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Understanding Teacher Candidate Students' Level of TPACK Mastery In Learning That Applies to Ethnosciencetech-Oriented Lecture Programs

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Abstract.
The development of the Ethnosciencetech-Oriented Lecture Program is motivated by the importance of mastering TPACK by prospective teacher students so that they can teach effectively with technology and also integrate ethnoscience into learning. This study aims to describe the skills gained by prospective teachers while mastering TPACK. The results show that they experience a growth of knowledge in each stage, starting from perception to conception and finally to action. Students in the conception category know the conceptual relationship between Content Knowledge (including ethnoscience), Pedagogical Knowledge, and Technological Knowledge. Students in the action category know the goals of Content Knowledge (including ethnoscience), Pedagogical Knowledge, and Technological Knowledge.

Keywords: Ethnosciencetech,TPACK, Teacher Candidate

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1. Introduction

Indonesian cultural diversity can be promoted as an excellent education program through a learning with the theme of ethnoscience with a purpose to strengthen students' identity and characters, and to master the concept/knowledge related to such culture. For this reason, we need an educational breakthrough combining culture with science, or ethnoscience.The ability of teachers to combine original and scientific knowledge is needed in applying science learning with an ethnoscience approach (1). Ethnoscience is an exercise of transforming between indigenous science consisting of all knowledge community aspects that comes from the beliefs handed down from generation to generation and carries myths. Ethnoscience is a knowledge that can be achieved by way of observing cultural wisdom of a nation/community. According

to Baynes & Austin, incorporating cultural knowledge into school curriculum may be useful in maintaining people's identity of a nation (2). Integrating culture into scientific learning (ethnoscience) determines the importance of professional services for teachers/teachers canditate. Therefore, teachers/teachers canditate must be able to understand cultural elements so that they can be incorporated into their learning (3). One of the competencies that teacher-candidate students must possess is mastering the integration of technology, pedagogy, scientific content and/or expertise. Teachers need an understanding of conceptual representation using technology. Meanwhile, pedagogical techniques that constructively use technology to teach content; knowledge of what makes a concept difficult or easy to learn.

Consequently, knowledge of technology, pedagogy, and content must be an integral part of teacher education programs to prepare prospective teachers to teach using technology. This is a logical consequence that teachers must also have 21st century skills to facilitate students to have 21st century skills, which emphasize cooperation skills, creativity, critical thinking, problem solving and especially technology skills (4). The development of learning by integrating technology makes a significant contribution to the level of pedagogical practice for students(5). Good teaching with technology requires at least three components of knowledge, namely Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK) and the relationship between these components (6). The three are interconnected to form Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical and Content Knowledge (TPACK). Furthermore, Koehler explained that TPACK represents a collection of knowledge needed by teachers to teach effectively with technology.

Considering the description above, it is necessary to implement an Ethnoscience-Oriented Lecture Program, namely learning science/physics integrated with culture/local wisdom by utilizing technology. The development of the Ethnosciencetech-Oriented Lecture Program is motivated by the importance of mastering TPACK by prospective teacher students so that they can teach effectively with technology and also integrate ethnoscience into learning. Increasing mastery of TPACK is gaining the knowledge and skills needed to form professional teachers. Ethnosciencetech-Oriented Lecture Program has the characteristics: a) learning involves students actively in learning activities to increase TPACK; b) learning materials are presented so that students learn about ethnoscience, technology, TPACK, and develop ethnoscience-oriented learning tools within the TPACK framework; c) learning provides peer teaching activities to implement ethnoscience and technology-oriented learning tools within the TPACK framework.

Based on this background, this study has the following objectives to describe the profile of teacher can did a testudent TPACK mastery in learning that applies Ethnosciencetech-Oriented Lecture Program.

2. Method

The type of this research used is descriptive qualitative. The subjects in this study were 18 prospective teacher students who took the Intership 2 course. The research subjects were students of the Physics Education Study Program FPMIPATI UPGRIS. The required data were obtained using instruments in the form of lesson plan assessment sheets and TPACK component assessment sheets based on lesson plan prepared by students.Analysis of the results of the assessment of the TPACK component in the lesson plan prepared by students and learning practices were carried out to see the profile of students' TPACK mastery. The student TPACK description is determined based on indicators in determining the level of the TPACK component which was adapted from Srisawasdi (7) and categorized into 4 levels, namely:

1) Nn (Non-Perception Level): has no perception of TPACK.

2) Pn (Perception Level): has a perception towards TPACK alignment.

3) Cn (Conception Level): can reveal the relationship of knowledge content, pedagogy, and technology.

4) An (Action Level): can reveal content, pedagogy, and technology's relevance and purpose in classroom learning practices.

