

# Analysis of Teaching Competence Science Teachers in Using Multimedia at Junior High School

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**Abstract.** This study aims to measure the professional competence of science teachers in using multimedia, particularly power point and learning applications. This research utilized a quantitative descriptive approach with a survey method. The study was conducted in six public junior high schools in the Tulang Bawang Tengah District, namely SMPN 6 Tulang Bawang Barat, SMPN 7 Tulang Bawang Barat, SMPN 8 Tulang Bawang Barat, SMPN 9 Tulang Bawang Barat, SMPN 11 Tulang Bawang Barat, and SMPN 12 Tulang Bawang Barat. The sample consisted of 19 science teachers from these schools. Data were collected through questionnaires and interviews with science teachers, as well as distributing questionnaires to students to support the research results for greater objectivity. The data obtained were analyzed using percentage formula for data analysis. The results of the study showed that the level of professional competence of science teachers in using multimedia is 69%. It can be conclude that science teacher have teaching competence in using multimedia at a high level.

## 1 Introduction

Education is important for every individual, which means that every individual has the right to get it and is expected to develop in it. Education is not only something that pursues a level or degree but with education can change the human mindset. Therefore, education personnel who are competent in their fields are needed, one of which is the teacher. According to the Law of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers. Teachers are professional educators whose main task is to educate, teach guide, direct, train, assess, and evaluate students in early childhood education in formal education, basic education, and secondary education. Being an educator is not an easy thing because it involves the life and fate of each individual for future life, therefore being an educator is not a light thing [1].

Having the ability to realize the performance of the teaching profession as well as possible in order to achieve their professional duties is a characteristic that exists in professional teachers, as stated in Law No. 14 of 2005, Chapter IV Article 20 (a) concerning Teachers and Lecturers in carrying out their professional duties teachers are obliged to plan, carry out the learning process, and assess and evaluate learning outcomes. The optimization of teachers'

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work must also be aligned with educational goals and integrated with school components, be it principals, teachers, employees or students [2]. Therefore, in realizing this, teachers must have teaching competence.

However, many teachers do not pay attention to the importance of teaching competence. The findings of research conducted on 275,768 teachers at the national level who tested initial competence obtained quite alarming results. With a predetermined score weight of 100, it turns out that the lowest score of the test results is 1, and the average score is 41.5. This is seen from the benchmarks determined in the standards of educators and education personnel, showing that teacher competence is still at a low level. Furthermore, in 2015 a teacher competency test was conducted which found that the average score of national teacher competence only reached a score of 56.69. The results of this competency test show differences in competency test results between teachers who have passed bachelor's degree and teachers who have not passed bachelor's degree. The findings showed that for kindergarten teachers, the average score was 59.65, elementary school teachers, whose data mostly did not meet bachelor's degree, had an average score of 54.33, junior high school teachers had an average score of 58.25, and high school teachers had an average score of 61.71. These scores are puzzling because teachers have been teaching in the classroom for years. If we refer to these scores alone, we get the impression that most teachers are not competent in carrying out their duties. In fact, competent teachers are the key to effective education [3].

Pedagogical competence encompasses the mastery of knowledge and skills inherent in a teacher's persona, crucial for the effective and responsible execution of their professional duties [4]. A proficient teacher possessing pedagogical competence plays a pivotal role in cultivating high-caliber students. The significance of teachers within the educational framework becomes evident in their ability to instigate transformative changes in students, particularly by igniting enthusiasm and fostering a keen interest in learning. Notably, teacher competence is multifaceted, comprising four key dimensions: pedagogical, professional, personal, and social. These dimensions encompass various components that educators must aptly grasp to fulfill their roles effectively [5]. Recognized as an indispensable attribute in educators, teaching competence assumes a central role in ensuring the smooth progression of the learning process and the attainment of predefined educational objectives.

