

DEVELOPMENT TEACHING MATERIAL IN NUMERIC METHOD

by Zulyadaini .

Submission date: 22-Feb-2020 08:36AM (UTC+0800)

Submission ID: 1261756564

File name: DEVELOPMENT_TEACHING_MATERIAL_IN_NUMERIC_METHOD.pdf (746.79K)

Word count: 3157

Character count: 17906

DEVELOPMENT TEACHING MATERIAL IN NUMERIC METHOD

ZULYADAINI

Lecturer of FKIP Batanghari University

Corresponding EMAIL: zulyadaini825@gmail.com

Zulyadaini.unbari@gmail.com

Abstract

This research is aimed to develop teaching material in numeric method in faculty of teaching and education in Batanghari Jambi, this research using Research and Development approach (R&D). The subjects of the study were students in semester 4 of 2018/2019. Development model that used is instructional development models. The development model used is an instructional development model. After being developed, validation is done by design experts, material experts, media experts. Then one to one learner, small group, and field trial trials were conducted. The results of the study based on validation by experts were categorized as feasible with a feasibility percentage for design validation 90%, media validation 87.7% and material expert 90.1%. Then it continue with one to one test with 93.7% percentage, small group 91.74%, with field trial 88.69%. The conclusion from validation result and test has been done so the teaching material media mathematic learning is profit to use.

Key Words: Teaching Material, Instructional Development Model, Numeric Method.

INTRODUCTION

The learning process in college based on the curriculum which has been prepared by each university because it is an autonomous right to higher education. This will impact on the lecture system that refers to a paradigm shift that is centered on students. But it still appears in the field that there is still a lesson that still uses the old paradigm that is centered on the teacher (lecturer). This is based on the observation result in the field showing that in learning lecturers delivers the material and while student hear and understand the material presented. In addition, the teaching material used is still uses several books whose material is still separate from one another, so it is necessary to the combine material with one another to be studied. This has an impact on student financial side to buy those books that relevant with any material that in syllabus. Moreover, the result of interview with student is showed a lot of numeric methods material was studied was difficult to understand relate to the methods that require iteration. This is one of student reason is not interested in learning.

Based on the fact that revealed above, it gives a chance to do a Research of Development Teaching Material in Numeric Method in Faculty of Teaching and Education in Batanghari University, Jambi. In development needs to studied; 1) what is the learning process and teaching materials used in the Numerical Methods at FKIP Batanghari University Jambi? And 2) How to develop numerical method teaching materials in the Batanghari Jambi FKIP?

Development Concepts

According to (Ali, 2014) Ali and Asrori in the field of education, development is a process of developing educational devices carried out through a series of research using various methods in cycles that go through various stages. Then according to Borg and Gall that quoted from *English Educational Journal* by Abdillah (Abdillah and Rukmini, 2013), define "research and development as a process used to develop and validate educational product". The Research and development are as process that used to develop and validate the educational product.

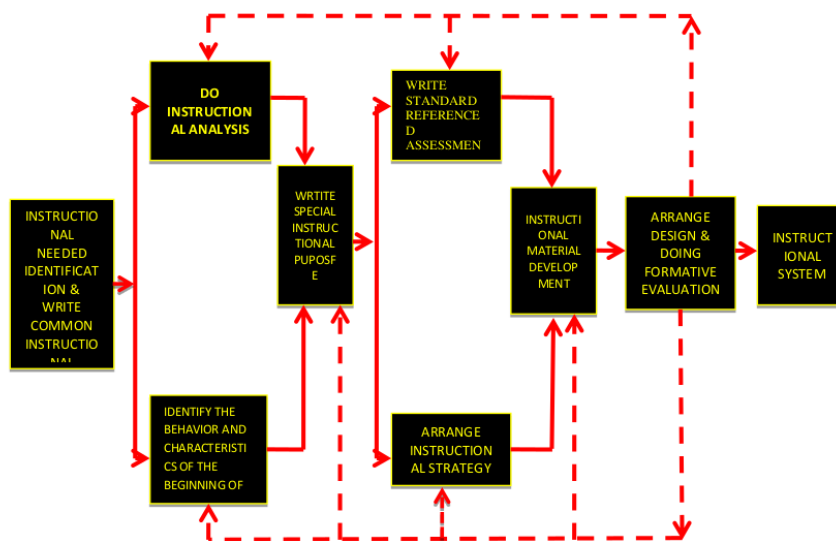
Instructional development models (MPI)

