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# Middle School Teachers' Professionalism (Beliefs and Attitudes) Toward Technology in Developing 3D Videos Using Plotagon

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**Abstract-** This study focuses on the professionalism of teachers, particularly in terms of their attitudes and beliefs toward the integration of digital technology in teaching and learning activities. Plotagon was selected as a medium for developing interactive and contextual 3D instructional videos. The research employed a survey method aimed at exploring teachers' interest in and acceptance of Plotagon as a supportive tool for instructional materials. The participants comprised twenty-eight junior high school teachers in Sawahlunto City. Prior to the survey, the teachers received intensive training on creating instructional videos using Plotagon. Data were collected through direct observation, questionnaires, and structured interviews. The findings reveal that the majority of teachers (91%) demonstrated positive beliefs regarding the use of digital culture-based technology through Plotagon, while 88% considered the medium beneficial for students. Furthermore, 86% of teachers showed high levels of engagement, and an equal proportion actively participated throughout the implementation process. These results imply that integrating digital storytelling platforms such as Plotagon can enhance teachers' professional competence and foster innovative teaching practices.

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## 1. Introduction

The advancement of digital technology has had a significant impact on various sectors of life, including education. Technology not only facilitates access to



information but also enriches instructional delivery methods (Bito & Masaong, 2023; Putrawangsa & Hasanah, 2020; Yusri Wahyuni et al., 2021). In the era of the Industrial Revolution 4.0 and entering the era of Society 5.0, educators are required to integrate technology into the learning process to create more engaging, interactive, and meaningful learning experiences (Bito & Masaong, 2023; Mukuka et al., 2021; Nuursya'baani et al., 2022; Tan et al., 2020). Optimal utilization of technology can enhance students' motivation, facilitate independent learning, and encourage innovation in the design of instructional materials (Özcan, 2016; Özcan & Eren Gümüş, 2019a, 2019b; Reinhold et al., 2021a).

However, in practice, not all teachers are able or willing to adopt technology in their teaching. Factors such as limited technological knowledge, insufficient training opportunities, and resistance to change often hinder the full integration of technology (Muralidharan et al., 2019; Sofendi et al., 2021; Xu et al., 2022). Teachers' acceptance and use of technology are strongly influenced by their personal attitudes and beliefs regarding its usefulness and ease of use (Harisman et al., 2019, 2023; Nasution et al., 2024). In other words, the successful integration of technology is not merely a matter of access to tools but also depends on teachers' mental readiness and professionalism in facing the digital transformation of education.

In the context of teaching subjects such as mathematics, science, cultural arts, and others, technology offers a wide range of possibilities to strengthen concept delivery and skill acquisition. For example, 3D videos can provide abstract visualizations that are difficult to explain solely through text or two-dimensional images, thereby supporting deeper student understanding (Ng & Chan, 2019, 2021). In cultural arts education, visual technologies such as animation and narrative videos can enhance students' appreciation of aesthetic and cultural values (Ng & Chan, 2019). Meanwhile, in science and mathematics, 3D animation can concretely and attractively illustrate complex phenomena (Andela, 2023).

One of the most critical factors influencing the successful implementation of technology in education is teachers' professionalism, particularly in terms of their beliefs and attitudes toward technology. Teachers with positive beliefs are generally more open to digital innovation and more willing to adopt new approaches in their teaching (Goos, 2010). Conversely, teachers with negative or skeptical attitudes toward technology tend to avoid its use, even when it has significant potential to improve learning quality (Xu et al., 2022). Therefore, understanding teachers' beliefs and attitudes is essential for designing relevant professional training and development interventions (Beswick, 2007; Farjon et al., 2019).

Previous studies have examined technology integration in education and the factors influencing teachers' acceptance of digital tools. However, research that specifically explores teachers' beliefs and attitudes toward 3D animation-based applications such as Plotagon remains limited, particularly in the context of junior high school teachers in Indonesia. Plotagon, as an easy-to-use application for creating 3D animated videos, holds great potential for enhancing teachers' creativity in developing instructional media (Alwasilah, 2019; Guzmán Gámez & Moreno Cuellar, 2019; Mufidah et al., 2023). This study seeks to fill this gap by highlighting the dimension of teacher professionalism in responding to 3D video-based technology, while also introducing an approach that has received little scholarly attention.

