

DEVELOPMENT OF LINIER ALGEBRA MODULE WITH 4ME STAGE

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Abstract: Module is an alternative in learning. However, there are still many learning modules than are not yet in accordance with learning needs. During this time modules tend to be used for cognitive achievement, delivering material, giving examples of questions, exercises and tests so that the role of the module is still limited to how students can understand the concept without knowing how to find concepts. Based on this problem researchers developed a linier algebra module with 4Me stage. The research method used is development research that will explore information about the development of research objects in a certain time. the model used in the reference of the learning module development is the 4D model. From the results of the study it can be concluded that the development of a linear algebra module with 4Me stages is said to be good, and the student response is positive.

Keywords: Linier Algebra, Module, 4me Stage

INTRODUCTION

Modules have been widely discussed as one of the alternative teaching aids that support student learning. Modules utilization is one of the ways used to make students active and motivated in the implementation of learning. The module is an independent teaching material that contains a series of learning experiences, organized, systematically and can help students achieve learning objectives (Lestari, As'ari: 2013). Thus the module can make students active and not dependent on lecturers because the learning activities arranged systematically. Motivate students because in addition to modules arranged systematically modules are also arranged with language that is easy to understand and designed as interesting as possible so that does not make students bored with the material discussed in the module.

All this time, there are many college students learning using module as teaching material, but there are many modules that have not been in accordance with the desired student conditions. During this time, the module tends to be used for cognitive achievement, delivering material, giving examples of practice and test questions. So the role of the module is still limited to how students can understand a concept/material contained in the module regardless of how the characters appear in students. In the other words, module only as a substitute for the role of lecturers i.e. as a means of learning resources so that the utilization in the student character development is not maximal.

In line with the current college curriculum, universities apply the Indonesian National Qualification Framework (KKNI) according to Presidential Regulation No.8/2012. KKNI, the framework of job qualification that pairing, equalize, integrate education, training sectors, and work experience, in order to give recognition of work competence corresponding job positions in various sectors. Bachelor and D4 graduate equivalent to level 6 which is expected to have the ability: (1) able to utilize science and technology in the field of expertise, and can adapt to the situation in the problem solving, (2) have competence in the theoretical concepts of a particular field of knowledge in general and the theoretical concepts of a special section in the field of knowledge in depth, and capable of formulating problem solving procedural (3) able to make strategic decisions based on analysis of information and data, and provide guidance in choosing various alternative solutions, and (4) responsible for self-work and can be given responsibility for the achievement of organizational work. Based on the level 6 capability, bachelor graduates are required to have competence for the foundation of personality, competence in science and technology, skills in facing problems and attitude.

Competence that must be had by the graduates, supported by the decision of government regulation in 2010, clause 97 that is (1) Curriculum of university developed and implemented based on competence. (2) The education unit level curriculum for each department at the university is developed and established by each university with reference to the National Education Standards. (3) The competencies referred to in paragraph (1) at least satisfy the curriculum elements as follows: a) personality base; b. have competence on science, technology, art, and/or sport; c. ability and skill of work; d. attitudes and behaviours in the work according to the level of expertise based on knowledge and skills mastered; and e. have competence of the rules of community life corresponding with the choice of expertise in the work. With these competencies, hopefully will be able to face the challenges in the globalization era.

Based on the competence that must be owned by the graduates, mathematics department at Muhammadiyah University of Surabaya (UM Surabaya) that has been implemented 2015 curriculum (KKNI Curriculum) is required to be followed up the learning that can form that competence, one of them in linear algebra course, using the module as an alternative learning media is expected in addition to building the concept of knowledge in finding the concept and problem solving in addition it is expected to develop the 4C's basic character. According to As'ari (2016) the National Education Association or NEA (without years) put forward four things that need to be developed to face 21st century and the globalization era as 4C, they are: (1) Critical Thinking and Problem Solving Skills, (2) Communication Skills, (3) Collaborative Skills (4) Creativity and Innovation. Mathematics learning should consider 4C's in helping prepare students for global competition. Therefore, we serve four characters as a priority to be developed so that 4C can grow and develop well. The four characters are: (1) careful and accurate

in terms or, information, claims, or arguments, (2) polite in communicating, (3) respect in collaboration, and (4) persistent and unyielding in creating and innovating.

