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Development of Interactive Multimedia Assisted with Articulate Storyline 3 Application Integrated with TPACK (Technological Pedagogical Content Knowledge) to Increase Student Learning Motivation

Zuhrotul Aini[1], Haryanto[2], Isra Miharti[3]
[1,2,3] *Universitas Jambi, Indonesia*

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ABSTRACT

The employment of interactive learning media constitutes a pivotal component in enhancing learning efficacy within the digital era. Interactive media fosters learner engagement in educational activities, thereby addressing a prevalent challenge in chemistry education, namely the underutilisation of technology. The dearth of innovation and accessibility to learning materials contributes to students' diminished motivation in chemistry classes. The objective of this study was to develop interactive learning media, facilitated by the Articulate Storyline 3 application, employing the TPACK approach to support the teaching of naming chemical compounds in class XI IPA Man 2 Tebo.The research method employed a development (R&D) approach, following the Lee & Owens model, which comprises five stages: analysis, design, development, implementation, and evaluation.The findings indicate that the developed media is conducive to effective learning. This can be seen from the results of material validation with an average score of 84.6% which is in the value range of 81%-100% with the criteria "Very Feasible", while the percentage of media expert validation scores of 67.6% is in the value range of 61%-80% with the category "Feasible" seen from the aspects of design, layout, and ease of use of the media. The results of using interactive learning media are proven to be able to increase student learning motivation, seen from the results of the student assessment questionnaire obtained a value of 94.35% which is on a value scale of 81%-100% with the value criteria "Very Good". From the results of the study it can be concluded that the interactive learning media using Articulate Storyline developed is very feasible to be used as additional media in the learning process.

Keywords *Multimedia Interaktif, Articulate Storyline, Student Learning Motivation.*

Corresponding Author : isra@unja.ac.id

INTRODUCTION

Education is undergoing a transformation in response to the global dynamics and technological developments of the 21st century. Education must

keep up with technological trends and prepare students to adapt to rapid and continuous change. Therefore, curriculum change is one way to improve the quality of education in Indonesia.

The Merdeka Curriculum, launched in 2020, emphasizes active and learner-centered learning. This approach is in line with the demands of 21st century skills, such as creativity, collaboration, and critical thinking (Ananda et al., 2023). In research (Lestari & Iryanti, 2024). stated that the concept of the 21st century is said to be an education that combines cognitive, affective, psychomotor abilities, as well as mastery of information and communication technology (ICT) in learning, so the role of teachers in 21st century education. To achieve this goal, the use of teaching media in the learning process makes learning more enjoyable (Miharti, 2024).

Interactive multimedia combines text, image, graphics, animated video, and sound. The TPACK (Technological Pedagogical Content Knowledge) approach is key to developing interactive learning media. This approach makes the classroom more interactive and interesting, increasing students' motivation and desire to learn.

The TPACK framework serves as the foundational basis for effective technology-based teaching methods. This framework is designed to facilitate the development of novel learning models by integrating three primary components: technology, pedagogy, and content/knowledge.The integration of information and communication technology has been shown to exert a positive influence on the learning process of students (Rahmatiah et al., 2022). ICT-based teaching materials have the capacity to foster a conducive and effective learning atmosphere, thereby facilitating the transformation of knowledge by teachers and its reception by students (Haryanto et al., 2020).

One of the applications that can help in creating learning multimedia is Articulate storyline. Articulate Storyline software is used to create interactive learning media that provides audio and visual experiences to students. This software has a working screen consisting of scenes and slides, as well as features such as audio, video, images, characters, and links to the web to make the source material interesting and complete (Rahmania et al., 2023). Articulate storyline can be accessed online or ofline because it can be published in the form of web, articulate online, LMS, CD and word so that the resulting product can be used on PCs, laptops and android smartphones (Lestari & Iryanti, 2024).

In the context of the chemistry curriculum for students in class XI IPA, the subject of compound naming emerges as a pivotal element. This topic encompasses a wide array of compounds, including ionic, covalent, organic, and acid-base compounds.The process of acquiring and mastering compound

names necessitates clear and precise conceptual frameworks to ensure effective learning. Students' comprehension of these concepts is often influenced by various factors, including anxiety and learning difficulties, which can impede the efficacy of the learning process.Addressing these challenges necessitates the enhancement of students' metacognition skills. The integration of game-based learning has been shown to offer distinct advantages in terms of emotional intelligence, practical skills, and social engagement (Sanova et al., 2023).The concept of motivation is an intrinsic component that influences the efficacy of educational practices, particularly in the context of teaching and learning. Motivation refers to the internal forces that propel the learning process, resulting in continuous engagement in educational activities. In learning activities, motivation plays a pivotal role in encouraging students to actively participate in the learning process (Putri et al., 2025).