Teacher competence is needed especially in the face of the current digital era. Technological advances at this time have a major influence on the world of education, especially during teaching and learning. Nowadays, the existence of teachers is no longer seen from their charisma alone. More than that, being a teacher today must be able to communicate and adapt to the times, therefore being a teacher today is different from the 20th century. Teachers in this era are required to be able to innovate and be creative as far as the development of the times [6]. One of the actions is that the teacher adjusts the learning model and method according to the students. With the right model and method can realize learning objectives. In the model and method, it is also necessary to have interesting learning media for students, what concerns researchers is using multimedia in learning.

Multimedia is a combination of various media. If multimedia is associated with the word learning, then it means learning that is designed by using various media simultaneously such as text, images (photos), movies (videos), and so on [7]. The use of multimedia in learning can foster students' interest in teaching and learning activities. If multimedia is present in the learning process, the teacher does not only lecture or use conventional methods that will make students bored and less interested in learning. Therefore, the presence of multimedia can help teachers realize good learning outcomes.

The many types of learning multimedia are expected that teachers can master one or all learning multimedia. One very common multimedia is the use of power point. Power point is software used to present learning. The other learning multimedia is learning applications.

Learning application is a program that has been created in such a way as to help teaching and learning activities better and more varied. Examples of learning applications are Google classroom, Edmodo, Quizziz, Phet and many others.

The arrival of learning multimedia that can improve the quality of learning outcomes requires teachers to master it. Therefore, researchers want to measure how high teaching competence is in the use of learning multimedia, especially in the use of power point and learning applications.

This research has been conducted by Nur Halisah, but what distinguishes this research from the previous one is the variable measured in the research. Previous research examined how teacher competence utilizes ICT in learning. This study aims to determine the level of teaching competence of science teachers in the use of multimedia, especially Power Point and learning applications at SMPN Tulang Bawang Tengah District.

## 2 Methods

The approach used in this research is a quantitative approach with a descriptive type. The method used is a survey using questionnaire and interview instruments. The participants in this research comprised science educators from public junior high schools located within the Central Tulang Bawang District, specifically SMPN 6 Tulang Bawang Barat, SMPN 7 Tulang Bawang Barat, SMPN 8 Tulang Bawang Barat, SMPN 9 Tulang Bawang Barat, SMPN 11 Tulang Bawang Barat, and SMPN 12 Tulang Bawang Barat, constituting a total of 19 teachers.

This study used a questionnaire instrument totaling 20 statement items given to the teacher. The instrument was also given to the teacher's students totaling 14 statement items to support primary data to make the research more objective. The questionnaire has been validated by three lecturers and further tested using the SPSS application and obtained the results that the questionnaire can be said to be valid, reliable, normal, and homogeneous.

The validity test in this study was carried out in two stages using the product moment formula, namely the validity test of the science teacher teaching competence questionnaire in the use of multimedia and the validity test of the student perception questionnaire to the science teacher in the use of multimedia. The rtable value for 0.05 (5%) significance so that the questionnaire to the science teacher for 19 samples is 0.456, while the rtable for 0.05 (5%) significance so that the student perception questionnaire for 331 samples is 0.113.

The reliability test uses the Alfa Cronbach test, this test is said to be reliable if the Alfa Cronbach reliability coefficient is more than 0.700 ( $r_i > 0.700$ ) the Alfa Cronbach reliability coefficient, cannot be more than 0.900 ( $r_i < 0.900$ ) [8]. The reliability test conducted on the questionnaire of teaching competence of science teachers in the use of learning multimedia totaling 20 statements resulted in an Alpha Cronbach reliability coefficient of 0.890, it can be concluded that the questionnaire is reliable. The reliability test conducted on the questionnaire of student perceptions of science teachers in the use of learning multimedia resulted in an Alpha Cronbach coefficient of 0.749, so it can be concluded that the questionnaire is reliable.

The normality test uses the Kolmogorov-Smirnov test, the decision-making guidelines in this test are:[9]

- Significance value or probability value  $> 0.05$  then the distribution is normal
- Significance value or probability value  $< 0.05$  then the distribution is abnormal

The Kolmogorov-Smirnov test results on the questionnaire given to science teachers amounted to 0.200, while the questionnaire given to students amounted to 0.54. The results of the calculation of the two questionnaires show a significance value  $> 0.05$ , so it can be concluded that the two questionnaires are normally distributed.

