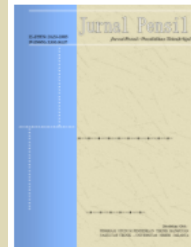


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DEVELOPMENT OF ARTICULATE STORYLINE-BASED INTERACTIVE MEDIA ON CONSTRUCTION DRAWINGS OF UTILITIES AND PLUMBING SYSTEMS

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Abstract

Vocational education seeks to prepare students with practical skills aligned with industry needs. One critical area is Building Modeling Design and Information (DPIB), which encompasses the development of digital learning media focused on construction utilities and plumbing systems. At SMK Negeri 11 Malang, student comprehension of this material has remained limited due to the lack of interactive media and restricted access to computing devices. This study aimed to design and implement a learning tool using Articulate Storyline software to improve students' understanding. Adopting a Research and Development (R&D) methodology, the study followed the ADDIE model for instructional design. Validation results indicated the media was highly feasible, with an average score above 80%. Effectiveness testing revealed a notable increase in student comprehension and learning motivation, with over 85% of participants responding positively. The media demonstrated strong potential to boost engagement and conceptual grasp. Future studies are encouraged to expand interactivity and incorporate game-based features to further enhance learning outcomes.

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Introduction

Education plays a pivotal role in shaping a nation's development, as it fosters the comprehensive growth of students intellectually, morally, spiritually, and in practical skills. In an era marked by rapid technological advancement and global competition, vocational education holds a strategic position in preparing a skilled workforce ready to meet industry demands. Vocational high schools (SMK), particularly those with a focus on Building Modeling Design and Information (DPIB), offer specific competencies aimed at bridging the gap between education and professional practice. One of these competencies is the subject of Utility Construction Drawing and Plumbing Systems (Makkawaru, 2019; Inayah et al., 2023).

Article Education is a fundamental aspect in shaping a nation's progress, as it plays a crucial role in developing students' potential comprehensively intellectually, morally, spiritually, and in terms of practical skills (Zahrok, 2020). In an increasingly competitive global context driven by technological advancements, vocational education has become essential in preparing a workforce that is ready for employment. One of the competencies taught in vocational high schools (SMK), particularly in the Building Modeling Design and Information (DPIB) concentration, is the subject of Utility Construction Drawing and Plumbing Systems (Santika et al., 2023; Santika et al., 2023)

In practice, however, several schools such as SMK Negeri 11 Malang face challenges including low levels of student understanding and participation, which are influenced by limited access to learning media and inadequate facilities (Suhailah et al., 2021). To address these issues, it is necessary to develop learning media that align with student characteristics and support the achievement of learning objectives. Engaging and easily accessible interactive media are crucial for enhancing student motivation and understanding, especially in subjects that require visualization, such as Utility Construction Drawing and Plumbing Systems. Constraints such as limited numbers of computers can be overcome by utilizing students' own devices, such as smart phones, as learning tools. One promising medium is Articulate Storyline, as it allows content to be delivered visually and interactively while providing immediate feedback to students (Ananda, 2022). This medium is not only effective in supporting self-directed learning but also enhances student engagement in the learning process (Magdalena et al., 2021).

This study aims to evaluate and develop the use of Articulate Storyline in learning activities at SMK Negeri 11 Malang, with the hope of improving the quality of education and students' practical skills in the construction sector in line with industry demands. Based on the problems identified, the researcher is interested in conducting a study titled: "Development of Articulate Storyline-Based Interactive Media on Construction Drawings of Utilities and Plumbing System".

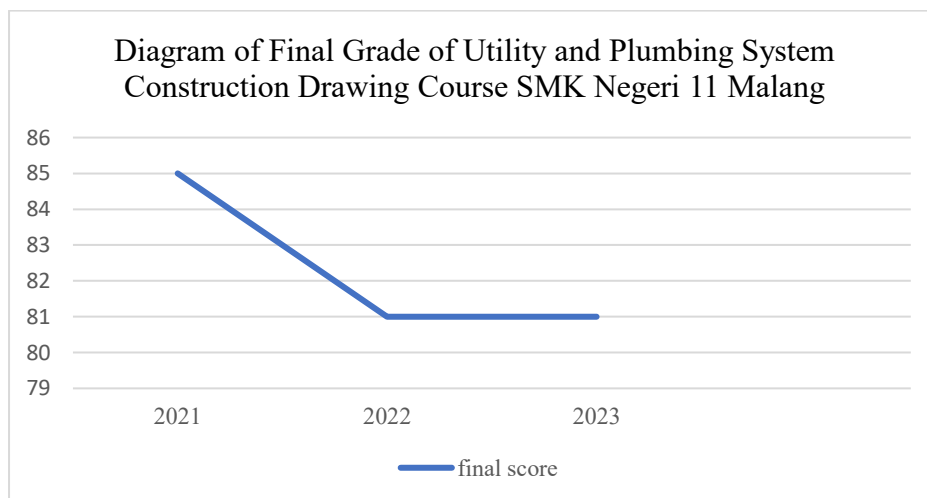


Figure 1. Diagram of impairment in the last 3 years

The diagram on Figure 1 presented above illustrates a noticeable downward in the observed variable over the designated period. This persistent decline raises critical concerns regarding its underlying causes and broader implications. Such a pattern strongly suggests the existence of systemic factors that warrant closer examination, thereby providing a compelling rationale for undertaking the present study. By exploring this issue more rigorously, the research aims to uncover contributing elements and offer data-driven insights that could inform future interventions or strategic decisions.

This research offers several important benefits, including improving student learning outcomes through the use of Articulate Storyline-based media, which may serve as a reference for media effectiveness in the learning process (Purniawan, 2015). Additionally, this study supports the development of students' digital competencies to better prepare them for entering the workforce, particularly in the construction sector. The findings of this research may also serve as recommendations for other schools and as a foundation for further studies on the integration of technology in vocational education (Julianti et al., 2025).