Instructional development models (MPI) as models that used in development design learning system in the subject of numeric method for student in the College because MPI has clear relevance for the development of learning. Besides this instructional development models is

simply and easy to understand, with this *output* model later is expected to have peculiarity with the criteria: (1) there is a clear analysis of general instructional needs and objectives; (2) content in accordance with the specific objectives of learning; (3) the order is correct; (4) there are instructions for the use of teaching materials; (5) there are practice questions; (6) there are examples of training; (7) there are performance tests; (8) there are instructions for student progress; and (9) there are instructions for students towards the next activity

Development teaching material MPI is using system approach, because is attach importance the connection between each component. The system approaches also able to increase the opportunities for integrating of all variables that influence the learning in design learning. As for the step of instructional development models in the picture 1

The structure of the development model can be seen as shown in Figure 1.



Picture 1. Instructional development models (MPI) (Suparman, 2004)

Teaching Material

Based on (Depdiknas, 2008) teaching material is any form of material that uses to help the teacher/instructor in carrying out teaching and learning activities. While teaching material according to (Lestari, 2013) is a set of objectives or learning tools that contain learning materials, methods, boundaries and ways of evaluating that are designed systematically and attractively in order to achieve the expected goals, namely achieving competence or sub competence with all its complexity. According to (Majid, 2007) teaching material is any form that uses of teaching material that used to help teacher/instructor in carrying out teaching and learning activities in class. The indented material can be the form of written material or unwritten teaching material. (Hamdani, 2011) teaching material or learning material (*instructional materials*) in broadly consisting of knowledge, skills and attitudes that students must learn in order to achieve predetermined competency goals

From some of the above theories it can be concluded that teaching materials have all forms of learning materials or resources that contain subject matter, methods, evaluate that used by educators in implementing learning, both in electronic form, *hand out*, book, module, student worksheet, brochure, and so on.

Numeric Methods

The characteristics of many mathematical materials are abstract, but abstract material must be studied and it is important to know one of them is numerical or numeral methods. According to (Chapra, 2012) numeric method is using technique that used to formulate the mathematical problems so they can be solved by arithmetic and logical operation. The same thing was expressed by (Triatmodjo, 2002) that numeric methods are the step or technique to solve mathematically formulated by arithmetic operations (*arithmetic*).

The ability of using the step or technique where the mathematic problem that formulate can solved with arithmetic operation. (Chapra, Steven C. and Canale, 2010). The numeric ability have one general characteristics is always involved and using arithmetic calculations. This means that numerical ability is closely related to arithmetic and has a large role in learning mathematics material so that numerical ability is one that influences mathematics learning outcomes.

RESEARCH METHODS

This research is using system approach. The system approach is a stages series of problem solving that each step is understood and produces an alternative solution. The approach is adjusted to development models that used is MPI models. The method used in this research is the research and development (*R&D*) method. The *R&D* method is a research method used to produce a product or test the effectiveness of a particular product.

²⁴ The subjects in this study were students enrolled in numerical methods subject in the even semester of 2018/2019 at the Mathematics Study Program of the Teaching and Education Faculty of Batanghari University, Jambi. Development of teaching materials is carried out in several stages, namely: 1) a preliminary study, 2) development planning, 3) validation, evaluation and revision, 4) and implementation. Formative evaluations carried out: (1) *one to one expert*, that is material expert, instructional design expert and media expert, (2) *one to one learner*, that is individual trials of subjects consisting of three students, (3) *small groups*, namely a small group trial consisting of 9 students, and (4) *field trial*, namely a field trial.

DISCUSSION AND RESULT

1. Preliminary studies

Preliminary research is conducted to determine the real situation and to analyze the needs related to the problem and the solution offered as a solution to the problem so that it is necessary to analyze the user needs analysis. The results of the research based on lecturer interviews showed that currently lecturers in teaching are still using references or teaching materials that are still separate from one book to another so that some teaching materials are needed to adjust to the syllabus that has been set.

2. Development steps

a. Identify Instructional Needs and Formulate General Instructional Objectives

1. Instructional needs identification.

The instructional needs result can get that many students is difficult to find the teaching materials that match with the material compiled in the numerical method syllabus and the book is relatively expensive. So that when offered to students as product users to use numerical method teaching materials that are in accordance with the material compiled in the syllabus, students strongly agree and are very in need of offers from numerical method teaching materials. Then it supported by several technological facilities to support students learning activity such as in focus, internet network and other facility that support numerical methods learning.