The homogeneity test uses the Levene test as a test criterion, if the significance value is more than 0.05, it can be said that the variance of two or more data groups is homogeneous. The results of the calculation of the two questionnaires are getting a significance value of 0.255 for the teacher questionnaire and a significance value of 0.716 for the student questionnaire. Therefore, it can be said that the two questionnaires taken from several different groups in this study are homogeneous.

Hypothesis testing in this study uses a one tail test with the left side test type. The hypothesis in this study is as follows:

Ho:  $\mu \geq 60\%$ , the level of teaching competence of science teachers in the use of multimedia is greater than or equal to 60%

Ha :  $\mu < 60\%$ , the level of teaching competence of science teachers in the use of multimedia is less than 60%.

If Tcount is greater than Ttable then Ho can be accepted, otherwise if Tcount is smaller than Ttable then Ho is rejected. The table for 19 samples at 5% significance (0.05) is 1.729 [10]. The results of this research hypothesis test get Tcount of 6.238, thus it can be concluded that Tcount > Ttable, so Ho in this study is accepted.

The data analysis technique in this study uses percentage analysis techniques for quantitative descriptive analysis using simple tables simply using the percentage formula [11], namely:

$$P = \frac{f}{n} \times 100\%$$

Description:

P : percentage

f : number of frequencies

n : number of respondents

**Table 1.** Category level of teaching competence in the use of multimedia

Percentage Range	Categories
80-100%	Very High
60-79,9%	High
40-59,9%	Medium
20-39,9%	Low
0-19,9%	Very Low

## 3 Research result and discussion

### 3.1 Tadabur alam learning model

The results of statistical analysis related to the questionnaire show the variable score of science teacher competence in using multimedia learning. The way to describe the data in this study is to use the technique of making tables and frequency distributions. The frequency distribution shows the number and number of items of each indicator so that the measurement is analyzed through statistical methods and then given a qualitative interpretation. The frequency distribution table and the percentage of competence of each indicator on science teachers in the use of learning multimedia are as follows:

**Table 2.** Analysis of indicators of mastering the material, structure, concepts, and scientific mindset that support science subjects related to multimedia

No	Respondent's Answer	Frequency (F)	Percentage(%)
1	Always	18	26%
2	Often	33	38%
3	Sometimes	41	35%
4	Rarely	3	2%
5	Never	0	0%
Total		95	100%
Average Percentages			74%

Based on the table above, it can be stated that the results of the questionnaire on the indicator of mastering the material, structure, concepts, and scientific mindset that supports science subjects related to multimedia amounted to 5 questions with a total frequency of 95, 18 frequencies answered always with a percentage of 26%, 33 frequencies answered often with a percentage of 38%, 41 frequencies answered sometimes with a percentage of 35%, 3 frequencies answered rarely with a percentage of 2%, and 0 frequencies answered never with a percentage of 0%. So it can be concluded that this indicator is at a high average percentage level of 74%.

**Table 3.** Analysis of indicators of mastering competency standards and basic competencies of science subjects

No	Respondent's Answer	Frequency (F)	Percentage(%)
1	Always	5	11%
2	Often	48	84%
3	Sometimes	4	5%
4	Rarely	0	0%
5	Never	0	0%
Total		57	100%
Average Percentages			80%

Based on the table above, it can be stated that the results of the questionnaire on the indicator of mastering the competency standards and basic competencies of science subjects amounted to 3 questions with a total frequency of 57, 5 frequencies answered always with a percentage of 11%, 48 frequencies answered often with a percentage of 84%, 4 frequencies answered sometimes with a percentage of 5%, 0 frequencies answered rarely with a percentage of 0%, and 0 frequencies answered never with a percentage of 0%. So it can be concluded that this indicator is at a very high average percentage level of 80%.