This study produces interactive learning media based on Articulate Storyline, designed to support the teaching of Utility Construction Drawing and Plumbing Systems at SMK Negeri 11 Malang. The media incorporates a combination of text, video, audio, and engaging animations, and is structured in accordance with the applicable curriculum. The media structure consists of a cover, main menu, instructional information, introduction (pre-test), main material, and evaluation (post-test) (Pipit et al, 2020; Ernawati, 2017). Each section is designed to enhance student understanding gradually through a visual and interactive approach. Moreover, the media can be accessed via devices such as PCs and smart phones, allowing flexibility for students to study anytime and anywhere (Mukhtar et al., 2022; Magdalena et al., 2021).

Research Methods

This study employs the Research and Development (R&D) method, which aims to produce and develop innovations in the form of learning products and assess their feasibility (M. Sari et al., 2024; Alyusfitri et al., 2023). This method emphasizes the development and testing of product effectiveness as a support for learning (Cahyadi, 2019; Susilo, 2019; Sungkar et al., 2023). The product developed in this study is learning media based on the Articulate Storyline software to support the achievement of learning objectives in the Utility Construction Drawing and Plumbing System components at SMK Negeri 11 Malang (Setiani et al., 2024).

In addition, this research also adopts the ADDIE development model, consisting of analysis, design, development, implementation, and evaluation (Jazuli et al., 2024; Purnamasari, 2019; Hidayat & Nizar, 2021). This model is intended to systematically and efficiently design and develop educational products while promoting interactive engagement between students and educators throughout the learning process (Hidayat & Nizar, 2021; Sungkar et al., 2023).

The population in this study comprised 34 students enrolled in the 11th grade DPIB class at SMK Negeri 11 Malang. Given the manageable size and homogeneous characteristics of the group, a total sampling technique was employed, whereby all members of the population simultaneously served as the research sample. This approach ensured comprehensive representation and facilitated accurate data collection across the entire cohort, thereby enhancing the reliability of the study's findings.

In this study, data were collected using two main instruments from expert validation questionnaires were distributed to evaluators consisting of a lecturer in education and a vocational high school teacher, both of whom assessed the feasibility, content accuracy, and functionality of the developed learning media. The expert validation instruments were distributed to subject matter specialists to evaluate the feasibility, content accuracy, and technical functionality of the developed learning media.

Following validation, the media was trialed in two student groups to assess its impact in real classroom settings. These groups consisted of students from the 11th grade DPIB class, who responded to the learning media through structured surveys. The results from these student responses were analyzed to determine levels of engagement, comprehension improvement, and overall effectiveness of the media implementation.

Table 1 Stages of the ADDIE Method (Cahyadi, 2019)

	Concept	General Procedures
Analyze	An analysis of learning media at the target school was conducted	<ol style="list-style-type: none"> 1. The researcher identified performance gaps by highlighting fundamental issues encountered in the learning process 2. The researcher also analyzed student characteristics, including: <ul style="list-style-type: none"> - Learning-related traits; Knowledge and skill levels; - The instructional material models needed by students. 3. The researcher analyzed the learning objectives to identify the skills or competencies students are expected to master. The following are some of the learning objectives in this element: <ul style="list-style-type: none"> - Students understand the design aspects of utility systems and their scope; - Students comprehend mechanical aspects of utility systems in multi-story houses; - Students understand electrical aspects of utility systems in multi-story houses; - Students grasp plumbing aspects of utility systems in multi-story houses
Design	This phase involves planning the learning media	<ol style="list-style-type: none"> 1. The researcher designed the media using Articulate Storyline software aligned with the learning objectives. 2. A learning activity scenario was developed using an instructional approach. 3. The initial design of the learning media was based on these objectives
Develop	The learning media was developed and validated	<ol style="list-style-type: none"> 1. The researcher executed the product design, during which the media was further developed and adjusted to align with the intended concepts.

		2. The developed media was then submitted for validation by experts
Implement	The final stage involved analyzing the improvement data and finalizing the product	<ol style="list-style-type: none"> 1. The learning media was implemented with students to gather feedback. 2. Following the implementation, an initial evaluation was conducted to gather input for future improvements
Evaluate	Analyze the results of the improvement data then finalize the product	<ol style="list-style-type: none"> 1. An evaluation was conducted to ensure the media meets development needs. 2. The evaluation results were used to provide feedback for enhancing the learning media