2. Formulating general instructional purpose

In generally, after following courses numeric method, student is expected to understand the methods that learned in numeric method.

b. Instructional analysis

The instructional analysis result is 1) understanding the introduction to numerical methods and errors in computing; 2) understanding settlement of nonlinear equations with bisection method, regula falsi, fixed point iteration method, Newton Raphson method, secant method and modification of Newton Raphson method; 3) understanding solving system equation with Matrix Notation and Matrix Inverse, Gaussian Elimination, Iteration Method, Jacobi Method, Gauss–Seidel Method; 4) understanding interpolation consist of linear interpolation, quadrant interpolation, interpolation of difference divided by Newton, Lagrange interpolation and spline interpolation; 5) understanding differentiation and integration consist of derivative formula, numeric integration, and Simpson Method.

c. Identifying Early Behavior and Characteristics

1) Initial Behavior

Target group or student can be participant in following the numeric method subject is student that registered in Batanghari University (UNBARI) in even semester 2018/2019.

2) Initial characteristic

The initial characteristics that become users are students. The results of data collection based on the characteristics of students who will use teaching materials are students who have high motivation and willingness to learn numerical methods of heterogeneous educational backgrounds, example High School, vocational school, and Islamic Senior High School.

d. Formulate Special Instructional Purposes

From general instructional purpose above, so it able to be specific instructional objectives can be described as follows: which is 1) student understands Introduction to numerical methods and Errors in computing; 2) student understands resolving nonlinear equation with bisection method, regula falsi, fixed point iteration method, Newton Raphson method, secant method, and modification of Newton raphson method; 3) understanding solving system equation with Matrix notation and matrix inverse, Gaussian elimination, iteration method, Jacobi method, Gauss–Seidel method; 4) understanding interpolation consist of linear interpolation, quadrant interpolation, interpolation of difference divided by Newton, Lagrange interpolation and spline interpolation; 5) understanding differentiation and integration consist of derivative formula, numeric integration, and Simpson Method.

e. Assessment tools

Assessment tools are using test that consist of middle test semester, semester test, task, and competency test.

f. Arrange the learning strategy

Learning strategy is using teaching material numeric method in the courses consist of three main activities which is three main activities namely introduction, core activities, and closing. In addition, the method used is also given, times, media and tools, and also ability test.

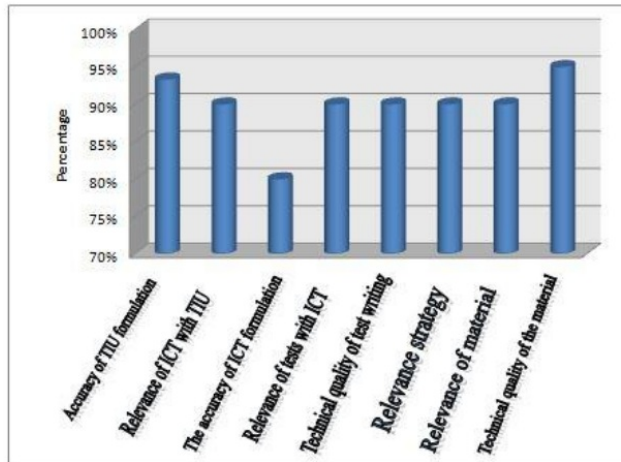
g. Develop teaching materials

Develop teaching material is development of teaching materials is made in the form of textbooks consisting of 5 chapters. The results of eligibility which consist of validation and formative evaluation are:

a. Expert test (one to one expert)

1) Learning design expert

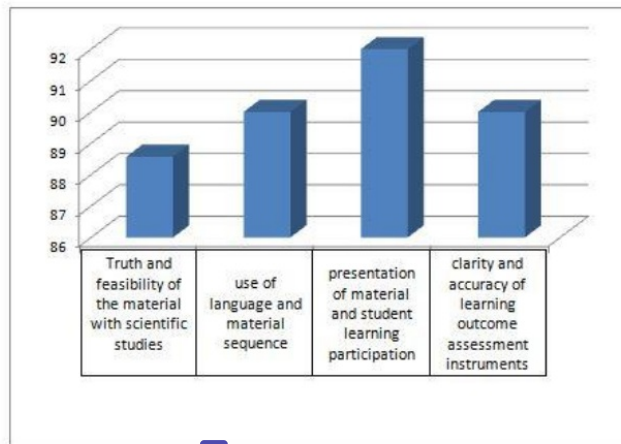
This expert validation is carried out to determine the product's feasibility and the results of the validation can be seen in the graph 2.



