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The Effectiveness of Articulate Storyline 3-Based Learning Media on Students' Learning Outcomes in Inorganic Compound Nomenclature

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Abstract
The use of technology-based learning media is still rarely applied by chemistry teachers in schools, teachers tend to use conventional methods such as lectures and assignments, so that student learning outcomes are still low, one of the learning media that can be applied is Articulate Storyline 3. The purpose of this study was to determine the effectiveness of using Articulate Storyline 3-based learning media on the material of Nomenclature of Inorganic Compounds. The method used is Quasi Experimental Nonequivalent Control Group Design. With a sample of class XI-F5 as the experimental class and XI-F4 as the control class, each with 32 students. The results of the normality test showed that some of the data were not normally distributed, and the homogeneity test showed that the posttest variance was not homogeneous (Sig. = 0.040 <0.05), so the Mann-Whitney U test was used, the test results showed a significant difference between the pretest and posttest scores in the experimental class with a value of (0.001 <0.05). Then the effect size value was obtained at 0.915 with a large category. Thus, the use of learning media based on Articulate Storyline 3 is more effective in improving students' learning outcomes in the material on nomenclature of inorganic compounds.

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INTRODUCTION

The rapid development of technology and information in the 21st century requires educators to integrate information technology (IT) into the planning and implementation of the learning process. One form of this integration is the use of technology-based learning media, such as interactive digital media, instructional videos, and e-learning platforms, which can assist educators in delivering learning materials more effectively. Learning media do not only function as instructional aids, but also serve as tools to facilitate the achievement of learning objectives and to enhance communication between teachers and students. According to Violla & Fernandes, (2021), the use of learning media has a significant impact on improving the quality of learning, as it encourages students to become active participants in the classroom learning process.

However, in practice, not all educators are able to effectively utilize learning media in the instructional process. Based on interviews conducted with chemistry teachers at SMAN 3 Pontianak, it was found that learning media are still rarely used to support classroom instruction. Teachers tend to rely more on conventional teaching methods, such as lectures, question-and-answer sessions, and assignments when delivering learning materials. This condition leads to low student interest and limited enthusiasm in participating in learning activities, which in turn results in low learning motivation. Consequently, students' learning outcomes remain

relatively low. This is reflected in the mid-semester scores of Grade XI students in the 2025/2026 academic year, where 61% of students scored below the minimum mastery criterion. Therefore, innovation in the use of engaging and interactive learning media is necessary to improve students' learning outcomes, particularly in the topic of compound nomenclature.

One of the software applications that can be utilized to develop effective learning media is Articulate Storyline 3 (Saputri, Y. M., & Abbas, 2023). This software enables educators to design and deliver interactive learning media in a more structured and engaging format. The media produced can be easily accessed through various devices, including laptops and smartphones, which increases its flexibility in the learning process. Furthermore, Articulate Storyline 3 is known for its user-friendly interface, as its features are comparable to those available in PowerPoint, making it easier for educators to create interactive instructional media (Risma Agustina et al., 2022).

Based on the findings of previous studies, Sundari & Silitonga, (2022) reported that students' learning outcomes on chemical bonding material improved after the implementation of Articulate Storyline 3-based learning media. The results showed that the average student score reached 85.2, exceeding the minimum mastery criterion of 80. Furthermore, Adisti et al., (2023) found that learning media developed using Articulate Storyline 3 were effective in enhancing students' learning interest. In the experimental class (XI IIS 2) that utilized this media, the average level of learning interest reached 73% (high category), whereas in the control class (XI IIS 1) it was only 53% (low category). These findings indicate that the use of Articulate Storyline 3 has a positive and significant contribution to the improvement of students' learning processes.

Based on these conditions, two research questions are formulated: (1) whether the use of Articulate Storyline 3-based learning media leads to differences in learning outcomes between the control and experimental classes on the topic of inorganic compound nomenclature, and (2) how effective the implementation of this media is in improving students' learning outcomes. Therefore, this study aims to examine the effectiveness of the developed Articulate Storyline 3-based learning media on the material of inorganic compound nomenclature.

METHOD

The research method used in this study was an experimental method with a Quasi-Experimental design in the form of a Nonequivalent Control Group Design. The research design is presented in Table 1.