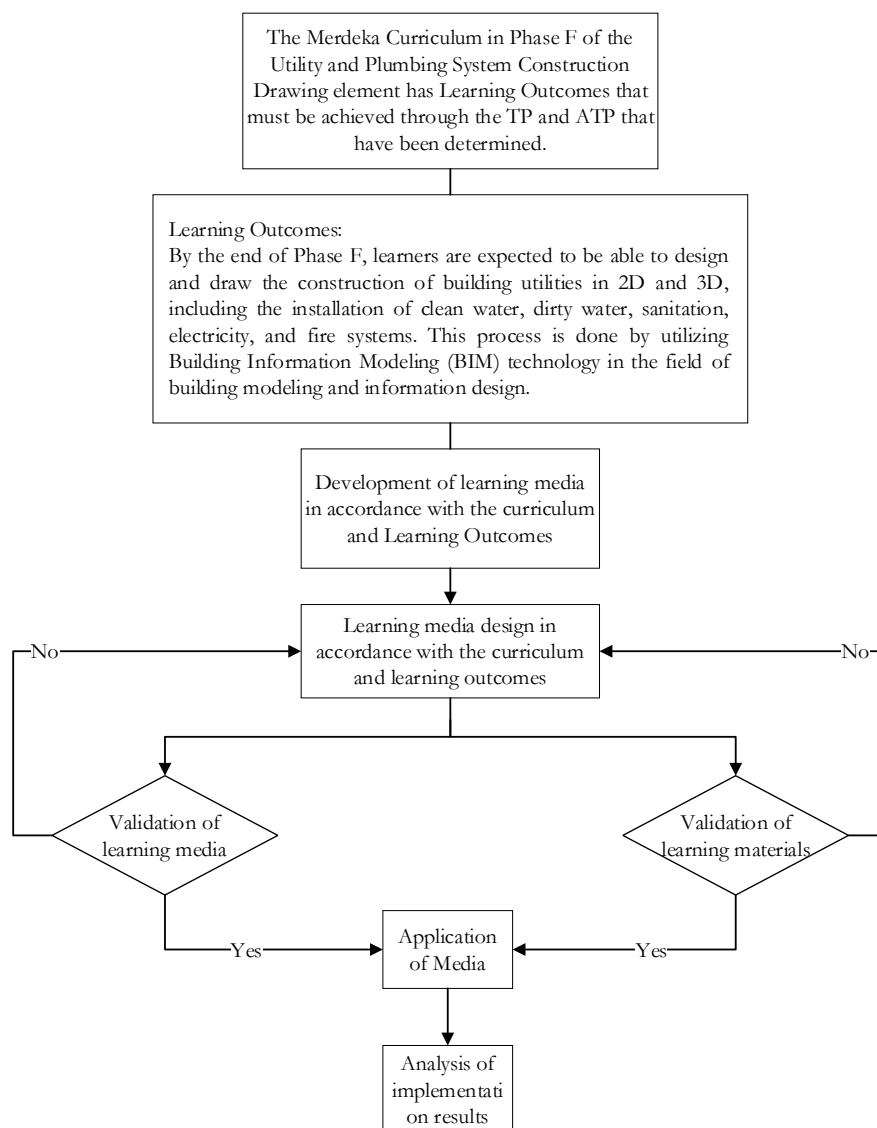


Figure 2. Flowchart of Learning Media

Research Results and Discussion

The development of learning media based on Articulate Storyline was carried out using the R&D method and the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The initial analysis was conducted through literature studies and field studies at SMK Negeri 11 Malang to understand students' needs, particularly in the subject of Construction Utility Drawings and Plumbing Systems. The main problem identified was the students' low level of understanding due to the use of conventional learning media, which are less engaging and not interactive. Text-based media were found to be ineffective in helping students visualize technical concepts, making it difficult for them to relate theoretical material to real-world practices (Chatarina et al., 2022; Kamilah & Susanti, 2022). Observations and interviews with teachers indicated that students are more attracted to visual media and interactive technologies (Kustandi et al., 2021; Susilo, 2019; Jazuli et al., 2024; Cahyadi, 2019)

The use of digital media such as animations, 3D simulations, and augmented reality is considered to have the potential to enhance students' comprehension (Julianti et al., 2025). Additionally, students today have access to personal electronic devices, which supports independent learning and flexible exploration of materials (Sungkar, Arthur and Anisah, 2023). The characteristics of students who prefer technology-based media became a strong foundation for the development of this media. With the right strategies and support from teachers, interactive learning media such as Articulate Storyline can serve as an innovative solution to improve classroom learning effectiveness (F. A. Sari, 2024; Alyusfitri et al., 2023).

The curriculum for the Building Information Modeling and Design (DPIB) program at vocational schools (SMK) demands learning media that align with learning outcomes, especially in the design of building utility systems (Kusuma, Candramila and Ariyati, 2017). The media used must support students' understanding both theoretically and practically in order to meet the competencies required in the industrial world (Kustandi *et al.*, 2021). One of the key topics is the MEP (Mechanical, Electrical, and Plumbing) systems for multi-story buildings. Therefore, the learning media must be capable of delivering theoretical concepts while also providing interactive simulations, so that students can understand the actual functions of each system (Julianti et al., 2025; Amalia, 2023).

The Articulate Storyline-based learning media developed by the researcher comprehensively covers all three aspects of MEP. In the mechanical aspect, the media explains HVAC, ventilation, as well as heating and cooling systems through interactive simulations. In the electrical aspect, the media presents materials on electrical installation, power distribution, and safety systems with the help of animations and interactive quizzes. In the plumbing aspect, the media provides simulations of piping systems, waste treatment, and water distribution. The visual, dynamic, and practical presentation of the material received very positive evaluations from subject matter validators, as it was deemed effective in improving students' understanding of technical concepts and skill acquisition in accordance with curriculum demands (Aulia et al., 2022; Chatarina et al., 2022; Irfan & Effendi, 2023; Jazuli et al., 2024; Ananda et al., 2022).

The results of validation by subject matter experts indicate that the developed learning media possesses a high level of accuracy and relevance, supported by concrete simulations. This aligns with the findings of Wijaya et al. (2022), who emphasized the importance of interactive digital media in enhancing students' comprehension and retention (Pribowo, 2018). The excellent assessment provided by the validators reflects the success of the media in combining theory and practice in an innovative way to support the learning of utility systems in multi-story residential buildings (Susilo, 2019; Jazuli et al., 2024).

The following are the results of the questionnaire assessed by the media expert validator:

$$\begin{aligned} x_i &= (\sum S) / S_{\max} \times 100 \% \dots (1) \\ &= 98 / 100 \times 100 \% \\ &= 98 \% \end{aligned}$$

Description:

- xi = Feasibility Percentage (%)
- $\sum S$ = Total score
- Smax = Total maximum score

The researcher revised the media based on these suggestions until it was deemed feasible. Based on the feasibility criteria adapted from Haking & Soepriyanto (2019), the developed media received a 98% feasibility score, indicating it is highly suitable for use (Sasmita & Prayudi, 2024).