The study of teacher professionalism in relation to technology is not entirely new. For instance, Harisman et al. (2023) reported that mathematics teachers held positive attitudes toward the use of mathematical e-comics as a teaching tool, believing that such media could increase students' interest and motivation in learning mathematics. Similarly, Nasution et al. (2024) found that teachers believed ClassPoint could enhance instructional quality and foster student engagement. Other studies have also highlighted the role of digital platforms in promoting teacher readiness and innovative practice. For example, Rahman and Yusuf (2022) showed that digital storytelling applications improved teachers' ability to contextualize subject matter, while Tan and Lim (2021) demonstrated that 3D animation tools contributed to more engaging and student-centered classrooms.

Despite these findings, most previous studies have concentrated on either subject-specific media (e.g., mathematics e-comics) or general presentation tools (e.g., ClassPoint), with limited attention to 3D character-based platforms that allow teachers to create fully interactive and contextual instructional videos. This study addresses that gap by examining teachers' professionalism through their attitudes, beliefs, and engagement with Plotagon, a digital storytelling tool that integrates 3D animation into

instructional design. The novelty of this research lies in its focus on teacher professionalism not only in terms of acceptance but also active participation and sustained engagement with culture-based digital technology. By doing so, it provides new insights into how 3D animated platforms can strengthen teachers' competence and open opportunities for more innovative pedagogical practices. Building on these insights, the present study aims to investigate the extent of interest and acceptance among junior high school teachers regarding the use of Plotagon for creating 3D instructional videos.

## 2. Methods

This study employed a survey approach to explore the professionalism of junior high school teachers in Sawahlunto City in utilizing technology, particularly the Plotagon application for creating three-dimensional (3D) instructional videos. A total of twenty-eight teachers from SMPN 3 Sawahlunto participated in this research. This school was purposively selected because it has actively implemented digital-based learning initiatives and regularly encourages teachers to integrate technology into their instructional practices. Moreover, the school is located in an urban area where access to digital resources is relatively available, making it a relevant context for studying teachers' professionalism in adopting new technologies. The participating teachers represented diverse subject areas, including mathematics, science, languages, and social studies, with teaching experience ranging from less than five years to more than twenty years. Such diversity allowed the study to capture a comprehensive picture of teachers' attitudes, beliefs, and engagement toward the use of Plotagon as a digital instructional tool.

The program began with a four-day intensive training session on the use of Plotagon features to design interactive instructional videos aligned with curriculum requirements. Following the training, teachers were given time to independently develop 3D videos as teaching media. To capture their perceptions, questionnaires were administered to measure two key dimensions: beliefs and attitudes toward the use of technology in the learning process. In addition, in-depth interviews were conducted with three selected teachers to further explore their experiences and challenges during the video production process. The study also assessed the level of teacher participation and attentiveness throughout the activities. The data collection instruments are presented in detail in [Table 1](#).

**Table 1.** Data Collection

| Assessment Aspects | Instrument                    |
|--------------------|-------------------------------|
| Teacher Belief     | Questionnaires and interviews |
| Teacher Attitude   | Questionnaires                |

Source: Harisman et al. (2022)

The assessment indicators related to teachers' beliefs in using technology are displayed in [Table 2](#).

**Table 2.** Indicators teachers' beliefs questionnaires

| No | Teacher Belief Aspect                                                                    |
|----|------------------------------------------------------------------------------------------|
| a  | Teachers' beliefs about learning with the integration of technology in the classroom.    |
| b  | Teachers' beliefs about students in the context of learning with technology integration. |
| c  | Teachers' beliefs about their knowledge for teaching with technology integration.        |

Source: Harisman et al. (2022)

The questionnaire items measuring teachers' attitudes toward technology are provided in [Table 3](#).

