Validity of Technological Pedagogical Content Knowledge (TPACK) Instruments in Learning Media for Science and Biology Teachers

Nevrita[1*], Elfa Oprasmani[2], Dios Sarkity[3]
{nevrita@umrah.ac.id[1], elfaoprasmani@umrah.ac.id[2], diossarkity@umrah.ac.id[2]}

[1, 2, 3] Biology Education Department, Universitas Maritim Raja Ali Haji, Tanjungpinang, Indonesia

Abstract. Instruments have an important role in measuring the ability of teachers to use technology in learning media. One of them is by using the Technological Pedagogical Content Knowledge (TPACK) instrument for learning media. However, the TPACK instrument for learning media is still very limited. For this reason, researchers are encouraged to develop a TPACK instrument for learning media so that can be measured the TPACK ability of teacher's learning media. This study aims to describe the result validity of the TPACK instrument of learning media for the science teacher. The type of research used is quantitative descriptive research. The validation test was carried out by content validation (Expert Judgment) assessment. Validation in this research by 4 expert validators who were lecturers of the Biology Education Department and science teachers in Tanjungpinang City. The results of the validation of the TPACK instrument of learning media showed that overall validity value of 93,75 % in the valid category.

Keywords: Learning Media, TPACK, Validity

1 Introduction

Teachers also have an important role in changing the behavior and attitudes of participants for the better. Apart from being teacher educators, they must also be able to become teachers, mentors, and assessors and conduct periodic and ongoing evaluations of their knowledge. In the learning process, the teacher has an important role in developing learning media. This is because, without learning media, the subject matter will be difficult to digest for students, especially abstract material. With the existence of learning media, learning materials will be delivered effectively and efficiently..

In this digital era, the learning media used by teachers need to be integrated with technology. So teachers must be able to improve their ability to carry out student-centered education and be supported by technology. Teachers must have appropriate knowledge of pedagogy, content, and technology. The importance of integrating technology in education will help students to learn and teachers to carry out the teaching profession more effectively [1]. This requires teachers to master various competencies in the selection and development of learning media, to facilitate teachers and students in achieving learning objectives.

One of the competencies that professional teachers need to master in the selection and development of learning media is the TPACK (Technological Pedagogical and Content

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Knowledge) competency. If teachers can master TPACK in their learning media, then student learning outcomes are expected to be better and the quality of education can be improved [2].

TPACK is a framework for designing new learning models by combining three aspects, namely technology, pedagogy, and content. This is because technology cannot be separated from human life, including education, so teachers must be able to use technology in classroom learning. TPACK can be the basis for developing effective learning media in teaching a material [3]. TPACK can also make students more active in following lessons in class. Learning is more meaningful if the three main elements of knowledge, namely technology, pedagogy, and content, are interconnected and applied according to the context [4]. Teachers' TPACK competencies in learning media need to be measured to determine the quality of learning media related to pedagogy, content, and technology.

Several studies have been carried out by researchers, especially on science teachers and biology teachers in Tanjungpinang City. Based on the results of previous research in 2020 it was found that teachers in Tanjungpinang City already had good abilities even though the technology used by teachers was still simple technology. In previous research, researchers still use the TPACK instrument developed by other researchers so it is not in accordance with the conditions of education in the city of Tanjungpinang. For this reason, it is necessary to develop a learning media TPACK instrument that is in accordance with the characteristics of teachers in the Riau Islands, especially junior high school science teachers and biology teachers in Riau Islands.

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2 Research Methods

The type of research used is quantitative descriptive research. The validation test was carried out by content validation (Expert Judgment) assessment. The data collected for quantitative analysis in this study included the validity of the content on the TPACK instrument of learning media using a questionnaire. The content validity was seen in terms of relevance, representation, specification, and clarity of the measurement instrument. Validation in this research by 4 expert validators who were lecturers of the Biology Education Department and science teachers in Tanjungpinang City. They gave their assessment by filling in the validation instrument. Validation analysis using the formula by Purwanto [5]:

$$NP = \frac{R}{SM} \times 100\%$$

Description:
NP : The value of the percent sought
R : The score obtained
SM : Maximum score

Table 1. Validity Category

No	Validation Value (%)	Category
1	86-100	Very Valid
2	76-85	Valid
3	60-75	Enough Valid
4	55-59	Less Valid
5	0-54	Not Valid

3. Result and Discussion

The researcher determines the aspects to be measured in the developed learning media TPACK instrument. These aspects refer to the research conducted by Mishra Kohler. Based on the results of needs analysis and literature study, 7 aspects were obtained which were developed into TPACK instruments for learning media for science and biology teachers, including Technological Knowledge, Pedagogical Knowledge, Content Knowledge, Pedagogical Content Knowledge, Technological Content Knowledge, Technological Pedagogical Knowledge, and Technological Pedagogical Content. Knowledge. an elaboration of the aspects that have been obtained at the design stage is carried out. So 29 items of statements on the TPACK instrument of learning media were obtained. which is further validated by expert validators. Based on the results of the validation obtained data in Table 2.

Table 2. Validation of Instrument

No	Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Validator 4 (%)	Average (%)	Category
1	Relevance	75	100	100	100	93,75	Very Valid
2	Representation	91,75	83,25	100	100	93,75	Very Valid
3	Specification	87,5	100	100	87,5	93,75	Very Valid
4	Clarity of measuring instruments	93,75	100	100	81,25	93,75	Very Valid

Based on the validation data of the learning media TPACK instrument, it showed that the instrument obtained an average of 93.75% with a very valid category.

Based on the results of the research obtained, it is known that the learning media TPACK instrument for science and biology teachers in Tanjungpinang City that was developed has been very valid according to content validation (expert judgment) with an average validation score of 93.75%. This shows that the TPACK instrument is relevant for measuring the TPACK ability of teacher learning media, has been representative of describing the TPACK concept in a logical order, has good specifications with a standard format for collecting facts, and has a clear measuring instrument with linguistic accuracy. This means that the developed instrument is representative of describing the concept to be measured. Content validity is very important in the development of all types of instruments, because from content validation it is known whether the test items/items reflect the concept being measured or not [5]. If not, then the content of the item/item must be modified or revised.

Even though it has a very valid category, there are several things that need to be revised according to the suggestions given by the validator. This is done to produce a better test instrument. Content/content validity is the validity determined by experts who are experts in their fields, namely from experts the decision is taken to revise the instrument content for clarity, truth, and relevance and decide to what extent the items reflect the content domain [5].

After conducting content validation, the next stage is implementation and evaluation to obtain empirical validity and reliability of the developed instrument. This needs to be done to obtain a good instrument before being used in further research. After developing a test instrument, it is necessary to analyze the quality and feasibility of the instrument through instrument analysis [6]. One of the purposes of instrument analysis is to determine the value of the validity and reliability of the instrument.

4. Conclusion

The learning media TPACK instrument for science and biology teachers in Tanjungpinang City that was developed has been very valid according to content validation (expert judgment) with an average validation score of 93.75%. Even though it has a very valid category, there are several things that need to be revised according to the suggestions given by the validator. This is done to produce a better test instrument. After conducting content validation, the next stage is implementation and evaluation to obtain empirical validity and reliability of the developed instrument. This needs to be done to obtain a good instrument before being used in further research.

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