To achieve the purpose, we use 4Me steps i.e., *memahami, menyelesaikan, membandingkan dan mendiskusikan, and menyimpulkan* (understanding, completing, comparing and discussing, and concluding) on a topic of concern as the module development systematic. The steps are taken from the steps in Realistic Mathematics Education (RME) learning approaches 1) understanding contextual problems, 2) resolving contextual problems 3) comparing or discussing answers and 4) concluding. While for the fifth characteristic that is, there is a linkage between the various sections of the topic of learning (intertwining) allows it to be done at every step. Thus students learn by topic of everyday problems then they understand the problem, analyze it to be solved by connecting with the existing linear algebra concept, then compare and discuss their answers so that it can be continued by summarizing the solution to the initial problem encountered.

APPROACH & RESEARCH METHOD

This research purposes to improve the utilization of module learning media in supporting linear algebra learning, in addition to develop linear algebra learning module with 4Me approach steps (understanding, completing, comparing and discussing, and concluding) on a topic of the problem.

While the specific purpose, to develop the 4C's mathematics education students character, 4C's students character is the four basic skills in facing the globalization era challenges and also for supporting the implementation of KKNi in college: (1) critical thinking and problem solving, (2) communication skills, (3) collaboration skills, and (4) creativity and innovation.

RESULTS AND DISCUSSION

This study aims to improve the utilization of learning media module in supporting linear algebra learning, in addition to developing linear algebra learning module with 4Me approach stages (Understanding, Completing, Comparing and Discussing, and Concluding) on a topic of the problem. While the specific purpose, to develop the character of 4Cs mathematics education students, 4Cs character is the four basic skills in facing the challenges of the era of globalization and also in supporting the implementation of KKNi in college: (1) critical thinking and problem solving skills, (2) communication skills, (3) collaboration skills and (4) creativity and innovation. Based on the 4-D model development procedure, the development steps in this research include define, design, development, and disseminate.

The process of developing a learning module with the 4Me stage follows the steps of the 4-D development model proposed by Thiagarajan. The four steps are: (a) Define, this stage consists of the beginning-end analysis, student analysis, material analysis, task

analysis, and the indicator of learning outcomes. At the beginning of the analysis stage obtained information about the lack of media use in the learning process and less support the module used by students. At student analysis step obtained the number of mathematics education students there are 26 students with heterogeneous ability. Based on learning outcomes in the middle of the first semester, academic year 2017/2018, from 26 students only 47.48% of students who achieve the more enough value criteria. In conducting material analysis, researchers pay attention to taking Linear Algebra material. (b) Design, this stage consists of media selection, format selection, and early design of learning tools. At the media selection step, we use module based 4Me, with the initial learning device design obtained RPP, Module, Test Instrument. (c) Develop, this step consists of expert validation tests and field trials. Experimental test results by experts for learning devices are declared good with a little revision and are worth using. Expert validation results are used as a basis for revision and refinement of instructional devices. Validators that validate learning tools developed consist of three people who have status as a lecturer in college. The results of general assessment of instructional devices by validators and research instruments draft I can be seen in the following table:

Table 1 Results of General Assessment of Validators on Learning Devices

No	Validated Device	Assessment
1.	RPP	Good, it can be used with small revisions
2.	Learning Module	Good, it can be used with small revisions
3.	Test	Valid, understandable language, can be used with little revision

After a small revision the researchers conducted a test of legibility and field trials to determine whether or not the device has been developed.