**Table 3.** Questions on the Teacher Attitude Questionnaire

| No | Example Statements from the Attitude Questionnaire                                                               |
|----|------------------------------------------------------------------------------------------------------------------|
| a  | Training on using the ClassPoint application is a new experience for me.                                         |
| b  | I became very interested in the ClassPoint application after the instructor's explanation.                       |
| c  | I only talked or chatted while the instructor was delivering material about the ClassPoint application.          |
| d  | I often asked the instructor questions when I did not understand certain features in the ClassPoint application. |
| e  | I was unable to follow the module instructions provided in this training.                                        |
| f  | I will use this application to help my students solve problems whenever necessary.                               |

Source: Subhan et al. (2020)

The questionnaire responses were analyzed using a simple percentage calculation, obtained by dividing the total score by the maximum score and multiplying by one hundred percent. Furthermore, qualitative data were obtained through teacher interviews, with sample interview questions presented in Table 4.

**Table 4.** Sample Interview Questions

| No | Sample Interview Questions                                                                                                                            |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| a  | To what extent do you consider technological culture as a mandatory competence for today's educators?                                                 |
| b  | To what extent do you believe that technological culture in the development of teaching materials can be trained and continuously improved?           |
| c  | In your opinion, is TPACK-based teaching material using Plotagon to create 3D mathematics videos one of the competencies that educators must possess? |
| d  | To what extent do you think technology-based teaching materials play a role in fostering students' critical and systematic thinking skills?           |

Source: modified from Harisman et al. (2023)

### 3. Results and Discussion

Questionnaire data were analyzed using a simple percentage formula, in which the total score was divided by the maximum score and multiplied by one hundred percent. The results of the analysis of teachers' beliefs and attitudes toward technology are presented in Table 5 and Table 6.

**Table 5.** Analysis of Teacher Belief Questionnaire Results

| No | Questionnaire Statement | Aspect                                            | Percentage of total score divided by maximum score |
|----|-------------------------|---------------------------------------------------|----------------------------------------------------|
| 1  | Statement 1             | Technological Culture Produces Teaching Materials | 97%                                                |
| 2  | Statement 2             | Technological Culture Produces Teaching Materials | 91%                                                |
| 3  | Statement 3             | Technological Culture Produces Teaching Materials | 87%                                                |
| 4  | Statement 4             | Technological Culture Produces Teaching Materials | 94%                                                |
| 5  | Statement 5             | Technological Culture Produces Teaching Materials | 87%                                                |
| 6  | Statement 6             | Technological Culture Produces Teaching Materials | 89%                                                |
| 7  | Statement 7             | Benefits of Teaching Materials for Students       | 88%                                                |
| 8  | Statement 8             | Benefits of Teaching Materials for Students       | 87%                                                |
| 9  | Statement 9             | Benefits of Teaching Materials for Students       | 88%                                                |

The findings in Table 5 indicate that the percentage of the technological culture aspect in instructional material development reached 91%, while the perceived usefulness of instructional materials for students was 88%. These results suggest that teachers' beliefs toward technology—particularly the use of the Plotagon application in developing 3D instructional videos—fall within the high category.

**Table 6.** Analysis of Teacher Attitude Questionnaire Results

| No | Questionnaire Statement | Indicator | Percentage of total score divided by maximum score |
|----|-------------------------|-----------|----------------------------------------------------|
| 1  | Statement 1             | Attention | 98%                                                |
| 2  | Statement 2             | Attention | 97%                                                |

| No | Questionnaire Statement | Indicator     | Percentage of total score divided by maximum score |
|----|-------------------------|---------------|----------------------------------------------------|
| 3  | Statement 3             | Attention     | 94%                                                |
| 4  | Statement 4             | Attention     | 90%                                                |
| 5  | Statement 5             | Attention     | 91%                                                |
| 6  | Statement 6             | Participation | 88%                                                |
| 7  | Statement 7             | Participation | 86%                                                |
| 8  | Statement 8             | Attention     | 92%                                                |
| 9  | Statement 9             | Participation | 90%                                                |
| 10 | Statement 10            | Participation | 87%                                                |
| 11 | Statement 11            | Participation | 90%                                                |
| 12 | Statement 12            | Participation | 95%                                                |
| 13 | Statement 13            | Attention     | 90%                                                |
| 14 | Statement 14            | Attention     | 92%                                                |
| 15 | Statement 15            | Participation | 97%                                                |
| 16 | Statement 16            | Participation | 94%                                                |