The researcher made revisions based on these inputs until the media reached its final version, which was deemed appropriate by both the researcher and the validator:

$$\begin{aligned}
 xi &= (\sum S) / S_{max} \times 100 \% \dots (2) \\
 &= 105 / 120 \times 100 \% \\
 &= 87,5 \%
 \end{aligned}$$

Description:

- xi = Feasibility Percentage (%)
- $\sum S$ = Total score
- Smax = Total maximum score

According to the feasibility criteria adapted and modified from Haking & Soepriyanto (2019), the developed media received an 87.5% score, indicating the content is highly suitable for use (Maisarah, et al., 2023).

In the development process, Articulate Storyline technology was selected due to its ability to present materials interactively, complete with animations, simulations, and quizzes tailored to students' needs. According to Pratama & Widyastono (2021), such interactive media have been proven to improve student engagement and understanding of complex materials, particularly in visually-oriented subjects like Building Information Modeling and Design (DPIB) (Rohmawati, 2015).

After validating the test items, a reliability test was conducted using SPSS software to ensure that the test or instrument produced consistent and stable results when administered repeatedly under the same conditions, as well as to determine the level of confidence in the instrument's ability to generate data unaffected by random factors or measurement errors (Ramadhani, 2018; Fatimah & Bramastia, 2021). The following are the results of the reliability test on the Pre Test and Post Test questions.

Table 2. Reliability of Pre Test Questions

		N	%
Cases	Valid	31	100.0
	Excluded	0	0
	Total	31	100.0
Cronbach's Alpha		N of Item	
.952		40	

Table 3. Reliability of Post Test Questions

		N	%
Cases	Valid	31	100.0
	Excluded	0	0
	Total	31	100.0

Cronbach's Alpha	N of Item
.964	40

The reliability test in this study used the Cronbach's Alpha statistical method, with the criterion that if Cronbach's Alpha > 0.60, the variables are considered reliable. However, if Cronbach's Alpha < 0.60, the variables are deemed unreliable. Based on the reliability test results, all variables in this study showed a Cronbach's Alpha value greater than 0.60, thus indicating that the research variables are reliable.



Figure 2. The results of the development of Articulate Storyline-based learning media

The N-Gain test is conducted to measure the effectiveness of a learning process or intervention in enhancing students' understanding or abilities. The main function of the N-Gain test is to evaluate the extent of improvement in learning outcomes achieved after the implementation of a media development intervention using Articulate Storyline (Mukhtar et al., 2022; Fathurrahman et al., 2019; Hafiedz & Nurhamidah, 2023; Chatarina et al., 2022).

Table 4. Control Group N-gain Test Results

	N	Minimum	Maximum	Mean	Std. Deviation
N-gain_Skor	15	-.50	1.00	.6563	.37932
N-gain_Persen	15	-50.00	100.00	65.6314	37.93216
Valid N	15				

Based on the N-Gain test conducted by the researcher, the control group showed an N-Gain score of 0.65. This score falls within the medium N-Gain category and corresponds to a 65% percentage, thus classifying the media as moderately effective.

Table 5. Experimental Group N-gain Test Results

	N	Minimum	Maximum	Mean	Std. Deviation
N-gain_Skor	13	-.50	1.00	.7534	.46986
N-gain_Persen	13	-50.00	100.00	75.3367	46.98553
Valid N	13				

In contrast, the N-Gain test results for the experimental group yielded a score of 0.75. Adheres to the established guidelines, this score belongs to the high N-Gain category and corresponds to a 75% percentage, indicating that the media is effective. When comparing the percentages between the control and experimental groups, the experimental group using the Articulate Storyline-based learning media demonstrated better effectiveness (Kusuma et al., 2017; Alyusfitri et al., 2023; Hafiedz & Nurhamidah, 2023).

The implementation stage of this study involved testing the effectiveness of the Articulate Storyline-based learning media with Grade XI DPIB students at SMK Negeri 11 Malang. A total of 31 students were randomly divided into two groups: 16 students in the experimental group used the Articulate Storyline media, while 15 students in the control group used a PDF module containing the same material. The trial was conducted face-to-face in the computer laboratory to ensure a conducive learning environment. The results showed that the experimental group was more enthusiastic and engaged due to the visual and interactive appeal of the media, in line with Mayer’s (2020) Cognitive Theory of Multimedia Learning.

However, technical issues such as internet access temporarily hindered some students in accessing the media. This was resolved by the researcher providing a mobile hotspot, proving that infrastructure support is critical in technology-based learning. Compared to the control group using the PDF module, the experimental group demonstrated better understanding due to the presence of simulations and animations that helped them visualize and practically comprehend the concepts. Nevertheless, the full effectiveness of this media requires adequate facilities and training for both teachers and students. With sufficient support, Articulate Storyline can become an effective learning tool for improving the quality of technical education in vocational schools (Magdalena et al., 2021; Zahrok, 2020; Sungkar et al., 2023; Yudhistira et al., 2020).

Another advantage of Articulate Storyline is its flexibility of access through various devices such as smartphones, tablets, and laptops, allowing students to learn anytime and anywhere. This is consistent with the findings of Wijaya et al. (2022), who stated that the flexibility of digital access can improve learning effectiveness and students’ material retention. During the development phase, the researcher also conducted instrument validation and refined the media based on

feedback from validators. Suggestions included adding institutional logos to clarify the identity of the media, adjusting font size and type for better readability, and including a foreword to provide context for media usage.