Image 1. The activity learning of lecture and student

Based on the results of data analysis, shows that the average value of the teacher's ability to manage learning for each learning activity is in the range of grades 3-4 this means that the teacher's ability to manage cooperative learning is good. Clarity of lecturer and student activities in RPP, modules and worksheets greatly determines the implementation of the learning process in accordance with the learning model applied. lecturers always go around to monitor student performance in groups. The lecturer provides guidance by using Scaffolding to students / groups who have difficulty completing LKS (shown in figure 3.1). The teacher realizes that students are not accustomed to solving problems in the form of stories, therefore the teacher always goes around watching students while providing assistance if there are students / groups feeling difficulties. Besides that the success of the teacher in managing this learning is by having a discussion between the researcher and the partner teacher about the learning steps in the RPP and providing input for improving learning in the next meeting.

Based on the results of data analysis, it was concluded that students' activities in learning were effective. According to Eggen and Kauchak (1996: 1) the higher the activeness of students the more effective learning is carried out. Students are said to be active if doing activities such as spelling out worksheets, answering questions or explaining to a teacher or friend, and asking both the teacher and friends. While students are said to be passive when listening to the explanation of the teacher and friends (Leiken & Zaslavsky in Suradi, 2005). From the data obtained, it can be seen that the percentage of active students (as stated above) is greater than the percentage of passive students. Based on descriptive analysis, it can be concluded that student activities in learning are effective.

The results of student response analysis on the linear algebra course learning process using the algebraic module with 4me stages indicate that more than 94% of students expressed a positive response to the learning process and learning tools. Positive responses from students provide clues that learning can make students happy and enthusiastic in learning and students can accept the learning process, so that students are expected to get better learning outcomes.

From the posttest data shows that 4 students from 30 or 86.6% of students in the trial class were completely studied. This shows that the learning outcomes of students who take part in learning using the linear algebra module Learning Tools with 4 stages are effective. The use of modules is effective, giving a good influence on student achievement and students' abilities.

CONCLUSION

Based on the results of the field trial, it was concluded that the learning tools that had been developed by the researcher had fulfilled the criteria of a good learning tool because the results of the study had fulfilled the requirements, among others: 2) After the trial, it meets the following criteria: (a) The ability of the lecturer to manage learning

is classified as effective (b) Student activity is classified as active. (c) Students' response to learning meets the positive criteria and completeness of learning meets the criteria of completion (d) Tests for learning outcomes meet valid, reliable and sensitive.

REFERENCES

- As'ari, A.R. (2016). "Pengembangan Karakter dalam Pembelajaran Matematika: Prioritas dalam Rangka Mengembangkan 4C's". Makalah ini disajikan dalam Seminar Pendidikan Nasional, 26 Maret 2016.
- National Education Association (2002). Preparing 21st Century Students for a Global Society: *An Educator's Guide to the "Four Cs"*. <https://www.nea.org/assets/docs/A-Guide-to-Four-Cs.pdf>.
- Gravemeijer, K. (1994). *Developing Realistic Mathematics Education*. Utrecht: Freudenthal Institute.
- Pacific Policy Research Center. 2010. *21st Century Skills for Students and Teachers: Research and Evaluation*. Kamehameha Schools Research & Evaluations Division.
- Partnership for 21st Century Skills (2009). Learning for the 21st Century skills. www.21stcenturyskills.org.
- Soejadi (2001). "Pemanfaatan Realitas dan Lingkungan dalam Pembelajaran Matematika". Makalah ini disajikan dalam Seminar Nasional Realistic Mathematics Educations (RME) di Jurusan Matematika FMIPA UNESA, 24 Februari 2001.
- Treffers, A. (1991). Didactical Background of a Mathematics Program for Primary School. Dalam *Realistic Mathematics Education in Primary School*, L. Streefland (ed). Utrecht: Freudenthal Institute.
- Thiagarajan, S. S. (1974). *Intructional Development for Training Teachers of Exceptional Children*. Minnesota: University of Minnesota.
- Treffers, A. d. (1985). Rational Analisis of Realistic Mathematics Education-The Wiskobas Program". *Proceedings of Ninth International Conference for the Psychology of Mathematics Education*. Noordwijkerhout: In L. Streefland (ed.).