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Analysis of Mathematical Connection Ability Based on Independent Character in Project Based Learning Assisted With Digital Module

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Abstract

The purpose of this study is to describe the students' mathematical connection ability based on their independent character in Project Based Learning assisted with digital module. The study was conducted using a qualitative method with the research subjects are students of grade XI TAV 1 SMK Negeri 1 Kandeman in the 2019/2020 academic year as many as 36 people. The data were collected by using questionnaire, observation, documentation, and interviews. The data analysis was conducted by data reduction, data display, triangulation, data interpretation, and data conclusion. The result show that the students' independent character has two categories, namely very independent and independent. Students' mathematical connection ability are varied for both independent character category.

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INTRODUCTION

Students' mathematical connection skills need to be further developed so that students can better understand mathematical topics and can use mathematics in their daily life. This is necessary because a mathematical connection can link a mathematical material with other materials, subjects other than mathematics, and everyday life.

Mathematical connection ability is the ability to understand and associate relationships between mathematical topics or mathematical topics with other topics outside mathematics, and to use these relationships (Kenedi et al, 2019; Junaedi & Asikin, 2012). Mathematical connections are structured networks as links or intermediaries between mathematical ideas just like spider webs (Eli et al, 2013; Zengin, 2019).

Learning at SMK Negeri 1 Kandeman is directed to make students achieve skills and competencies so that they are ready to enter the world of work. Students' character, one of which is independent character, is needed to support their skills and competencies. Independent character is the tendency to determine by himself the actions he takes and not determined by others (Suharnan, 2012). Independent character supports students to be able to adapt to the environment, determines job readiness, influences career maturity, and supports creativity, and determines the level of life satisfaction and happiness (Simamora et al, 2015; Suharnan, 2012). Independent character is also one of the priorities for character strengthening education at SMK Negeri 1 Kandeman, in addition to the character of religious values.

Learning facilitation by the teacher needs to be adjusted to the chosen learning model, one of which is Project Based Learning which is in line with the implementation of the 2013 Curriculum at SMK Negeri 1 Kandeman. The implementation of Project Based Learning allows students to explore their activities in achieving learning goals, by using various learning resources, learning methods, and learning media. This exploration encourages students to develop their mathematical connection ability.

Project Based Learning can be combined with the use of digital modules. The digital module is a form of presenting independent learning materials that are systematically arranged into specific learning units, which are presented in an electronic format (Directorate of SHSD, 2017). The digital module can be created in various file formats, including epub. The epub format digital module can contain videos and interactive exercises, and is equipped with video tutorials, animations, or audio presentations to enrich the learning experience. The epub format digital module can be accessed via a computer or smart device which has software installed to read this epub format file.

The use of digital module can help students learn independently, increase student learning motivation, are effective and efficient, easy to understand and use, contain various features such as videos, and are practical (Amielia et al, 2018; Sugianto et al, 2013; Febrianti et al, 2017). Learning to use digital modules supports students to develop learning steps, needs, and abilities that affect student learning outcomes (Hairida, 2016; Hamdunah et al, 2016).

Since March 16, 2020, learning at SMK Negeri 1 Kandeman has been carried out online due to the Covid-19 pandemic. Learning during a pandemic needs to be done in an interesting way, for example using software or learning videos (Wijaya et al, 2020). Learning is carried out virtually using Google Meet.

Efforts in facilitating students' mathematical connection ability can be carried out in Project Based Learning assisted with digital module. This mathematical connection ability needs to be described according to the students' independent character, whether the value of the mathematical connection obtained is really a representation of the independent character they have or not.

The purpose of this study is to describe students' mathematical connection ability based on the students' independent character in Project Based Learning assisted with digital module.

METHOD

The study was conducted using qualitative methods. The research subjects were 36 students of class XI TAV 1 SMK Negeri 1 Kandeman in the 2019/2020 academic year. The study data were collected by means of questionnaires, tests, documentation, interviews, and observations.

Students' independent character data were obtained through questionnaires, while data on students' mathematical connection abilities was obtained through tests. Data analysis was performed by data reduction, data display, triangulation, data interpretation, and data conclusion. Meanwhile the data validity test includes credibility test, transferability test, dependability test, and confirmability test (Sugiyono, 2017). The credibility test was carried out by triangulation of method and triangulation of sources, the transferability test was carried out by describing students' mathematical connection ability in Project Based Learning assisted with digital module in detail and systematically. The dependability test was carried out by taking students data according to the independent character and the pattern of their mathematical connection ability, the confirmability test was conducted by linking the research data with existing theories, confirming the result of research with experts or supervisors.