Graph 2 Results of Expert Learning Design Validation 1

2) Material expert

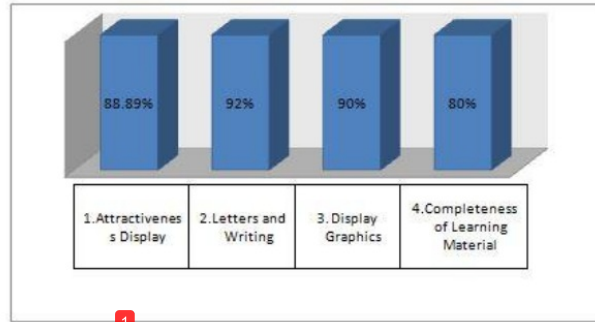
The feasibility test by the material expert ¹¹ carried out earlier than the feasibility test for the learning design expert. The results of the validation by the material expert on the numerical method teaching material are outlined in the graph 3



Graph 3. Graph of Expert Validation Results

3) Media expert

The ¹¹ validation is from media experts together with learning design validation and material expert validation. The results of the validation by media experts are outlined in Graph 4.

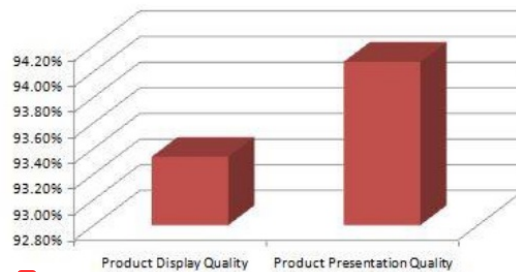


1
Graph 4 results of media expert validation

- 4) Revision and suggestion from expert
 - a) Learning design expert revision
The revision of the design expert is that the benchmark reference test is in accordance with ICT, so that the ICT will be measured. This has been improved and recommended to be used.
 - b) Material expert revision
Revision from material expert on learning material which is teaching material that teaching materials are made a lot of typing mistakes so it needs to be fixed. Those parts is already repaired and already agreed by material expert, until it is recommended to be used.
 - c) Learning media expert revision
Media expert suggest that the book size is more attractive. Suggestion is already repaired and recommended to be used.

b. Individual test (*one to one learner*)

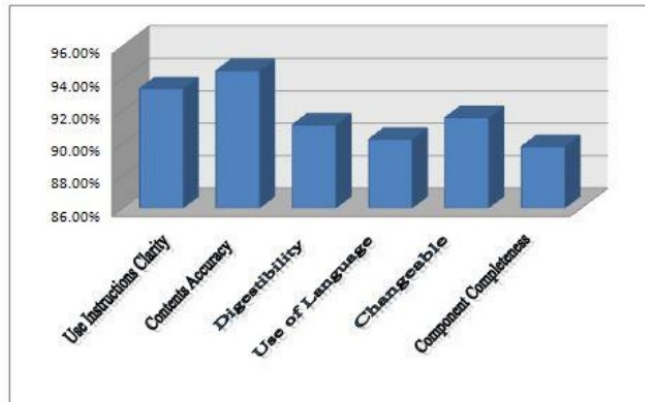
Individual test result (*one to one learner*) is consisting of two indicators which is the quality of product appearance, and the quality of product presentation. Subject responses to individual trials (*one to one learners*) can be presented as graph 5:



1
Graph 5 Individual Trial Results (*One To One Learner*)

c. Small group test (*small group*)

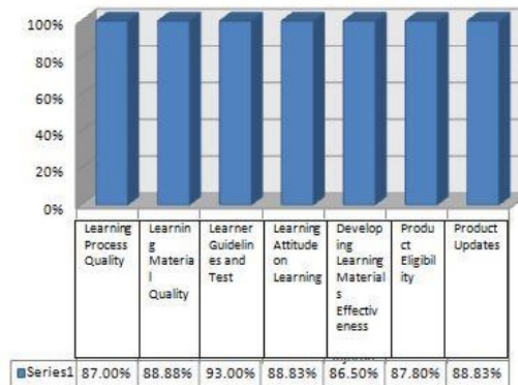
Subject responses to *small group* trials can be presented in graph 6