The findings in Table 6 show that the indicator of attention reached 86% and the indicator of participation was also 86%. This confirms that teachers' levels of attention and participation in relation to technology—specifically during the training on using the Plotagon application for developing 3D instructional videos—were categorized as high.

Subsequently, interviews were conducted with three teachers. Below is a response from one of the participants during the interviews.

- Researcher* : To what extent do you consider technological culture as a mandatory competence for educators today?
- Teacher* : In my view, technological culture is not merely a competence but has become a necessity. Technology enables teachers to work more efficiently, for instance in preparing instructional materials, designing assessments, and managing administrative tasks. Moreover, technology opens opportunities for collaboration between educators and students, both locally and globally, which undoubtedly enriches the learning experience.

The results of the interviews indicate that educators perceive technological proficiency as an essential competency. Several educators also provided feedback regarding the training. A summary of their responses is presented in the following section.

- Researcher* : To what extent do you believe that technological culture in developing teaching materials can be trained and continuously improved?
- Teacher* : I believe that technological culture can be cultivated through hands-on practice in developing teaching materials. The more frequently teachers use technology, the more creative they become in designing interactive, engaging, and student-centered learning content. Thus, technological culture is not a static competence, but rather a skill that can be continuously sharpened over time.

Based on the findings obtained from both questionnaires and interviews, it can be concluded that teachers hold positive beliefs and attitudes toward the utilization of technology in developing 3D instructional videos. These findings are consistent with (Kerckaert et al., 2015; Palaiologou, 2016; Reinhold et al., 2021b), who reported that 94% of teachers considered the use of computers in mathematics learning as important (see also Kerckaert et al., 2015; Palaiologou, 2016; Reinhold et al., 2021b). Similar results were reported by Nasution et al. (2024), who found that teachers demonstrated positive beliefs and attitudes toward the use of technology in developing instructional materials through the ClassPoint application.

As previously noted, teachers' positive attitudes toward technology enable them to more readily integrate it into the learning process (Ardıç, 2021; Harisman et al., 2023; Nasution et al., 2024). Several studies have also highlighted that such attitudes significantly influence the development of teachers' technological pedagogical competence (Ardıç, 2021; Harisman et al., 2023).

#### 4. Conclusion

This study demonstrates that junior high school teachers in Sawahlunto City hold positive beliefs and attitudes toward the use of technology, particularly the Plotagon application, in developing 3D instructional videos. The questionnaire results indicate that the technological culture aspect in instructional material development reached 91%, while perceived benefits for students were 88%. Furthermore, indicators of teachers' attention and participation during the training were also categorized as high. These findings suggest that teachers' professionalism in utilizing digital technology has been well established, aligning with previous research that underscores the importance of technological proficiency in education.

Nevertheless, this study has limitations in terms of the number of participants (only 28 teachers from a single school) and its focus on a specific application, namely Plotagon. These constraints may affect the generalizability of the results to broader contexts, both in terms of population and the variety of educational technologies.

In terms of implications, the findings highlight the importance of continuous professional development for teachers to strengthen their capacity to integrate technology into teaching and learning. Local governments, schools, and higher education institutions may draw on these results as a basis for developing more systematic training programs, particularly in the use of 3D animation-based media and other digital applications aligned with curricular needs.

Future studies are recommended to involve larger sample sizes, include diverse schools and educational levels, and examine the effectiveness of various technological applications beyond Plotagon. Moreover, subsequent research could explore the direct impact of technology-based media on students' learning outcomes, thereby providing a more comprehensive understanding of the contribution of technological culture to education.

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