RESULTS AND DISCUSSIONS

To obtain a description of students' mathematical connection ability based on students' independent character, the researcher determined 3 instruments consisting of an independent character questionnaire, a mathematical connection ability test, and an interview. Independent character questionnaire was compiled using Google Forms, where links were shared to the students via the class WhatsApp group to identify students' independent character. The mathematical connection ability test in the form of an essay written test description was given to identify the students' mathematical connection ability according to the mathematical connection indicators. Interviews were conducted in private between the researcher and the research subject through the WhatsApp message service to ensure the identification result of the students' independent character with the students' mathematical connection ability.

The independent character questionnaire is prepared according to the characteristics of independent behavior which include, (1) taking the initiative to act and controlling the activities carried out, (2) empowering one's ability, and (3) appreciating the results of one's own work (Suharnan, 2012). The independent character of the students is categorized as very independent, independent and less independent (Hidayah et al, 2019; Anzora, 2017).

The independent character questionnaire link was shared via class WhatsApp group with a time limit for filling out. From a total of 36 students, 33 students filled out the questionnaire before the deadline, 2 students filled out the questionnaire on the time limit, and 1 student filled out after the time limit.

After obtaining the students' independent character data, the researcher analyzed the result of the students' independent character. Based on the research data, it was found out that the students' independent character in the category of very independent and independent. Sixteen students were in very independent character category and 20 students were in independent character category.

Furthermore, it was conducted Project Based learning assisted with digital module and a mathematical connection ability test (MCAT) was given to the research subjects at the end of the lesson. Based on the result of the final MCAT, the data obtained from the students' mathematical connection ability were 10 students with very high mathematical connection ability, 18 students with high mathematical connection ability, and 8 students with moderate mathematical connection ability. The students' mathematical connection ability is confirmed by the students' independent character through analysis of the final MCAT result and deepened by interviews. Interviews were conducted by researcher with several subjects and two vocational subject teachers because there were more hours of vocational subjects than mathematics, so it was possible that vocational teachers could recognize students' character and ability.

The pattern of students' mathematical connection ability is described based on mastery of the mathematical connection indicators (MCI). The mathematical connection indicators used are (1) inter-topic connection in a mathematics material; (2) the connection between the topic in a mathematics material with other material in mathematics that has been studied; (3) the connection between mathematics topic and other subjects other than mathematics; (4) the connection between mathematics topics and everyday life; (5) the

connection between the topic of mathematics and technology (Agustini et al, 2017; Saminanto & Kartono, 2018). The description of the pattern of students' mathematical connection ability based on the students' independent character is as follows.

Students with very independent character

There are 16 students who belong to very independent character category with 3 categories of mathematical connection ability, namely very high, high, and moderate. Of the 16 students, 9 students have very high mathematical connection ability, 6 students have high mathematical connection ability, and 1 student has moderate mathematical connection ability. The following is a description of the pattern of the students' mathematical connection ability with very independent character.

Students with very independent character having very high mathematical connection ability gain the scores of 84, 80, and 76. Those with high mathematical connection ability get the scores of 72, 68, and 68. One student with moderate mathematical connection ability scores 44.

Students with independent character

There are 20 students with independent character category. They belong to 3 categories of mathematical connection ability, namely very high, high, and moderate. Of the 20 students, 1 student has very high mathematical connection ability, 12 students have high mathematical connection ability, and 7 students have moderate mathematical connection ability. The following is a description of the pattern of the students' mathematical connection ability with independent characters.

Among the 20 students with independent character, there are students who scoring 76 in mathematical connection ability which are categorized very high, scoring 68, 64, and 60 with high category, and scoring 56, 52, and 48 with moderate category.

From 36 students as research subjects, it was obtained that the mathematical connection ability of students based on their independent character had various patterns. Even students who have independent character and mathematical connection ability with the same category have a pattern of mathematical connection ability which is not necessarily the same.

CONCLUSION

The pattern of the students' mathematical connection ability of grade XI of SMK Negeri 1 Kandeman based on the students' independent character of in Project Based Learning assisted with digital module is varied. There are students with very independent character who have very high, high, and moderate category of mathematical connection ability. There are students with very independent character who master indicator 2, indicator 3, and indicator 5 well, enough to master indicator 4, but less master indicator 1. There are students with independent character who have very high, high, and moderate category of mathematical connection ability. There are students with independent character who master indicator 3 well, enough to master indicator 2 and indicator 4, while indicator 1 and indicator 5 are not well mastered by students.

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