**Table 4.** Analysis of indicators of developing learning materials that are taught creatively using multimedia assistance

No	Respondent's Answer	Frequency (F)	Percentage(%)
1	Always	1	1%
2	Often	25	30%
3	Sometimes	57	51%
4	Rarely	31	18%
5	Never	0	0%
Total		114	100%
Average Percentages			59%

Utilizing the presented table, it is discerned that the outcomes of the survey pertaining to the development of creatively delivered learning materials aided by multimedia tools

encompass six queries. The cumulative frequency of responses amounts to 114, wherein one instance indicated a consistent response, constituting 1% of the total, 25 responses indicated frequent occurrence, accounting for 30%, 57 responses denoted occasional instances, representing 51%, 31 responses conveyed infrequent instances, comprising 18%, and there were no instances of respondents indicating a never response, constituting 0%. Consequently, the analysis reveals that this particular indicator registers a modest level, with an average percentage of 59%.

**Table 5.** Analysis of indicators of developing professionalism in a sustainable manner by taking reflective action

No	Respondent's Answer	Frequency (F)	Percentage(%)
1	Always	8	14%
2	Often	46	64%
3	Sometimes	20	21%
4	Rarely	2	1%
5	Never	0	0%
Total		76	100%
Average Percentages			76%

Based on the table above, it can be stated that the results of the questionnaire on the indicator of developing professionalism on an ongoing basis by taking reflective action amounted to 4 questions with a total frequency of 76, there were 8 frequencies answering always with a percentage of 14%, 46 frequencies answering often with a percentage of 64%, 20 frequencies answering sometimes with a percentage of 21%, 2 frequencies answering rarely with a percentage of 10%, and 0 frequencies answering never with a percentage of 0%. So, it can be concluded that this indicator is at a high level average percentage of 76%.

**Table 6.** Analysis of indicators of utilizing information and communication technology to develop themselves using multimedia

No	Respondent's Answer	Frequency (F)	Percentage (%)
1	Always	0	0%
2	Often	9	32%
3	Sometimes	20	53%
4	Rarely	9	16%
5	Never	0	0%
Total		36	100%
Average Percentages			60%

Based on the table above, it can be stated that the results of the questionnaire on the indicator of utilizing Information and Communication Technology to develop themselves using multimedia amounted to 2 questions with a total frequency of 38 there were 0 frequencies answering always with a percentage of 0%, 9 frequencies answering often with a percentage of 32%, 20 frequencies answering sometimes with a percentage of 53%, 9 frequencies answering rarely with a percentage of 16%, and 0 frequencies answering never with a percentage of 0%. So it can be concluded that this indicator is at a high average percentage level of 60%.

**Table 7.** The overall total indicator of the questionnaire of teaching competence of science teachers in the use of multimedia

No	Respondent's Answer	Frequency (F)	Percentage(%)
1	Always	32	12%
2	Often	161	49%
3	Sometimes	142	32%
4	Rarely	45	7%
5	Never	0	0%
Total		380	100%
Average Percentages			69%

Based on the table above, it can be stated that the results of the questionnaire on the total overall indicator of teaching competence of science teachers in the use of learning multimedia amounted to 20 questions with a total frequency of 380, there were 32 frequencies answering always with a percentage of 12%, 161 frequencies answering often with a percentage of 49%, 142 frequencies answering sometimes with a percentage of 32%, 45 frequencies answering rarely with a percentage of 7%, and 0 frequencies answering never with a percentage of 0%. So, it can be concluded that this indicator is at a high average percentage level of 69%.

To support the primary data, the questionnaire of students' perceptions of science teachers was analyzed. The results of statistical analysis related to the questionnaire show the variable scores of students' perceptions of science teachers in the use of multimedia learning. The frequency distribution table and the percentage of the calculation results of all indicators in this questionnaire are as follows:

**Table 8.** Overall total indicators of student perception questionnaires to science teachers in the use of multimedia

No	Respondent's Answer	Frequency (F)	Percentage(%)
1	Always	648	23%
2	Often	935	26%
3	Sometimes	1573	33%
4	Rarely	1021	14%
5	Never	457	3%
Total		4634	100%
Average Percentages			61%

Based on the table above, it can be stated that the results of the questionnaire on the total of all indicators of student perceptions of science teachers in the use of learning multimedia amounted to 14 questions with a total frequency of 4,634, there were 648 frequencies answering always with a percentage of 23%, 935 frequencies answering often with a percentage of 26%, 1,573 frequencies answering sometimes with a percentage of 33%, 1,021 frequencies answering rarely with a percentage of 14%, and 457 frequencies answering never with a percentage of 3%. So, it can be concluded that this indicator is at a high level average percentage of 61%.