3. Result and Discussion

3.1. Presenting the Results

Technological Pedagogical Content Knowledge (TPACK) analysis needs to be done in order to understand the level of student knowledge in integrating technology in PPBE learning. The research was conducted forgetting a profile of the level of mastery of TPACK students for physics teacher candidates. The categories for the six components of TPACK (CK, PK, TK, PCK, TPK, and TCK) are Perception (Pn) and Conception (Cn). The assessment results of student TPACK categorization are carried out after the other 6 TPACK components are categorized first. The results of the assessment of the TPACK component in the lesson plan prepared by students can be seen in Table 1.

Table 1: The results of the assessment of the TPACK component.

	Code	CategoryTPACK		Progress
No		Beginning	End	
1	K1-1	perception	conception	Konsepsi
2	K1-2	perception	konsepsi	Konsepsi
3	K1-3	perception	konsepsi	Konsepsi
4	K1-4	action	action	action
5	K1-5	konsepsi	conception	conception
6	K1-6	persepsi	conception	conception
7	K1-7	konsepsi	conception	conception
8	K1-8	konsepsi	conception	conception
9	K1-9	conception	conception	conception
10	K1-10	conception	conception	conception
11	K1-11	conception	conception	conception
12	K1-12	conception	conception	conception
13	K1-13	conception	conception	conception
14	K1-14	conception	conception	conception
15	K1-15	conception	conception	conception
16	K1-16	perception	action	action
17	K1-17	perception	action	action
18	K1-18	action	action	action
TotalPn		5	0	
TotalCn		11	14	
TotalAn		2	4	

Based on the results presented in Table1, there were 14 students in the conception category, and 4 students in the action category. There are 100% students reach the category of conception or action.Specifically, students have had a higher transformation of knowledge. 5 students experience a change or increase in the category from perception to conception. There are 2 students who since the preparation of the initial lesson plan have achieved action, and have remained consistent in the final lesson plan. Based on the TPACK category, 61.1% of students reached the concept of conception in the TCK component. This shows that students can use certain technologies that can explore content disciplines (including ethnoscience), which are reflected in the prepared lesson plans. In the PCK component, 77.8% of students reached the conception category. This shows that students can build interactive activities between students in the classroom using certain learning models and methods according to the content, including using ethno-science and technology-oriented learning which is reflected in the prepared lesson plans. In the TPK component, 72.2% of students reached the conception category. This shows that students can use several technologies to explain

some content (including ethnoscience) in a structured teaching method reflected in the prepared lesson plans.

3.2. Create a Discussion

In order to develop mastery of TPACK at the conception or action level, students produced conceptions in PCK, TPK, and TCK and the number of students who experienced an increase in the conception category also increased. Students in the perception category in the preparation of the initial lesson plan have a perception towards the alignment of the TPACK components. They canidentify content difficulties, feel the need for content transformation and be able to identify teaching methods that are appropriate to the use of technology. However, students have not been able to explain the use of technology to change content and support student learning processes. However, at the time of drafting the final lesson plans, they experienced a transformation of knowledge from the category of perception to conception, meaning they could reveal the conceptual relationship between CK (ethnoscience), PK, and TK. They can change the content with the support of the right technology. They can show the right representation to provide content knowledge changes in certain technology-based interactive learning processes. Students who fall into the action category can reveal the conceptual and goal relationships between CK, PK, and TK, followed up in class during learning practices.

Teachers/prospective teachers in carrying out learning in the classroom are influenced by their TPACK (7). The results of this study support this opinion. This can be seen in the students' TPACK achievements during learning practices. Students consistently implement the lesson plans prepared when carrying out learning practices. Students in the action category based on the prepared lesson plans are able to show the action category as well as during the learning practice. Students in the perception/conception category based on the compiled lesson plans show the perception or conception category as well as during the learning practice. This is in line with the opinion of Harris and Hofer which states the way a teacher/prospective teacher teachesin the classroom can be reflected in the preparation of lesson plans that have been prepared previously (8). In implementing Ethnosciencetech-Oriented Lecture Program, students develop TK on the use of ppt, and learning videos. They also develop PK on the use of learning models (eg problem based learning). They developed a CK on understanding the importance of integrating ethnoscience in learning. They developed a PCK about choosing a suitable learning model. They developed a TPK on using technology to

engage students. They develop TPK on the use of appropriate technology for the subject matter, and use technology to access information. They developed TPACK on the use of appropriate technology to facilitate students in learning the material using suitable learning models.

4. Conclusion

The TPACK profile of students in PBE class shows that students experience the transformation of TPACK knowledge from perception to conception or action. Students experience the transformation of knowledge into conceptual categories, meaning they can express the conceptual relationship between CK (ethnoscience), PK, and TK. Content can be changed with the support of the right technology and the proper representation to provide changes in content knowledge in the interactive teaching process based on specific technologies. Students in the action category, they can express the conceptual relationship and goals between CK, PK, and TK which will be followed up in class

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