanwhile, the highest score obtained in the posttest was 100 and the lowest score was 55, resulting in an average score of 78.92 (moderate). The comparison between the pretest and posttest scores of the experimental class students can be seen in Figure 1.

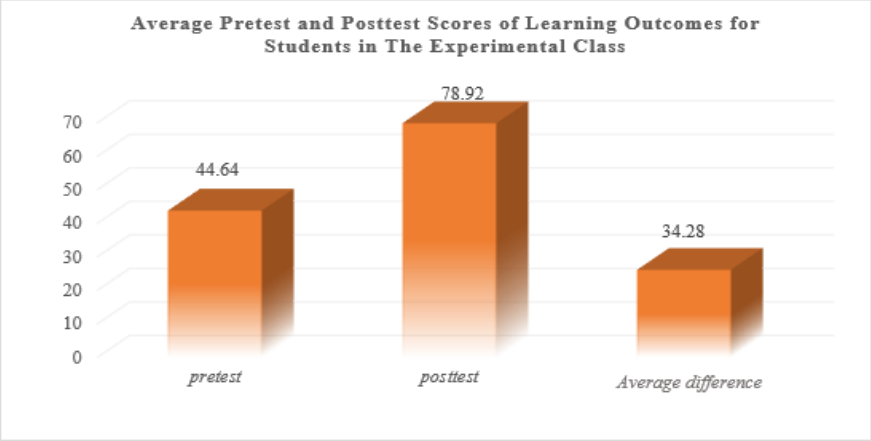


Figure 1. Comparison of Pretest and Posttest Scores of Experimental Class Students

Average Pretest and Posttest Scores of Control Class Students

Based on the calculation of data in the form of multiplechoice pretest questions, the highest score was 70 and the lowest score was 10, resulting in an average score of 43.75 (low). Meanwhile, the highest score obtained on the posttest was 80 and the lowest score was 40, resulting in an average score of 69.82. A comparison of the pretest and posttest scores obtained by the experimental class students can be seen in Figure 2.

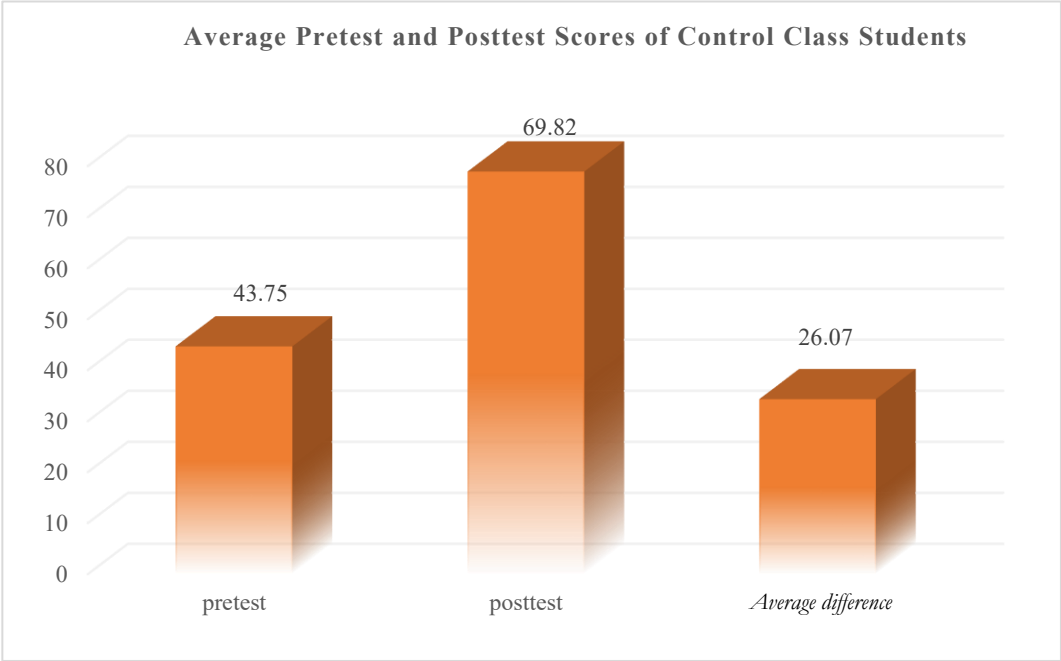
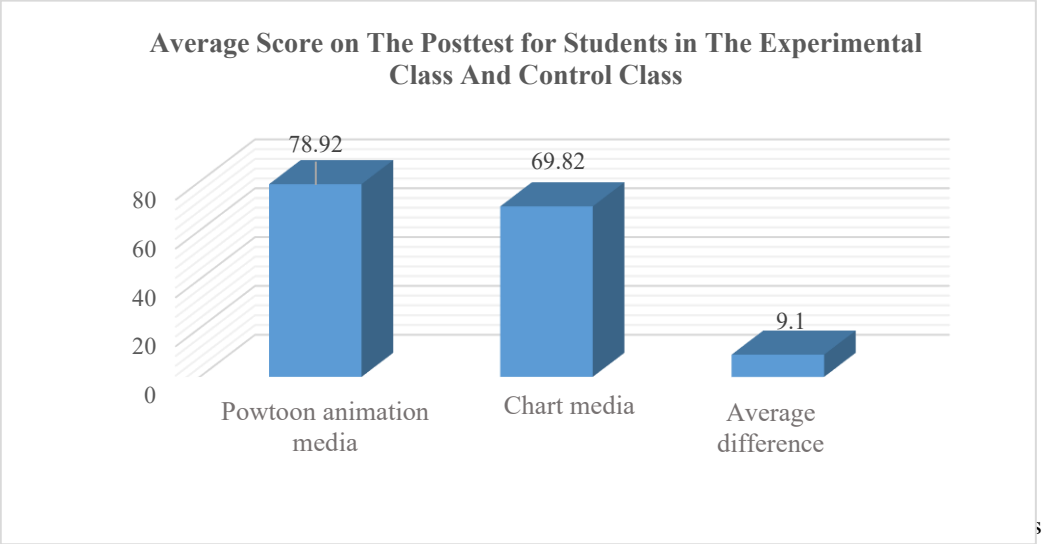