Graph 6 Responses of *small group* trial subjects.

d. Field group trial test

Field trial results in graph 7:



Graph 7 Responses to *field trials*

DISCUSSION

1. Role of Learning Materials in numerical methods in Learning

In Faculty of Teaching and Education (FKIP) Batanghari University Jambi, there are several mathematics study programs. In mathematics study programs there are compulsory courses of study namely numerical methods. In numeric method learning, lecture is not yet using still sorting and choosing from several that fit the syllabus being studied. Those thing makes student is already find references and needs substantial cost. Responding to this needed innovative new breakthroughs that make teaching materials in accordance with the syllabus. Teaching material made contains materials that are in accordance with the syllabus. Those things will facilitate students in learning the material provided. In accordance with the function of learning material or information submitted so that it can be studied effectively and efficiently so as to achieve instructional goals.

However, in arranging teaching material it needed to be studied as a whole both aspects of needs, users (students), material, learning strategies and evaluation. Because in the implementation of teaching and learning has an important role in the ongoing learning process. In addition, teaching materials become tools or means to achieve instructional goals that have been set.

2. Procedure for development of numerical method teaching materials

Development Procedure refers to the steps that must too in developing teaching material that will develop. Teaching material development in numeric method is guided by the design of instructional systems using instructional development models (MPI). Instructional development models (MPI) are one of the learning models in systematically and in accordance with the conditions that exist in the regions of Indonesia because this model is a modification of the Dick and Carey model.

Instructional development Model (MPI) in initially with identification of instructional needed and formulated general instructional purpose. Identification of needed are first step is to pay attention because this will determine whether the developed teaching materials are needed by the user or not. After being needed, the researchers then formulated the form of development and formulated general instructional goals which became the final goal of teaching materials. Then continue with attitude identification and the initial characteristics of the student's goal is to understand student behavior before development is carried out in order to compare with student behavior after instructional development occurs. Then conduct competency analysis to describe general behavior into specific behavior that is arranged logically and systematically. Then formulate a basic competency, which is with discussed concepts and how to formulate the competency until can get basic written test and instructional strategy. And then write a benchmark reference test to measure how far the level of success of students in achieving instructional goals. And continue to arrange instructional strategy and developing instructional material. In this step is discussed teaching material or teaching material to be compiled. After it is made, it is continued by designing and carrying out formative evaluations. This stage discusses how to carry out formative evaluations of instructional materials that have been produced by researchers in the form of learning materials. And get the desired instructional system.

CONCLUSION

1. In the implementation of learning numerical methods lecturers are still using conventional learning. Submission of materials using the lecture method and using teaching materials that the material to be studied is separate from one book to another. The books that already used is very good, but the material studied is not in accordance with the syllabus to be studied, therefore we need the teaching materials that contain material that is in accordance with the syllabus so that teaching materials which are the product of ordinary results are used easily by users because all material in the syllabus is included.
2. Procedures for designing and developing teaching materials on numerical methods using instructional development models (MPI). This model is done to design teaching material in the form of book. To get good results, a formative evaluation is carried out. Formative evaluation result from some validation expert the expert recommends that the model developed is feasible to use. And continue with one to one test, small group n field trial and result and all the test is get good results so the Numerical Method teaching materials are worth using.

REFERENCES

- Abdillah, A. F. and Rukmini, D. (2013) 'Developing Written Englishweb-Based Materials for', *English Education Journal*, 3(2).
- Ali, M. dan M. A. (2014) *Metodologi & Aplikasi Riset Pendidikan*. Bandung: Bumi Aksara.
- Chapra, Steven C. dan Canale, R. P. (2010) *Numerical methods for engineer*. Sixth. New York: McGraw-Hill Companies.
- Chapra, S. C. (2012) *Applied Numerical Methods with Matlab for Engineers and Scientists*. Third. New York: McGraw-Hill Companies.
- Depdiknas (2008) *Pedoman Pengembangan Bahan Ajar*. Jakarta: Direktorat Jendral Manajemen Pendidikan Dasar dan Menengah.