Instructional design research suggests that layout and visual structure greatly influence the effectiveness of content delivery, especially in visually based digital media. With improvements in design and structure, the media became more systematic, engaging, and effective in the teaching and learning process. The validation results from media experts showed a feasibility score of 98%, while subject matter experts gave a score of 88.9%, both indicating that the media is highly suitable for use in the learning process. These high scores were supported by the advantages of an interactive visual design, the use of varied colors, and engaging simulations that captured students' attention. These findings are in accordance with research by Febrianti (2019) and Santoso (2020), who stated that interactive visual media can enhance focus and facilitate students' understanding of concepts taught by teachers.

Evaluation in the development of Articulate Storyline-based learning media is a crucial stage for assessing goal achievement and identifying obstacles. In this study, the researcher encountered several challenges, such as delays in trial scheduling due to ineffective online communication. The solution was to communicate directly with the school, which proved to be more efficient. Additionally, DPIB teachers suggested that the media be developed to cover a broader range of material at SMK Negeri 11 Malang, indicating its potential for further expansion. Another challenge arose from the students' unfamiliarity with digital media, which required assistance or tutorials to enable them to utilize the media optimally. Technical constraints also emerged, such as limited internet access and low-specification devices that affected media performance. To address this, solutions such as file compression, offline versions, and cross-device testing were recommended to make the media lighter and more inclusive.

Overall, Articulate Storyline has proven to be effective and engaging in delivering learning materials, especially those requiring visualization such as utility construction and plumbing systems. However, to ensure optimal and sustainable use, improvements in technical aspects, user readiness, and development flexibility are necessary. Further research is recommended to focus on enhancing usability, interactivity, and the sustainability of the media to support broader and more efficient learning processes.



Figure 3. Research documentation during the trial of the learning media

Articulate Storyline-based learning media has proven to be more effective than conventional methods, with an effectiveness rate reaching 75%, which is 10% higher than the control group that only achieved 65%. This finding indicates that the use of interactive media can enhance students' understanding through more engaging and concrete material delivery, such as visualizations, simulations, and interactive exercises. This advantage is in line with various studies as described by Febrianti (2019) and Santoso (2020) stating that instructional technology based on

the principles of the Cognitive Theory of Mayer's (2020) can significantly improve student comprehension.

Although the increase in effectiveness is categorized as moderate, the success of using Articulate Storyline largely depends on several important factors. One of them is the students' readiness in operating digital media and their level of technological literacy. Additionally, school infrastructure such as the availability of devices and stable internet connectivity plays a crucial role in the long-term success of implementing this media. The role of teachers is also essential, as the effectiveness of interactive media is strongly influenced by the teacher's ability to integrate technology into the learning process according to the characteristics of the students.

Articulate Storyline also contributes to increasing student motivation and engagement. With interactive features such as animations, simulations, and quizzes, students become more active and do not merely receive information passively. The results of the N-gain test showed that students' understanding improved significantly after using this media. This proves that the use of technology in learning not only facilitates material delivery but also strengthens students' engagement and focus throughout the learning process.

Overall, technological innovations in learning media such as Articulate Storyline play a significant role in enhancing the effectiveness of learning. To ensure optimal and sustainable outcomes, the implementation of this media in educational environments, particularly in Vocational High Schools (SMK), must continue to be developed, integrated with other learning methods, and supported with proper training, adequate infrastructure, and appropriate mentoring strategies.

Based on observational data, student responses to the use of Articulate Storyline-based learning media reached 70%, which falls under the "Good" category. This percentage indicates that the majority of students responded positively to the use of this technology-based learning media. Such positive responses reflect that the media effectively met students' learning needs and helped them understand the material more effectively compared to conventional methods, such as textbook reading or lectures that tend to be less interactive.

The "Good" category of student responses can be interpreted as an indication that Articulate Storyline successfully captured students' attention and assisted them in understanding the concepts being taught. According to a study by Irfan & Effendi (2023), interactive learning media equipped with animations, simulations, and quizzes can increase student interest and engagement in the learning process. This is because visual and interactive elements in Articulate Storyline can simplify complex concepts through experiential and hands-on learning approaches.

Although 70% of students provided positive responses to the use of Articulate Storyline-based learning media, 30% did not fully experience its benefits. This is due to several interrelated challenges. First, technological readiness is a key factor. Some students faced issues such as unstable internet connections or limited access to supporting devices, which made it difficult to access all interactive features optimally. In addition, variations in students' levels of digital literacy also played a role, as those less familiar with digital tools may have had difficulty navigating the materials, resulting in suboptimal learning experiences.

Another factor is the role of the teacher in the learning process. Although interactive media has strengths in delivering content visually and dynamically, its successful use heavily depends on the teacher's ability to integrate the technology into their teaching strategies. Teachers who are unfamiliar with digital media or who provide insufficient guidance may cause some students to feel confused or lose context, preventing them from fully benefiting from the media.

To address these challenges, several solutions can be implemented. Enhancing teacher training and mentoring is essential to ensure they can utilize interactive features optimally and provide more intensive support to students. Additionally, improving the user interface such as simplifying navigation and making the design more user-friendly would help accommodate students with varying levels of digital literacy. Providing supporting infrastructure, such as improved internet access and sufficient learning devices, is also important to ensure that all

students can fully access the learning materials. With the implementation of these solutions, it is expected that the obstacles experienced by students who have not yet felt the full benefits of the media can be minimized, thereby increasing the overall effectiveness of technology-based learning (Ani, et al., 2023).

Moreover, the use of Articulate Storyline also offers advantages in delivering learning material more efficiently. Teachers can customize the layout and structure of learning content to make it more organized and engaging, which facilitates student understanding. In addition, the quiz and evaluation features within the media provide direct feedback to students, enabling them to assess their understanding independently. According to a study by Santoso & Widodo (2021), digital learning media can increase information retention and concept comprehension by up to 30% compared to conventional learning methods.