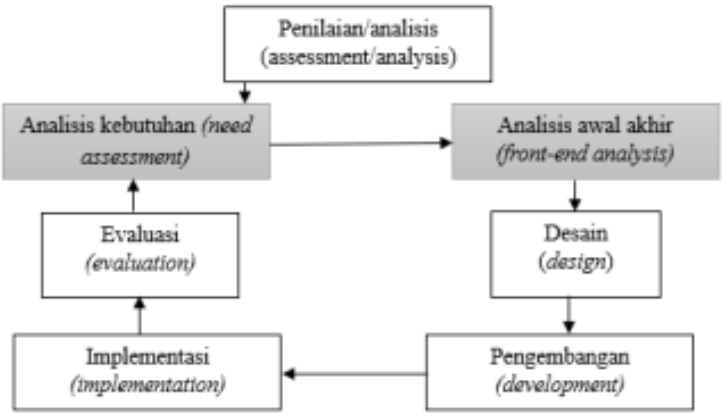
The learning environment has a significant impact on students' motivation to learn, and a conducive environment can have a substantial positive effect on the growth and development of students' learning motivation.Teachers have a key role in reinforcing and cultivating learning motivation. Teachers with extensive knowledge and insight create inspiring learning environments and motivate students to continue learning (Sakinah, 2023).Research on the implementation of learning models using interactive multimedia successfully increases student engagement (Rahman et al., 2024).

Interviews with chemistry teachers at MAN 2 Tebo show that the school has implemented the independent curriculum. Furthermore, package books are used as teaching materials, as well as using supporting media such as Youtube and ppt to support learning materials. Increasing student motivation in learning chemistry is very important. The use of TPACK-based interactive media on andorid smartphones in teaching chemical compound names can make learning more innovative, encouraging students to be more active. This is supported by the distribution of questionnaires of the needs of XII IPA Man 2 Tebo students, where 77.3% of them prefer to learn chemistry using interactive media through Android smartphones.

By considering the things mentioned above, a strategy is needed to increase students' interest and desire to learn chemistry. One way to improve students' understanding of compound naming is to use Articulate Storyline as an interactive learning tool during the learning process.

RESEARCH METHOD

This study uses research and development (R&D). With a development model (Lee & Owens, 2004) adapted from the ADDIE structure. Development is carried out with five stages, namely: Analyze, Design, Develop, Implement, and Evaluate.



Picture 1.
Tahap Pengembangan Model Lee & Owens

The types of data used include qualitative data and quantitative data. The pilot test was conducted on a small group of 10 students in class XI IPA MAN 2 Tebo. Qualitative data was obtained through interviews with chemistry teachers and through validation questionnaires from media experts and material experts, which contained input, responses, and criticism. Meanwhile, quantitative data were obtained from the results of the validation questionnaires of media experts and material experts, teacher research questionnaires, and student response questionnaires in the form of assessment scores. Researchers used non-test data collection instruments in the form of questionnaires and interview sheets. The questionnaire used includes a learner response questionnaire, an assessment questionnaire by a chemistry teacher, and a validation questionnaire filled out by media experts and material experts.

Development Procedure

The research and development procedures used in interactive multimedia are carried out by following the Lee & Owens model based on the TPACK approach as follows:

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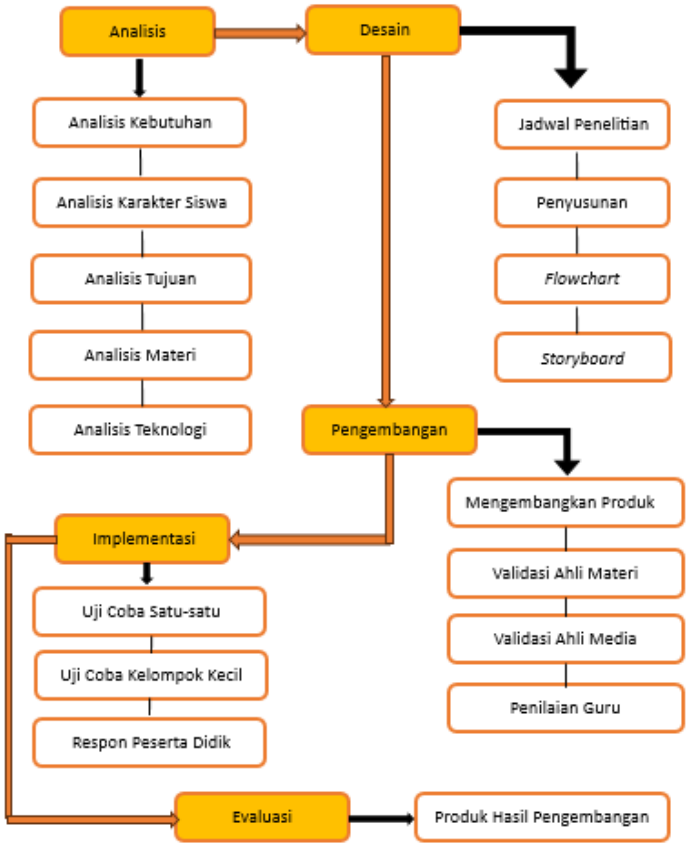