Hamdani (2011) *Strategi Belajar Mengajar*. Bandung: CV. Pustaka Setia.

Lestari, I. (2013) *Pengembangan Bahan Ajar Berbasis Kompetensi (Sesuai dengan Kurikulum Tingkat Satuan Pendidikan)*. Padang: Akademia Permata.

Majid, A. (2007) *Perencanaan Pembelajaran Mengembangkan Standar Kompetensi Guru*. Bandung: PT. Remaja Rosdakarya Offset.

Suparman, M. A. (2004) *Desain Instruksional*. Jakarta: Pusat Penerbitan Universitas Terbuka.

Triatmodjo, B. (2002) *Metode Numerik: dilengkapi dengan program komputer*. Yogyakarta: Beta Offset.

DEVELOPMENT TEACHING MATERIAL IN NUMERIC METHOD

ORIGINALITY REPORT

15%

SIMILARITY INDEX

8%

INTERNET SOURCES

11%

PUBLICATIONS

10%

STUDENT PAPERS

PRIMARY SOURCES

1	"Development Learning Models of Fish Stock Assessment Technique Subjects based E-Learning at Aquatic Resources Technology Management Program Study at the Jakarta Fisheries High School", International Journal of Engineering and Advanced Technology, 2019 Publication	2%
2	Submitted to Universitas Hasanuddin Student Paper	1%
3	ttem.ba Internet Source	1%
4	Submitted to Politeknik Negeri Sriwijaya Student Paper	1%
5	mathematics.leads.edu.pk Internet Source	1%
6	prosiding.upgrismg.ac.id Internet Source	1%
7	Laely Amaliyah, Ferli Septi Irwansyah, Neneng	

Windayani, Muhammad Ali Ramdhani. "Design of Android Interactive Multimedia for the Concept of Aromatic Compound", MATEC Web of Conferences, 2018
Publication 1%

8 www.scribd.com 1%
Internet Source

9 Submitted to SUNY, Binghamton 1%
Student Paper

10 es.scribd.com 1%
Internet Source

11 L Maharani, D I Rahayu, Yuberti, H Komikesari, Sodikin, R Hidayah. "Toondoo Application Based on Contextual Approach: Development of Comic Learning Media", Journal of Physics: Conference Series, 2019
Publication 1%

12 jurnalmahasiswa.unesa.ac.id 1%
Internet Source

13 Submitted to TechKnowledge 1%
Student Paper

14 "Developing Mobile Learning Media for Arabic Language Instruction at Islamic Senior High School in Lampung Indonesia", International Journal of Recent Technology and Engineering, 2019 <1%

15 Ahyanuardi, Ratih. "Effectiveness of Use Web-Based Learning Media for Information and Communication Technology in Senior High School", Journal of Physics: Conference Series, 2019
Publication <1%

16 Submitted to Universitas Negeri Surabaya The State University of Surabaya
Student Paper <1%

17 H Elmunsyah, W N Hidayat, S Patmanthara, F A Dwiyanto, W M Utomo, K Kusumadyahdewi. "Adaptive learning system in open educational resource digital sharing community as a media for learning autonomous students", IOP Conference Series: Materials Science and Engineering, 2020
Publication <1%

18 Mujiarto, A Djohar, M Komaro. "A Design of Innovative Engineering Drawing Teaching Materials", IOP Conference Series: Materials Science and Engineering, 2018
Publication <1%

19 harmadi-derasid.blogspot.com
Internet Source <1%

20 - Satinem, - Juwati. "Development of Teaching Materials of Poetry Writing Using Pictures for <1%

the Elementary Students", Advances in Language and Literary Studies, 2018

Publication

21

Submitted to Manuel S. Enverga University

Student Paper

<1%

22

Suprih Widodo, Puji Rahayu, Nahrowi Adjie, Sri Adi Widodo, Bayu Rahmat Setiadi. "The Development of Arithmetic Gamification Using Digital Dice", International Journal of Engineering & Technology, 2018

Publication

<1%

23

Submitted to Universitas Negeri Jakarta

Student Paper

<1%

24

Rohmad Junia Sandy, Budi Murtiyasa. "Developing a multimedia-based learning media for learning matrix transformation", Journal of Physics: Conference Series, 2019

Publication

<1%

Exclude quotes

Off

Exclude matches

Off

Exclude bibliography

Off