With a 70% positive response rate, it can be concluded that the use of Articulate Storyline in learning can be an effective alternative to enhance student engagement and comprehension. However, to maximize its effectiveness, further improvements are needed, such as increasing teachers' capacity to integrate technology into teaching and ensuring the availability of adequate facilities to support student access to the media. If the current challenges can be addressed, it is expected that the percentage of positive responses will increase in the future, allowing technology-based learning media to provide greater benefits for both students and educators.

Articulate Storyline-based instructional media has proven to be highly effective within vocational education settings due to its capacity to deliver interactive, contextual, and visually rich learning experiences. Unlike conventional methods that rely primarily on textual or passive video content, Storyline enables the development of dynamic modules that incorporate simulations, branching scenarios, drag-and-drop exercises, and step-by-step visual guides. These features align with the pedagogical demands of vocational learning, which prioritize practical skill acquisition and real-world application.

Vocational students typically possess strong kinesthetic and visual learning tendencies. Their cognitive engagement is often heightened by task-oriented activities that mirror the tools, processes, and challenges encountered in industry settings. By integrating construction-related animations, interactive component identification, and virtual troubleshooting tasks, Storyline facilitates experiential learning that supports both conceptual understanding and procedural fluency.

Moreover, Storyline's modular structure allows for adaptive delivery enabling students to navigate lessons at their own pace, revisit complex segments, and interact with content according to their individual readiness. This is particularly beneficial in classrooms characterized by varied levels of academic preparation and digital literacy. The platform also supports multimedia layering, which enhances learner retention and caters to diverse learning styles through the integration of audio narration, visual schematics, and embedded quizzes.

When aligned with vocational student characteristics, such as preference for autonomy, relevance, and tangible outcomes, Articulate Storyline serves not just as a content delivery tool, but as a pedagogical bridge between theoretical instruction and practical expertise. Its implementation is increasingly recognized as a means to foster engagement, improve learning outcomes, and prepare students for competency-based assessment and professional standards in fields such as construction engineering, interior finishing, and technical installation.

Conclusion

The instructional media based on Articulate Storyline is deemed feasible by media and subject matter experts as an effective interactive tool to improve student understanding. This media is engaging and supports independent learning; however, it still faces challenges such as dependency on internet connectivity and high system load on devices with low specifications. To improve its effectiveness, it is necessary to optimize file size, provide offline versions, and enhance

compatibility. With these improvements, the media will become more accessible and better support the achievement of learning objectives.

The research findings reveal that instructional media based on Articulate Storyline is 75% effective in improving students' understanding of Utility Construction Drawings and Plumbing Systems. This effectiveness is validated by the N-Gain test results, which fall into the high category, indicating that this media contributes positively to the learning process and enhances students' comprehension of the subject matter.

Based on observation results, the use of Articulate Storyline-based instructional media received a positive response from students, with 70% falling into the "Good" category, indicating that most students felt aided in understanding the material through this interactive media. However, 30% did not show a positive response due to limited access to technology, varying levels of digital literacy, and a lack of teacher support in integrating the media into the learning process.

Suggestions

Based on the research on the development of Articulate Storyline-based instructional media for Utility Construction Drawings and Plumbing Systems, several recommendations are proposed for future improvements. Content should be expanded to cover additional relevant topics, and automatic assessment features, such as interactive quizzes and task simulations, should be integrated to enhance learning effectiveness. Further research involving diverse student populations is necessary to test the media's generalization. To improve accessibility, file compression and multimedia simplification are advised, along with broader device and network testing.

Evaluating time efficiency compared to conventional methods and enhancing interactivity and visual design to boost engagement are also important. Long-term impacts on academic performance should be assessed, and greater input from educators and industry professionals is recommended to ensure practical relevance. Future developments should focus on optimizing interactive features, such as advanced simulations and adaptive quizzes, while providing additional support or training to maximize positive student responses and learning outcomes. With further development, it is hoped that Articulate Storyline-based instructional media can be increasingly optimized to support interactive, innovative, and effective learning in various educational contexts.

References

- Alyusfitri, R., Nora, Y. and Fadhillah, H.I. (2023) 'Analisis Respon Siswa Terhadap Proses Pembelajaran Berbantuan Multimedia Interaktif di Sekolah Dasar', *Inovasi Pendidikan dan Pembelajaran Sekolah Dasar*, 7(1), pp. 113–126. Available at: <http://ejournal.unp.ac.id/index.php/jippsd/indexDOI:https://doi.org/10.24036/jippsd.v7i1>.
- Amalia, S.N. (2023) 'Pengembangan Media Pembelajaran Flipbook Untuk Meningkatkan Hasil Belajar Siswa Kelas V Pelajaran Ips', *Joyful Learning Journal*, 12(1), pp. 53–58. Available at: <https://doi.org/10.15294/jlj.v12i1.68004>.
- Ananda, M.T.U. (2022) 'Jenis, Klasifikasi dan Karakteristik Media Pembelajaran', 9(2), pp. 356–363.
- Ananda, S.R., Mappalotteng, A.M. and Bakri, H. (2022) 'Pengembangan Media Pembelajaran Interaktif Pada Mata Pelajaran Teknologi Informasi dan Komunikasi Berbasis Articulate Storyline', *Jurnal MediaTIK : Jurnal Media Pendidikan Teknik Informatika dan Komputer*, 5(1), pp. 58–64. Available at: <https://ojs.unm.ac.id/mediaTIK/article/view/33213/15752>.