Picture 2.
Stage Development Procedure

The next step is to analyze the data that has been collected. This involves assessing the results of the needs questionnaire, validation by material experts and media experts, teacher assessment, and student opinions. The needs questionnaire data was analyzed using a Likert scale of 1-5 and using answer options such as strongly agree (SS), agree (S), disagree (KS), disagree (TS), and strongly disagree (STS).

$$\% \text{ Skor} = \frac{Jumlah\ skor\ yang\ diperoleh}{Jumlah\ total\ maksimum\ seluruh\ skor} \times 100\%$$

Data was analyzed and processed descriptively into interval data using a Likert scale

Table 1.
Material Expert and Media Expert Validation Rating Scale

No.	Rerata skor jawaban	Kriteria validasi
1.	> 4,2 – 5,0	Sangat Layak
2.	> 3,2 – 4,2	Layak
3.	> 2,6 – 3,4	Kurang Layak
4.	> 1,8 – 2,6	Tidak Layak
5.	> 1,0 – 1,8	Sangat Tidak Layak

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Table 2.
Teacher Rating Scale

No.	Rerata skor jawaban	Kriteria validasi
1.	> 4,2 – 5,0	Sangat Layak
2.	> 3,2 – 4,2	Layak
3.	> 2,6 – 3,4	Kurang Layak
4.	> 1,8 – 2,6	Tidak Layak
5.	> 1,0 – 1,8	Sangat Tidak Layak

To determine the classification of students' responses, you can use the formula:

$$K = \frac{F}{N \times 1 \times R} \times 100\%$$

Table 3.
Learner Rating Scale

No.	Skala Nilai (%)	Kriteria
1.	81% – 100%	Sangat baik
2.	61% - 80%	Baik
3.	41% - 60%	Kurang baik
4.	21% - 40%	Tidak baik
5.	0% - 20%	Sangat tidak baik

RESULT AND DISCUSSION

Through this research, a teaching media has been developed in the form of interactive learning multimedia based on the TPACK approach on compound naming material developed using Articulate Storyline 3. This media is presented in the form of interactive multimedia that can be accessed through Android smartphones, laptops, and computers. Teaching media is designed with the aim of supporting the learning process and being able to increase motivation and avoid boredom of students in the learning process. Development is carried out with five stages, namely: Analyze, Design, Develop, Implement, and Evaluate.

The Analyze stage is carried out to identify obstacles in the chemistry learning process. Then this data is analyzed from various aspects, including student needs, student characteristics, learning objectives, learning materials and appropriate educational technology.

At the needs analysis stage, observations and interviews with chemistry teachers were conducted. From the results of observations and interviews with chemistry teachers, it is known that teachers in teaching do not always use learning media. The media used is usually in the form of powerpoint media

with the usual design, videos taken from YouTube and using printed media. The powerpoint used by the teacher is an ordinary powerpoint that only contains slides with writings and has no sound, rarely displays images and no videos, besides that the interest and motivation of students to learn chemistry lessons is very low.

Furthermore, the stage of analyzing the characteristics of students is carried out to determine the initial abilities achieved by students as a requirement to achieve a learning objective. Based on the data obtained, 72.2% of students have personal smartphones, and 45.5% like to access material online on the internet.

Analysis of learning objectives is carried out to determine the basis for the need for learning media development. In developing learning media, it must be in accordance with the syllabus and basic competencies that students will achieve. In this study, the analysis of learning objectives is guided by the curriculum applied at MAN 2 Tebo class XI Ipa 1, namely the independent curriculum which consists of learning outcomes, learning objectives, material and practice questions.

Material analysis is made in synchronization applied at MAN 2 Tebo, so that the learning content in the media can be developed in accordance with the competencies that students must have. The selection of compound naming material as the focus of interactive multimedia development is due to students not being able to understand the material as a whole because the process of studying compound naming requires accurate and clear concepts, compound naming has an understanding of naming rules, how to formulate so that it causes understanding difficulties for most students in class XII. This is evidenced by the results of a questionnaire as many as 63.6% of students experience learning difficulties in compound names, and 77.3% of students are interested in learning compound names using interactive multimedia.