Figure 2. Comparison of Average Pretest and Posttest Scores of Control Class Students

Average score on the posttest for students in the experimental class and control class

Both samples were taught using different learning media, with the experimental class using Powtoon animation media and the control class using chart media. Based on the average posttest scores obtained by students in the experimental and control classes, the following graph shows the average comparison of scores between the two classes after learning using Powtoon animation media and chart media:



Prerequisite Test Student learning outcomes

The pretest data of students in the experimental and control classes were first analyzed using normality and homogeneity tests to determine their suitability before the treatment was applied.

Normality Test of Pretest and Posttest Results of Students' Learning in the Experimental Class

The normality of pretest and posttest data for both the experimental and control classes was tested using the Chi-Square test. The results of the normality test for both the pretest and posttest data are presented below.

Table 2. Normality Test of Pretest and Posttest Data on Learning Outcomes in the Experimental Class

Class	Test	N	Calculated χ^2	$\alpha = 0.05$	Description
Experimental	Pre-Test	28	5.454	11.07	Normal
Experimental	Post-Test	28	7.8586	11.07	Normal

Table 2 shows the pretest values for the experimental class with a significance level of 0.05 and degrees of freedom (df) = K-1. For the pretest data, the calculated χ^2 value was 5.4540, while the χ^2 table value was 11.07 with df = (6-1) = 5. Since the calculated χ^2 = 5.4540 < χ^2 table = 11.07, it can be concluded that the pretest data are normally distributed.Next, for the normality test of the posttest data in the experimental class, the calculated χ^2 value was 7.8586, while the χ^2 table value remained 11.07 with a significance level of α = 0.05 and df = (6-1) = 5. Since the calculated χ^2 = 7.8586 < χ^2 table = 11.07, it can be concluded that the posttest data in the experimental class are also normally distributed.

Normality Test of Pre-test and Post-test of learning outcomes of students in the control class

Based on the results of testing the normality of the pretest and posttest data of the control class students with a significance level of α = 0.05 and a degree of freedom of dk = K-1, the following results were obtained.

Table 3. Normality Test of Pretest and Posttest Data Learning Outcomes of the Control Class

Class	Test	N	Calculated χ^2	$\alpha = 0.05$	Description
Control	Pre-Test	28	6.1325	11.07	Normal
Control	Post-Test	28	7.8586	11.07	Normal

From the pretest data, the calculated χ^2 value was 6.1325, while the χ^2 table value was 11.07 with degrees of freedom (df) = (6-1) = 5. Since the calculated χ^2 = 6.1325 < χ^2 table = 11.07, it can be concluded that the pretest data are normally distributed.Next, for the normality test of the posttest data in the control class, the calculated χ^2 value was 7.8586, while the χ^2 table value remained 11.07 with a significance level of α = 0.05 and df = (6-1) = 5. Since the calculated χ^2 = 7.8586 < χ^2 table = 11.07, it can be concluded that the posttest data in the control class are also normally distributed.