Table 1. Research Design

Group	Pre-Test	Treatment	Post-Test
Experiment	O^1	X^1	O^2
Control	O^3	X^2	O^4

(Sugiyono, 2013)

Information:
O1 = Giving pretest to experimental class
O2 = Administering the posttest to the experimental class
X1 = The treatment uses Articulate Storyline 3 learning media
X2 = Treatment using conventional methods
O3 = Administration of pretest to control class
O4 = Administration of the control class posttest

The sample used was students of SMA Negeri 3 Pontianak, class XI-F5 as the experimental class and class XI-F4 as the control class, each class consisting of 32 students. The data collected in this study were in the form of a pre-test given to test students' initial knowledge, and a post-test given after the learning process.

Pretest and posttest data were analyzed using a normality test to determine data distribution, and a homogeneity test to ensure equality of variance between groups. If the data were normally distributed and homogeneous, an independent sample t-test was conducted to determine differences in learning outcomes between the control and experimental classes. However, if the data were not normally distributed, the Mann-Whitney U test was used as a nonparametric alternative. In addition, an effect size calculation was also performed to determine the extent of the influence of the use of Articulate Storyline 3-based learning media in improving student learning outcomes.

RESULTS AND DISCUSSION

The pretest and posttest instruments consisted of five multiple-choice items and four essay questions. The pretest was administered prior to the learning process to assess students' initial abilities, whereas the posttest was administered after the learning activities to evaluate students' learning outcomes following the implementation of Articulate Storyline 3 and PowerPoint as instructional media.

The study was implemented over two learning sessions in both the control and experimental classes. The data were collected from two groups, namely Class XI-F4 as the control group consisting of 32 students who learned using PowerPoint, and Class XI-F5 as the experimental group consisting of 32 students who learned using Articulate Storyline 3-based learning media. Following the implementation of the learning process, the data obtained were in the form of pretest and posttest scores.

Analysis of Students' Initial Abilities

Before the learning process began, students were first administered a pretest to assess their initial abilities. The pretest was intended to measure students' prior knowledge before the implementation of learning using Articulate Storyline 3-based learning media in the experimental class and PowerPoint (PPT) in the control class. The results of the analysis are presented in Table 2.

Table 2. Results of the analysis of the pretest scores of the control class and the experimental class of students at SMAN 3 Pontianak (N = 32).

Class	Pretest Score	Normality (Sig)
Control	43.72 ± 17.959	0.002
Experiment	48.91 ± 19.723	0.200

Note: Data values are expressed as mean ± SD.

Based on Table 2, it is evident that the average pretest score of the experimental class was higher than that of the control class. Furthermore, the normality test results indicate that the pretest data of the experimental class had a significance value of 0.200, which suggests that the data were normally distributed. In contrast, the pretest data of the control class showed a significance value of 0.002, indicating that the data were not normally distributed. Therefore, it can be concluded that the assumption of normality was only partially fulfilled.

The next step was to conduct a homogeneity test on the pretest scores of both the experimental and control classes. The results showed that the significance value of the pretest scores was 0.768, which is greater than 0.05. This indicates that the variance of the two groups was homogeneous. Consequently, prior to the treatment, the initial abilities of students in both classes were relatively comparable, meaning that there was no significant difference between the two groups. Based on the results of the normality and homogeneity tests, the difference test was conducted using a non-parametric Mann–Whitney U test, as the data did not fully meet the assumption of normal distribution.

Furthermore, a Mann–Whitney U test was applied to the pretest scores of the experimental and control classes, resulting in an Asymp. Sig. (2-tailed) value of 0.551, which is greater than 0.05. This finding indicates that the initial abilities of students in both classes were equivalent, meaning that there was no significant difference between the two groups prior to the treatment.

Analysis of Student Learning Outcomes

After the learning process was completed, students were given a posttest. The posttest aimed to evaluate students' final understanding after participating in learning activities using Articulate Storyline 3-based learning media in the experimental class and PowerPoint (PPT) in the control class. The results of the analysis are presented in Table 3.

Table 3. Results of Posttest Score Analysis of Control Class and Experimental Class Students of SMAN 3 Pontianak (N = 32).

Class	Posttest Score	Normality (Sig)
Control	54.19 ± 20.625	0.200
Experiment	82.47 ± 15.027	0.028

Note: Data values are expressed as mean ± SD.