- Ani, D. (2023) 'Konsep Dasar Media Pembelajaran', *Journal of Student Research*, 1(1), pp. 282–294. Available at: <https://doi.org/10.55606/jsr.v1i1.993>.
- Aulia, S. (2022) 'Uji Kelayakan Media Pembelajaran Interaktif Berbasis Android Menggunakan Articulate Storyline 3', 5(2), pp. 50–59.
- Cahyadi, R.A.H. (2019) 'Pengembangan Bahan Ajar Berbasis Addie Model', *Halaqa: Islamic Education Journal*, 3(1), pp. 35–42. Available at: <https://doi.org/10.21070/halaqa.v3i1.2124>.
- Chatarina, E.B.P., Sunaryo. and Sonny, K. (2022) 'Efektivitas Media Pembelajaran Interaktif Articulate Storyline dengan Media Powerpoint Terhadap Hasil Belajar Materi Substansi Genetika Siswa Kelas XII', *Journal of Natural Sciences and Learning*, 1(1), pp. 30–39. Available at: <https://doi.org/10.30742/jnsl.v1i1.20>.
- Ernawati, I. (2017) 'Uji Kelayakan Media Pembelajaran Interaktif Pada Mata Pelajaran Administrasi Server', *Elinvo (Electronics, Informatics, and Vocational Education)*, 2(2), pp. 204–210. Available at: <https://doi.org/10.21831/elinvo.v2i2.17315>.
- Fathurrahman, A. (2019) 'Peningkatan Efektivitas Pembelajaran Melalui Peningkatan Kompetensi Pedagogik Dan Teamwork', *Jurnal Manajemen Pendidikan*, 7(2), pp. 843–850. Available at: <https://doi.org/10.33751/jmp.v7i2.1334>.
- Fatimah, H. and Bramastia, B. (2021) 'Literatur Review Pengembangan Media Pembelajaran Sains', *INKUIRI: Jurnal Pendidikan IPA*, 10(2), p. 125. Available at: <https://doi.org/10.20961/inkuri.v10i2.57255>.
- Hafiedz, R. and Nurhamidah, D. (2023) 'Media Pembelajaran Interaktif Articulate Storyline Terhadap Motivasi Belajar Pembelajaran Bahasa Indonesia', *Pena Literasi*, 6(1), p. 54. Available at: <https://doi.org/10.24853/pl.6.1.54-64>.
- Hidayat, F. and Nizar, M. (2021) 'Model Addie (Analysis, Design, Development, Implementation and Evaluation) Dalam Pembelajaran Pendidikan Agama Islam Addie (Analysis, Design, Development, Implementation and Evaluation) Model in Islamic Education Learning', *Jurnal UIN*, 1(1), pp. 28–37.
- Inayah, A.N., Maftuh, B. and Sumantri, Y.K. (2023) 'JIPSINDO (Jurnal Pendidikan Ilmu Pengetahuan Indonesia) Pengaruh penggunaan media interaktif berbasis articulate storyline terhadap minat belajar IPS', *Jurnal Pendidikan Ilmu Pengetahuan Indonesia*, 10(02), pp. 173–187. Available at: <https://doi.org/10.21831/jipsindo.v10i2.59735>.
- Irfan, D. and Effendi, H. (2023) 'Studi Literatur Riview Pengembangan Media Pembelajaran Articulate Storyline dalam Pembuatan Pola Dasar di Sekolah Menengah Kejuruan Fatihaturahmi1', 05(02), pp. 2399–2407.
- Jazuli, L.O.A. (2024) 'Pengembangan media pembelajaran Articulate Storyline untuk pemahaman konsep materi turunan', *Jurnal Riset Pendidikan Matematika*, 10(2), pp. 139–152. Available at: <https://doi.org/10.21831/jrpm.v10i2.71066>.
- Julianti, R. (2025) '1,2,3,4', 13.
- Kamilah, N. and Susanti, S. (2022) 'Pengembangan Media Pembelajaran Interaktif Berbasis Articulate Storyline pada Materi Administrasi Perpajakan dengan Kompetensi Dasar PPh 21 Kelas Akuntansi', *Edukatif: Jurnal Ilmu Pendidikan*, 4(3), pp. 3201–3213. Available at: <https://doi.org/10.31004/edukatif.v4i3.2612>.

