Profile of Students’ Technological Content Knowledge in School Mathematics

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Abstract: This study aims to find out the technological content knowledge profile of Mathematics Education Students of Teacher Training and Education Faculty, Universitas Muhammadiyah Sukabumi who have completed courses in Mathematics Capita Selecta III. The research method used is descriptive with quantitative approach. Data is collected by survey method, using a questionnaire instrument whose statement is based on the component of technological content knowledge. The results showed that students’ technological content knowledge was in a good category with an means 3.52 which means that students of Mathematics Education understood how to integrate technology and material in learning school mathematics.

1. Introduction
Mathematics Capita Selecta addresses essential mathematical topics at school or school mathematics. It is necessary to develop the ability of students to be able to master and teach material in preparation for prospective mathematics educators. One of them is the ability to present abstract mathematical concepts in a form that is simpler and easier to understand. The abstract of the study object that makes it difficult for students to learn can be reduced by the help of technology. Technology can bring abstract thinking to the real world[12].

Technological developments require lecturers or teachers to be all digital, as stated by Ministry of Research, Technology and Higher Education that "digital learning in the era of industrial revolution 4.0 requires the use of information technology to improve the quality of education", this is in line with learning outcomes for graduates of the undergraduate level namely "able to apply their fields of expertise and utilize science and technology in solving problems and being able to adapt to the situation at hand". In this case there must be integration between technology and material, another term is technological content knowledge (TCK), so that the competencies (computer science) of students are sought to exceed the minimum standards of SN-DIKTI. TCK is included in understanding technology and subject matter that can help and influence other components[12].

In this study, the implementation of learning that discusses school mathematics materials, students use mathematics applications/software to help explain the concepts taught (how to teach them), so students integrate the materials and technology or vice versa.
2. Methods
The research method used is descriptive research with quantitative approach. This study describes the conditions that occur as they are, and measures the components studied in the form of numbers. Data was taken using survey method by giving questionnaires to students of Mathematics Education FKIP UMMI in the fourth semester who contracted the subject of mathematics capita selecta III as many as 23 students.

3. Result and Discussion
The results of questionnaire data analysis given to students included 3 aspects, namely content knowledge and technological knowledge as supporting aspects, and technological content knowledge as the main aspect studied in this study. The statements in the questionnaire were adopted and adapted to aspects of the TCK[2,10]. The statements developed on the questionnaire consisted of 23 items. The following results are obtained:

| TCK Aspects                | Means | Percentage | Criteria |
|---------------------------|-------|------------|----------|
| Content Knowledge         | 3.38  | 67.51      | Good     |
| Technological Knowledge   | 3.58  | 71.55      | Good     |
| Technological Content Knowledge | 3.52  | 70.48      | Good     |

Based on table 1. The average of students’ TCK ability in learning school mathematics is in good category, with 3.52 means score, even though the highest means score was obtained on the Technological Knowledge aspect, that was 3.58. The followings are the results of the analysis of each aspect of the TCK, the results are as follows:

| No   | Statements                                                                 | Mean | Percentage | Category |
|------|-----------------------------------------------------------------------------|------|------------|----------|
| 1    | Understand mathematical concepts and theories and their application         | 3.62 | 72.38      | Good     |
| 2    | Know the history of mathematical material                                   | 3.24 | 64.76      | Good     |
| 3    | Know the relation between mathematical material and Imtaq value             | 3.48 | 69.52      | Good     |
| 4    | Conducting mathematical experiments for learning or research                | 2.67 | 53.33      | Fair     |
| 5    | Using the latest references to increase mathematical science                | 3.52 | 70.48      | Good     |
| 6    | Mapping school mathematics material in accordance with curriculum standards| 3.67 | 73.33      | Good     |
| 7    | Determine the scope of school mathematics material concepts                 | 3.67 | 73.33      | Good     |
| 8    | Planning a sequence of mathematical concepts in learning                    | 3.43 | 68.57      | Good     |
| 9    | Delivering practical school mathematics material                            | 3.10 | 61.90      | Good     |
| **Means** | **3.38**                      | **67.51** | **Good**  |

From table 2. It is known that the ability of students’ content knowledge is in a good category with the means score 3.38. It shows that students are good at understanding the material. From table 2 it is also known that the statement with low average score is the activity of conducting mathematical experiments for learning purposes, this is in accordance with the observations made during the lecture that the research activities carried out by students still have to be improved. The highest average in the aspect of
content knowledge is in the statement of mapping school material according to curriculum standards and determining the scope of the school mathematics material concept, this shows that students are good at reviewing school mathematics material.

| No. | Statements                                                                 | Mean  | Percentage | Category |
|-----|-----------------------------------------------------------------------------|-------|------------|----------|
| 1   | Keep abreast of the latest technology                                       | 3.76  | 75.24      | Good     |
| 2   | Knowing how to solve technical problems on a computer                       | 3.00  | 60.00      | Good     |
| 3   | Understand basic computer components                                        | 3.19  | 63.81      | Good     |
| 4   | Proficient in using printers, scanners, projectors, and digital cameras     | 3.57  | 71.43      | Good     |
| 5   | Able to overcome problems related to connections                            | 3.19  | 63.81      | Good     |
| 6   | Using the internet as a communication medium                                 | 4.48  | 89.52      | Very Good|
| 7   | Follow various software developments, download and install the programs     | 3.43  | 68.57      | Good     |
| 8   | Store data on digital media                                                  | 4.00  | 80.00      | Very Good|
|     | **Means**                                                                   | **3.58** | **71.55** | **Good** |

From table 3. It is known that students’ technological knowledge capabilities are in a good category with an means score 3.58. It demonstrates that the ability of students in technology is good. From table 3, it is also known that the statement with a high average is the activity of using the internet as a communication medium, this shows that students are good at utilizing the media to assist learning.

Table 4. Analysis of Technological Content Knowledge Aspects

| No. | Statements                                                                 | Mean  | Percentage | Category |
|-----|-----------------------------------------------------------------------------|-------|------------|----------|
| 1   | I know technology that can be used to understand and work on mathematics    | 3.71  | 74.29      | Good     |
| 2   | Use technology to help understand mathematical concepts and theories        | 3.62  | 72.38      | Good     |
| 3   | I can study school mathematics material online                              | 3.62  | 72.38      | Good     |
| 4   | I know computer applications related to school mathematics material         | 3.52  | 70.48      | Good     |
| 5   | Proficient in using computer applications related to school mathematics material | 3.10  | 61.90      | Good     |
| 6   | I am able to use technology or various tools to deliver school mathematics material | 3.57  | 71.43      | Good     |
|     | **Means**                                                                   | **3.52** | **70.48** | **Good** |

Based on table 4. The ability of students’ technological content knowledge is in a good category with an means score 3.52. This shows that Mathematics Education students understand how to integrate technology and material in learning school mathematics. From table 4 it is also known that the highest average is in the statement of knowing and using technology to help understand mathematical material, this shows that students have good technological literacy skills to be used in learning.

4. Conclusion

Technological Content Knowledge of Mathematics Education FKIP UMMI students are in a good category with the means 3.52. This shows that Mathematics Education students understand how to integrate technology and material in learning school mathematics.
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