Educational technology analysis was conducted to identify technological capabilities and to determine the availability of facilities and infrastructure that support learning at school. It is known that school facilities and infrastructure as facilities to support teaching and learning activities are available such as computers, infocus and internet networks. This is supported by the results of the questionnaire analysis of the needs and characteristics of students who provide data results that 59.1% of students always bring smartphones to school and 45.5% like to access online material on the internet.

Furthermore, the design stage starts from the formation of the development team, research schedule, media specifications, material structure as well as making flowcharts and storyboards. Flowchart and Storyboard are

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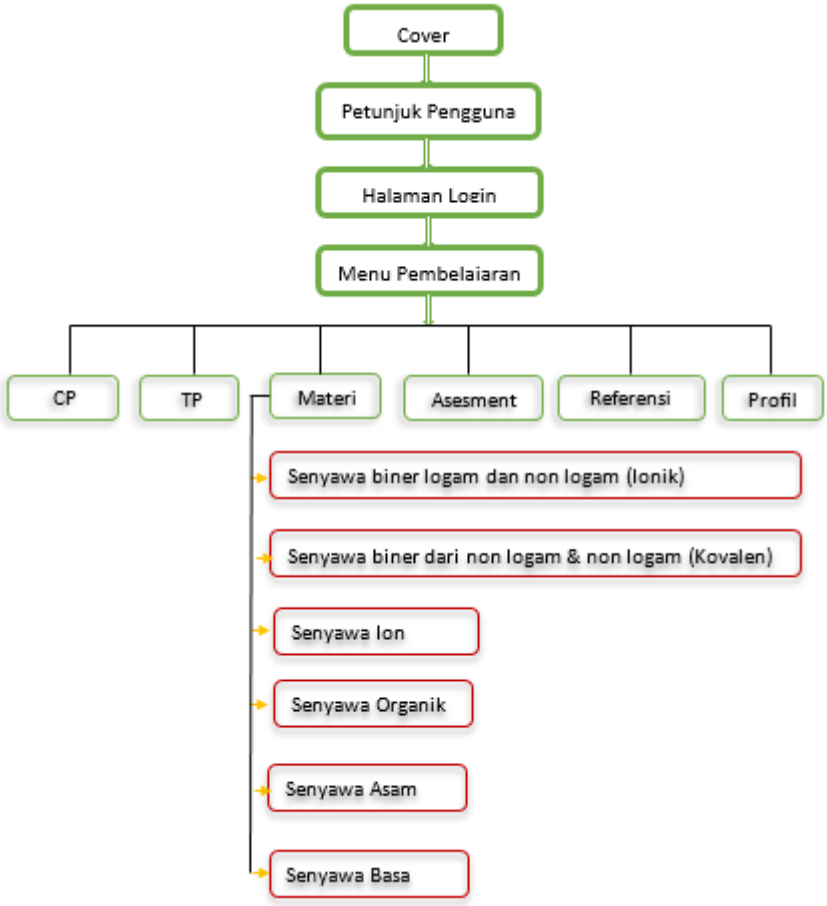
important steps in designing interactive multimedia because they have the ability to show the flow of interaction, organize the sequence of content, and become a reference for media developers to create effective learning media. In the design process, researchers used articulate storyline software, canva application, and apk 2 Builder to develop interactive learning multimedia products integrated with TPACK.



Picture 3. Flowchart

Cognitive learning theory contributes to the development of articulate storyline-assisted interactive learning multimedia to ensure that materials are organized according to the design of flowcharts and storyboards to the use of text, image and animation elements. Information processing principles, such as dividing content into small segments by combining images and text, and creating simple and easy-to-use displays.

Furthermore, the contribution of constructivism learning theory in learning is that it can give learners the freedom to choose learning materials and determine their own sequence. This can enable learners to learn with the level of ability, speed, and learning needs that are unique to each individual.