- Kustandi, C. (2021) 'Pemanfaatan Media Visual Dalam Tercapainya Tujuan Pembelajaran', *Akademika*, 10(02), pp. 291–299. Available at: <https://doi.org/10.34005/akademika.v10i02.1402>.
- Kusuma, A., Candramila, W. and Ariyati, E. (2017) 'Respon Siswa Terhadap Pembelajaran Berbasis Masalah Pada Materi Pencemaran Lingkungan Di Kelas X SMA', *Jurnal Pendidikan dan Pembelajaran Untan*, 6(10), p. 211336. Available at: <https://media.neliti.com/media/publications/211336-respon-siswa-terhadap-pembelajaran-berba.pdf>.
- Magdalena, I. (2021) 'Analisis Penggunaan Teknik Pre-Test Dan Post-Test Pada Mata Pelajaran Matematika Dalam Keberhasilan Evaluasi Pembelajaran Di Sdn Bojong 04', *Jurnal Pendidikan dan Ilmu Sosial*, 3(2), pp. 150–165. Available at: <https://ejournal.stitpn.ac.id/index.php/nusantara>.
- Maisarah, M., Maolida, N. and Prasetya, C. (2023) 'Pengembangan Media Video Pembelajaran Berbasis Canva Pada Pelajaran IPAS Kelas IV Sekolah Dasar', *Trapsila: Jurnal Pendidikan Dasar*, 5(1), p. 44. Available at: <https://doi.org/10.30742/tpd.v5i1.2932>.
- Makkawaru, M. (2019) 'Pentingnya Pendidikan Bagi Kehidupan dan Pendidikan Karakter dalam Dunia Pendidikan', *Jurnal Konsepsi*, 8(3), pp. 1–4.
- Mukhtar, E., Sudjani and Supriatna, N. (2022) 'Pengembangan E-Modul Konstruksi dan Utilitas Gedung Berbasis Proyek pada Kompetensi Keahlian Desain Pemodelan dan Informasi Bangunan (DPIB) di SMK', *JPTB: Jurnal Pendidikan Teknik Bangunan*, 2(1), pp. 31–40.
- Pipit, M., Dyah, A., Sukma, S.N., Tommy, H. and Setiana, S.W.S.T. (2020), No Title No Title No Title', *Journal GEEJ*, 7(2), pp. 16192–16197.
- Pribowo, S.F.P. (2018) 'Pengembangan Instrumen Validasi Media Berbasis Lingkungan Sekitar', *Jurnal Pendidikan dan Ilmu Pengetahuan*, 18(1), pp. 1–12. Available at: <http://journal.um-surabaya.ac.id/index.php/didaktis/article/download/1355/1153>.
- Purnamasari, N.L. (2019) 'Metode Addie pada Pengembangan Media Interaktif Adobe Flash pada Mata Pelajaran TIK', *Jurnal Pendidikan Dan Pembelajaran Anak Sekolah Dasar*, 5(1), pp. 23–30. Available at: <https://jurnal.stkipppgritulungagung.ac.id/index.php/penas-d/article/view/1530>.
- Purniawan, N. (2015) 'Pengembangan Media Pembelajaran Interaktif Berbasis Adobe Flash Pada Mata Pelajaran Konstruksi Bangunan di SMK Negeri 2 Pengasih', (c), pp. 1–9.
- Ramadhani, A. (2018) 'Pengembangan Media Pembelajaran Interaktif pada Mata Pelajaran Jaringan Dasar untuk Siswa Kelas X Jurusan Teknik Komputer dan Jaringan SMK Negeri 2 Depok Sleman', *Jurnal Pendidikan Teknik Informatika*, 7(1), pp. 21–31.
- Rohmawati, A. (2015) 'Efektivitas Pembelajaran', *Jurnal Pendidikan Usia Dini*, 9(1), pp. 15–32. Available at: e-mail: paud.ppsunj@gmail.com%0AAbstract:
- Santika, A. (2023) 'Peran pendidikan sekolah menengah kejuruan dalam memposisikan lulusan siswanya mencari pekerjaan', *Jurnal Kajian, Penelitian dan Pengembangan Kependidikan*, 14(1), pp. 84–94.
- Sari, F.A. (2024) 'Pentingnya Media Pembelajaran Dalam Sistem Pembelajaran', *Jurnal Pendidikan dan Teknologi Pembelajaran*, 2(2), pp. 414–421.

- Sari, M. (2024) 'Media Pembelajaran Berbasis Digital Untuk Meningkatkan Minat Belajar Pada Mata Pelajaran Bahasa Indonesia', *Warta Dharmawangsa*, 18(1), pp. 205–218. Available at: <https://doi.org/10.46576/wdw.v18i1.4266>.
- Sasmita, L. and Prayudi, A. (2024) 'Pengembangan Media Pembelajaran Poster Digital Pada Mata Pelajaran Ilmu Pengetahuan Sosial', *Jurnal Pendidikan dan Media Pembelajaran*, 3(1), pp. 36–46. Available at: <https://doi.org/10.59584/jundikma.v3i1.68>.
- Setiani, I., Medriati, R. and Purwanto, D.A. (2024) 'Pengembangan Media Pembelajaran Interaktif Berbantuan Aplikasi Canva untuk Meningkatkan Pemahaman Konsep Siswa', *JoTaLP: Journal of Teaching and Learning Physics*, 9, pp. 57–68.
- Suhailah, F. (2021) 'Articulate Storyline: Sebuah Pengembangan Media Pembelajaran Interaktif Pada Materi Sel', *Pedagonal: Jurnal Ilmiah Pendidikan*, 5(1), pp. 19–25. Available at: <https://doi.org/10.33751/pedagonal.v5i1.3208>.
- Sungkar, L., Arthur, R. and Anisah, A. (2023) 'Pengembangan E-Modul Konstruksi dan Utilitas Gedung Berbasis Proyek pada Kompetensi Keahlian Desain Pemodelan dan Informasi Bangunan (DPIB) di SMK', *Jurnal Pendidikan Teknik Bangunan*, 3(1), pp. 33–54. Available at: <https://doi.org/10.17509/jptb.v3i1.56252>.
- Susilo, M.A. (2019) 'Pengembangan Media Pembelajaran Berbasis Aplikasi Android Untuk Meningkatkan Hasil Belajar Kognitif Pada Pembelajaran Wheel Alignment (Development of Learning Media Based on Android Applications To Increase Cognitive Learning Results in-Wheel Alignment Le', *Jurnal Pendidikan Teknik Mesin*, 19(2), pp. 91–98.
- Yudhistira, R., Rifaldi, A.M.R. and Satriya, A.A.J. (2020) 'Pentingnya perkembangan pendidikan di era modern', *Prosiding Samasta*, 3(4), pp. 1–6. Available at: <https://jurnal.umj.ac.id/index.php/SAMASTA/article/view/7222>.
- Zahrok, A.L.N. (2020) 'Implementasi sistem penjaminan mutu internal di Sekolah Menengah Kejuruan (SMK)', *Jurnal Akuntabilitas Manajemen Pendidikan*, 8(2), pp. 196–204. Available at: <https://doi.org/10.21831/jamp.v8i2.31288>.