Homogeneity Test

The homogeneity test for the pretest and posttest data of the control and experimental classes was conducted using a two-variance equality test with a significance level of α = 0.05. For the pretest data, the calculated F value was 1.192, while the F table value was 1.882. Since F calculated < F table (1.192 < 1.882), it can be concluded that the pretest data variances are homogeneous.For the posttest data, the calculated F value was 1.003, while the F table value remained 1.882. Since F calculated < F table (1.003 < 1.882), it can be concluded that the posttest data variances are also homogeneous. Since both the pretest and posttest data are homogeneous, a t-test analysis can be conducted. The data from both groups have met the prerequisites for statistical testing using the t-test, where the normality test shows that the data are normally distributed and the homogeneity test shows that the variances are homogeneous.Next, a hypothesis test is required to determine whether the Powtoon-based animation media has a significant effect on students' learning outcomes. The statistical hypotheses are formulated as Ha: There is an effect of Powtoon-based animation media on students' learning outcomes in the cell material for biology students at SMAN 2 Langsa, H0: There is no effect of Powtoon-based animation media on students' learning outcomes in the cell material for biology students at SMAN 2 Langsa.

The following are the calculations for the hypothesis test on students' learning outcomes:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n1-1)s1^2+(n2-1)s1^2}{n1+n_2{}^{-2}}(\frac{1}{n_1}+\frac{1}{n_2})}}$$

$$t = \frac{78{,}92-69{,}82}{\sqrt{\frac{(28-1)111{,}90+(28-1)111{,}50}{28+28-2}(\frac{1}{28}+\frac{1}{28})}}$$

$$t = \frac{9{,}1}{\sqrt{\frac{(27)111{,}90+(27)111{,}50}{54}(\frac{56}{784})}}$$

$$t = \frac{9{,}1}{\sqrt{\frac{6031{,}8}{54}(\frac{56}{784})}}$$

$$t = \frac{9{,}1}{\sqrt{111{,}7\ (0{,}07)}}$$

$$t = \frac{9{,}1}{\sqrt{7{,}819}} = \frac{9{,}1}{2{,}796} = 3{,}25 = 4$$

$$t = 4$$

The calculated t-value obtained from the data above was 4, while the t-table value was 1.67356 with degrees of freedom (df) = $n_1 + n_2 - 2 = 28 + 28 - 2 = 54$ and a significance level of α = 0.05. Since t calculated > t table (4 > 1.67356), Ha is accepted and H0 is rejected.Based on the research conducted at SMA Negeri 2 Langsa on the effect of Powtoon-based animation media on students' biology learning outcomes, the study used a quasi-experimental design involving two classes receiving different treatments. Class XIB, consisting of 28 students, served as the experimental class taught using Powtoon animation media, while class XIC, also consisting of 28 students, served as the control class taught using chart media.A pretest of 20 multiple-choice questions was given to both classes before the different learning treatments to assess students' initial knowledge of cell biology. The experimental class had a pretest average score of 41.11, while the control class had an average score of 46.42.

After the learning process, a posttest was administered to measure students' learning outcomes. The experimental class achieved an average posttest score of 70.50, while the control class achieved 68. Although the Powtoon animation media produced higher learning outcomes than the chart media, some challenges were encountered during the study: 1) the researcher could not fully manage the classroom environment during learning, and 2) students were sometimes unprepared when answering questions because they had not studied the material beforehand. In conclusion, there is a difference in students' learning outcomes due to the effect of Powtoon-based animation media on biology learning at SMA Negeri 2 Langsa.

CONCLUSION

Based on the research results obtained from data analysis and hypothesis testing, the researcher concluded the following: Based on the hypothesis test at $\alpha = 0.05$, the calculated t-value was 0.05 and the t-table value was 1.673. Since $0.005 < 0.05$, Ha is accepted. Therefore, it can be concluded that Powtoon-based animation media has a significant effect on students' learning outcomes in biology, specifically on the cell material in class XI at SMAN 2 Langsa. There is a significant effect of animation media on students' learning outcomes in the biology subject on cell material. Based on the acceptance of Ha, it can be concluded that Powtoon-based animation media positively influences students' learning outcomes in class XI at SMAN 2 Langsa.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest to report study.

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