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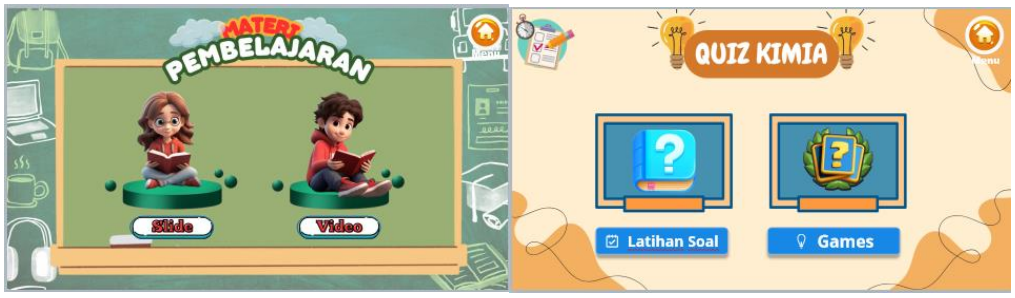
Next, the development stage is carried out which involves the process of transforming the storyboard design into the final product in the form of interactive learning multimedia. then material and media experts assess the products that have been developed theoretically. This stage aims to obtain an assessment of the suitability of the product with predetermined quality standards before testing on students. The following is the design of the Tpack integrated interactive multimedia product:

Picture 4.
Cover Page and Learning Objectives



Picture 5.
Material Page and Chemistry Quiz

Picture 6.
Developer Profile Page

Tpack-integrated interactive multimedia products have been validated and meet the requirements as teaching media. The assessment to compile this material involves aspects of material relevance, material organization, language, and ease of understanding for students. Material validation was carried out twice in order to obtain a material that was suitable for testing to students. Validation 1 obtained a total score of 47 with an average score of 3.61 which is in the interval> 3.4 - 4.2 with a percentage of 72.2% in the "Good"

category. while validation II obtained a total score of 55 with an average score of 4.23 which is in the interval> 4.2 - 5.0 with a percentage of 84.6% in the "Very Good" category. This shows that this interactive multimedia product has achieved good quality in terms of material and media. After that, the validator stated that this product was suitable for the next stage, namely field trials without modification.

Furthermore, media expert validation was carried out twice, which included aspects of language assessment, effects for learning strategies, software engineering, and visual appearance. Validation I obtained a total score of 33 with an average score of 2.69 which is in the interval >2.6 - 3.4 with the category "less feasible". The initial evaluation of the learning media showed that there were still some shortcomings that needed to be corrected. In the second validation stage, the learning media successfully reached the "Feasible" category with a total score of 44 and an average score of 3.38 which is in the interval >3.4 - 4.2. The validator stated that the interactive multimedia product assisted by articulate stotyline developed was good and worthy of trial with suggestions and revisions that had been given to be tested in the field. Furthermore, this Tpack-integrated interactive multimedia was assessed by a chemistry teacher before being implemented to students. The interactive multimedia achieved "Good" quality with an average score of 4.06, which is between 3.4 and 4.2. The teacher assessed that this interactive learning multimedia is very effective if implemented in the teaching process, with an attractive design and relevant material that not only makes the learning process more enjoyable, but also succeeds in increasing students' learning motivation.

Then the implementation stage is carried out, the trial is carried out on three students in class XI IPA 1 who have different levels of intelligence will be carried out before testing interactive multimedia products in small groups. The feasibility value of 95.68% is obtained from the results of the percentage of the three students, which is on a value scale of 81% to 100% with the value criteria "Very Good".

Furthermore, researchers conducted trials on interactive learning multimedia products with 10 students of class XI IPA 1 MAN 2 Tebo with different cognitive levels.The results of the questionnaire distributed showed a feasibility percentage of 94.35%, which is on a value scale of 81% to 100% with the value criteria of "Very Good."The results showed that the use of interactive learning media can increase students' desire to learn. The findings revealed that students reported heightened engagement and a more profound comprehension of compound names, as evidenced by their improved performance in practice and game questions on the interactive learning

media.This assertion is further substantiated by prior research conducted by Nurmala et al. (2021), which attested to the high quality of articulate storyline media in terms of material, media, and language.Moreover, the research data underscores the media's remarkable capacity to enhance student creativity. This increase in creativity is further validated by the findings of expert validation, which assessed the feasibility of Artticle Storyline 3 media from the material aspect (79.8% valid category), the media aspect (97.9% very valid category), and the linguistic aspect (87.5% very valid category). These results align with those reported by Firstanianta et al. (2023).

CONCLUSION

This interactive multimedia development adopts the Lee & Owens Model (2004) as a framework by integrating TPACK principles through the use of articulate storyline 3 to create an interesting learning design that is able to increase student learning motivation. The results of validation by material experts, material experts, and chemistry teacher assessments show that the interactive media created is conceptually and procedurally feasible. Based on student responses, an eligibility percentage of 94.35% was obtained, which is on a score scale of 81% to 100% with the score criteria being "Very Good". The development of interactive multimedia assisted by Articulate Storyline 3 integrated with TPACK has excellent potential to increase student learning motivation on compound nomenclature material.

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