Referring to Table 3, the average posttest score of the experimental class was higher than that of the control class. The normality test results show that the experimental class obtained a significance value of 0.028, indicating that the data were not normally distributed. Meanwhile, the control class had a significance value of 0.200, which suggests that the data were normally distributed. Therefore, the assumption of normality was not fully satisfied for both groups.

Subsequently, a homogeneity test was conducted on the posttest scores of the experimental and control classes. The results revealed a significance value of 0.040, which is less than 0.05, indicating that the variances of the two groups were not homogeneous. Considering that the data did not fully meet the assumptions of normality and homogeneity, the hypothesis testing could not be performed using a parametric test (Independent Sample t-test). Instead, a non-parametric Mann–Whitney U test was employed, as it does not require normally distributed and homogeneous data.

The Mann–Whitney U test on the posttest scores of the experimental and control classes

produced an Asymp. Sig. (2-tailed) value of less than 0.05. This result indicates that there was a significant difference in student learning outcomes between students who learned using Articulate Storyline 3-based learning media and those who learned using PowerPoint.

N-Gain Score Test Results

The N-Gain test was used to determine the improvement in student learning outcomes before and after the learning intervention. The analysis showed that the experimental class obtained an average N-Gain score of 0.6862, which falls into the moderate improvement category. In contrast, the control class achieved an N-Gain score of 0.1140, which is categorized as low improvement. These findings indicate that the increase in student learning outcomes in the experimental class was substantially higher than that in the control class. The comparison of the N-Gain percentages between the two classes is presented in Figure 1.

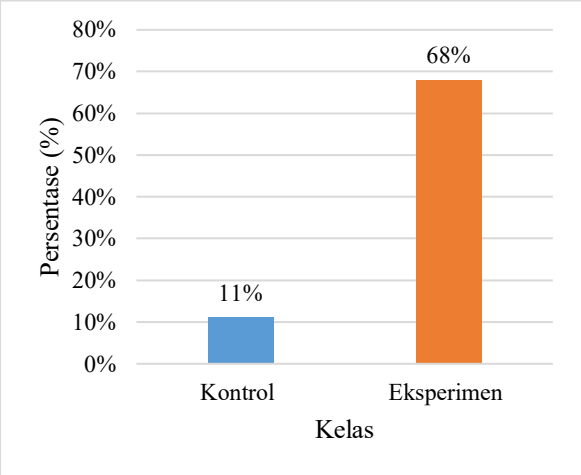

Figure 1. Graph of N-Gain Score magnitude for control and experimental classes

Effect Size Test Results

The effect size analysis was performed to determine the magnitude of the difference in learning outcomes between the control and experimental groups. Effect size interpretation was based on Cohen, et al., (2019) criteria, where 0.00–0.09 indicates a very small effect, 0.10–0.29 a small effect, 0.30–0.79 a medium effect, and values ≥ 0.80 represent a large effect.

The calculation showed that the effect size value reached 0.915, which falls into the large effect category. This result demonstrates that the implementation of Articulate Storyline 3-based learning media had a substantial impact on improving students' learning outcomes. Furthermore, the contribution of the media to the improvement of learning outcomes was 17.3%, indicating a high level of effectiveness in supporting the learning process.

Discussion

This study employed a quasi-experimental method with a Nonequivalent Control Group Design to investigate differences in student learning outcomes and to evaluate the effectiveness of learning media based on Articulate Storyline 3 in the topic of compound nomenclature. The research involved two classes, namely class XI-F5 as the experimental group that utilized Articulate Storyline 3-based media and class XI-F4 as the control group that used PowerPoint (PPT) as the learning media.

Prior to the implementation of the treatment, a pretest was administered to assess students' initial abilities. The analysis indicated that the initial abilities of students in both the control and experimental classes were relatively equivalent, as no significant differences were found between the two groups.

After the treatment was implemented, students in the experimental class demonstrated a greater improvement in learning outcomes compared to those in the control class. This improvement was reflected in the higher posttest scores achieved by the experimental class. The findings suggest that the use of Articulate Storyline 3-based learning media positively influenced students' learning outcomes in the nomenclature of compounds.