After the questionnaire data is generated, the researchers follow up by taking data by means of interviews to be more objective. The results of the interviews were analyzed and it can be concluded that the respondents understand the importance of using multimedia in learning, by using multimedia students more quickly capture the material, but because if using multimedia in the form of power point requires a rather long preparation, that is why there are some respondents who rarely use it. Respondents more often use multimedia in the laboratory because it is more practical. For multimedia learning applications, there are still many teachers who do not use it and do not even understand how to use it. The observed phenomenon can be attributed to the demographic characteristics of the participants,

predominantly aged 45 years and older. Consequently, educators encounter challenges in adapting to modern technological tools, particularly learning applications on smartphones. Furthermore, the limited integration of learning applications in the educational context stems from institutional policies, with some schools restricting students from bringing smartphones to the premises.

On the indicator of mastering the material, structure, concepts, and scientific mindset that supports science subjects related to multimedia, science teachers are in the high category. Almost all teachers must understand and master material related to learning, teachers also apply concepts, laws, and teachers are able to design science experiments if there is material that requires experiments that are usually carried out in the laboratory of each school. However, to explain various natural phenomena with the help of multimedia and explain the application of science laws in technology in everyday life with multimedia learning teachers are still rarely applied due to constraints on the tools and understanding of each teacher.

In the indicator of mastering the competency standards and basic competencies of science subjects, teachers are at a high level because almost all teachers understand the competency standards, basic competencies, and learning objectives they teach. In this indicator a teacher must understand it because the milestone of learning objectives achieved is that the teacher is able to understand the competency standards, basic competencies, and learning objectives.

In the indicator of developing learning materials that are taught creatively using multimedia assistance is at a low level. This is due to the lack of tools and understanding of each teacher regarding multimedia, especially power point and learning applications. From the results of the study it can be seen that using power point makes it easier to explain but requires considerable preparation such as before learning it can cut learning time. As for learning applications, there are many teachers who do not recognize various existing learning applications such as google classroom, edmodo, quiz, and many others. this happens because the age factor makes the lack of technology literacy related to this learning application and there are also several schools that prohibit students from bringing smartphones to school, therefore teachers rarely use learning applications.

The indicator of developing professionalism sustainably by taking reflective action is at a high level because every teacher always reflects on themselves, students, and learning outcomes. Teachers utilize the results of self-reflection to improve professionalism.

On the indicator of utilizing information and communication technology to develop themselves by using multimedia is at a high level. Teachers utilize information and communication technology to communicate with students, teachers also utilize information and communication technology for self-development activities, for example, they use smartphones to search for material they do not understand before learning.

This study also distributed questionnaires to students taught by science teachers regarding how students perceive science teachers in the use of learning multimedia from the overall results of questionnaire data given to students that teaching competence in the use of multimedia for science teachers in Central Tulang Bawang District is at a high level. However, in the indicator students assess the frequency of using learning multimedia with low results because there are some science teachers who rarely use power points and learning applications, but more often use other multimedia, for example tools in the laboratory. In the attitude indicator and the benefits felt by students are at a high level because they prefer to use learning multimedia because it is easier to understand and interesting

## **4 Conclusions**

Based on the research findings regarding the professional competency of science teachers in employing multimedia tools, specifically focusing on the use of PowerPoint and educational applications, in six State Junior High Schools located in the Central Tulang Bawang District

of West Tulang Bawang Regency, it can be inferred that the teaching proficiency of science educators in multimedia application is rated high, amounting to 69%. This conclusion is drawn from a combination of quantitative analysis of questionnaires and qualitative insights obtained through teacher interviews. Additionally, student feedback, collected through distributed questionnaires, further supports and triangulates the study's outcomes.

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