Observational data during the learning process also revealed noticeable differences in student engagement between the two classes. Students in the experimental class showed higher levels of participation, enthusiasm, and responsiveness during the lesson. They were more actively involved in following the learning activities, asking questions about difficult concepts, and responding to the teacher's questions. This indicates that interactive digital media can enhance student engagement, which in turn contributes to improved learning outcomes.The findings of this study are supported by previous research conducted by Alfirzan (2024), which reported that interactive media based on Articulate Storyline 3 can enhance student participation and responsiveness during the learning process. Similar results were also reported by Nurhasanah (2024), who emphasized that the interactive features of Articulate Storyline

3, particularly the direct feedback mechanism, encourage students to actively ask questions and engage in classroom discussions.

Moreover, the implementation of drag-and-drop game activities within the Articulate Storyline 3-based learning media contributed to increased student enthusiasm during the learning sessions. Students were actively involved in matching images with chemical formulas and linking compound names with their correct descriptions. This activity stimulated students' critical thinking and helped them develop a deeper conceptual understanding of compound nomenclature. The game-based elements created a more challenging and enjoyable learning environment, which in turn fostered greater engagement and motivation.

The increased engagement observed in the experimental class also aligns with the findings of Susanari and Santosa (2024), who reported that game-based learning significantly improves students' interest and enthusiasm compared to conventional instructional methods. Likewise, research by Ngilmi et al. (2023) indicated that game-based learning strategies are effective in enhancing students' learning motivation, thereby contributing positively to improved learning outcomes.

Figure 2. Condition of Students of SMAN 3 Pontianak When Playing Games Using the Learning Media Articulate Storyline 3

Figure 2 illustrates the classroom conditions during the implementation of the learning activities using Articulate Storyline 3. The experimental class demonstrated a more conducive and focused learning atmosphere compared to the control class. Students paid closer attention to the learning materials, followed the teacher's instructions more consistently, and showed minimal engagement in off-task activities.

Furthermore, the use of Articulate Storyline 3-based learning media was observed to improve students' concentration and learning focus. These findings are consistent with the study conducted by Ningsih et al. (2022), which revealed that the integration of Articulate Storyline 3 in learning significantly increased student engagement compared to traditional media, with a Mann–Whitney test significance value of 0.030 and an effectiveness level of 38.2%. In addition, Listiani et al. (2024) reported highly positive student responses toward interactive media based on Articulate Storyline 3 (81.85%), along with a significant improvement in average learning outcomes compared to conventional classes.

Figure 3. Condition of Students of SMAN 3 Pontianak When Working on the Pretest Using the Articulate Storyline 3 Learning Media

Figure 4. Condition of Students of SMAN 3 Pontianak When Working on the Posttest Using the Articulate Storyline 3 Learning Media

In contrast to the experimental class, students in the control class tended to show lower levels of focus during the learning process. Some students were observed talking to their peers and paying less attention to the teacher's explanations, which resulted in a weaker understanding of the learning material. This condition contributed to the lower learning outcomes achieved by the control class compared to the experimental class. The use of PowerPoint as the primary learning media appeared to provide only limited improvement in students' learning outcomes.

These findings are consistent with the study conducted by Dewi and Nurdiani (2021), which reported that learning that relies mainly on

presentation-based media tends to produce smaller learning gains than interactive digital media. Therefore, the limited interactivity of conventional media may reduce students' engagement and active participation during the learning process.

Overall, classroom observations indicated that students in the experimental class demonstrated higher levels of activity and engagement throughout the learning sessions. This observation is in accordance with the results of the quantitative analysis, which showed a significant improvement in learning outcomes after the implementation of Articulate Storyline 3-based learning media. The effect size value of 0.915, categorized as a large effect, further confirms that the use of interactive learning media had a substantial impact on students' achievement in the compound nomenclature material.

CONCLUSION

The results of this study indicate that there are significant differences in learning outcomes between the control and experimental classes. The use of Articulate Storyline 3-based learning media showed a strong effect on improving students' learning outcomes, as indicated by a large effect size of 0.915. This suggests that Articulate Storyline 3 is an effective instructional innovation for teaching compound nomenclature in chemistry.

The findings imply that interactive digital media can enhance student engagement and understanding during the learning process. For future research, it is recommended to apply this media to other chemistry topics, involve larger samples, and examine additional variables such as learning motivation and critical thinking skills.

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