student worKsheet seminar UNY

by Niken Wahyu Utami

Submission date: 01-May-2021 12:52PM (UTC+0700)
Submission ID: 1575160765
File name: ME_-_5.pdf (51.66K)
Word count: 2239
Character count: 12587

ME – 5

DEVELOPING STUDENT WORKSHEET OF DIFFERENTIAL EQUATIONS COURSES FOR HIGHER EDUCATION WITH LESSON STUDY

Niken Wahyu Utami
Mathematics Education Study Program FKIP UPY
nikenimoet@gmail.com

Abstract

The purpose of this study was to produce student worksheet, which have quality to use in the differential equations learning process. The main method involved a research and development study. It developed student worksheet with lesson study, which consisting of four primary steps: plan, do, see, and reflect. The data collecting instruments included student worksheet validation sheets, observation sheets, questionnaires, and tests. The collected data were those on the quality of the developed product: the validity, reliability, and effectiveness.
The result indicated that student worksheet was valid, practical, and effective to use in the differential equations learning process.

Keywords: student worksheet, higher education, lesson study

Introduction

The teaching of mathematics is now a global phenomenon. We can learn about the experiences of learning and teaching mathematics with Lesson Study. It is important if we can learn anything from the experiences learning mathematics before. It involves lecturer working together to design, test, and improve lesson sequences that are likely to improve learning and be useable by other lecturers.

The teaching, learning, testing of mathematics cannot escape our attention. There are some countries that appear to be more successful in teaching, learning and testing than others. In particular, Japan and other Asian countries seem to score higher marks in international tests consistently. While it may be sensible to question what such tests actually measure, it is also important to see if we can learn anything from these experiences. In Japan, particularly in primary schools, there is a long-established practice of lesson preparation that has been in existence for one hundred and thirty years. It is called Lesson Study (David Tall, 2008: 45).

Lesson Study involves teachers working together to design, test, and improve lesson sequences that are likely to improve learning and be useable by other teachers. The teacher who will teach the class, usually in . ollaboration with others, will take a mathematical topic, think through how to build the new ideas based on the learners' previous experiences, design a problem that can be used to illustrate the principles involved and reflect on the various ways that children might react to the new experience. This involves writing a plan that fits in with the overall development of the syllabus, specifying the main aims of the lessons and the detailed development of the lesson sequence, including a prediction of the different ideas that the learners may offer so that they can be taken into account during the lesson itself (David Tall, 2008: 45).

Part of the design is to structure the ideas that the students might suggest by organising the lessons in sequence so that an appropriate range of ideas have already been encountered in previous lessons. In this way the possible solutions are orchestrated so that the teacher can organise a coherent discussion based upon them. The lesson is taught by the teacher, with a group of supportive observers who discuss the lesson immediately afterwards. As the observers may have focused on different parts of the action, this has the advantage that the lesson is seen from several viewpoints by a team who have the ideas fresh in their minds. How the

observations are carried out depends on the individuals concerned. It could be a small group, or, as in my experience, there may be many observers at the same time (David Tall, 2008: 45).

Lewis (Brian Doig & Susie Groves, 2011: 77) describes the *Lesson Study Cycle* as having four phases:

a. goal-setting and planning – including the development of the Lesson Plan;
b. teaching the research lesson – enabling the lesson observation;
c. the post-lesson discussion; and
d. the resulting consolidation of learning, which has many far-reaching Consequences

On the other hand, in the higher education, Differential equations is a courses in mathematics education study program. Description of the course consists of: Differential Equations, General Solution of Differential Equations, First order Differential Equations, The Solution of Separabel Differential Equations, The Solution of First order Differential Equations, The Solution of Homogeneous Differential Equations, The Solution of Exact Differential Equations, The Solution of Linear Differential Equations, The Solution of Bernoulli Differential Equations.

The courses of differential equations is a prerequisite to have a relationship or courses previously, so lecturers must plan the courses. Planning is an important phase of teaching. Lecturers must make decisions about various aspects of instruction that ultimately shape students' opportunities to learn. One of teacher's plan is learning task.

The learning task must be made suitable to the learner and the type of material to be learned. Learning task in mathematics must attend the material in math. If the teacher is aware of the effectiveness of the whole method in most learning situations, he will develop his plans of teaching accordingly.

Plan of learning task in mathematics must be design. Ideally students should move through four stages of developing abstract thinking when learning mathematics (Naggar-Smith, 2008: 3):

a. physical experience;
b. language to describe that experience;
c. representation;
d. symbolization

Developing abstract thingking in mathematics can use question. The functions of question is (Chand, 2006: 19):

a. To measure the student's achievement in knowledge, habits, abilities, skills, and attitudes.
b. To stimulate interest in the work at hand
c. To help students to correlate past experiences to the new lesson
d. To challenge individual attention
e. To develop the power of evaluation.
f. To develop the power of organization.
g. To stimulate thought
h. To develop appreciation

Mathematical concepts can be presented in the mathematical problems or questions. Problems in mathematics teaching refer to the work lecturers do to further students' understanding of mathematics. This includes facilitating lecturers' discussion around the content, continuously pressing students to explain their ideas and to communicate with each other, posing questions, and selecting solution strategies to present to the class.

Questions can improve students' thinking about mathematical concepts and encourage them to discuss mathematical ideas related to the concept. Manipulation, illustration and modeling are used to aid the understanding and development of mathematical concepts. Furthermore, the task or question used to engage students in learning activities to understand and evaluate concepts students are learning (Madsen and Baker, 1993: 261).

Question or problem can be presented in student's worksheet. To made worksheet,

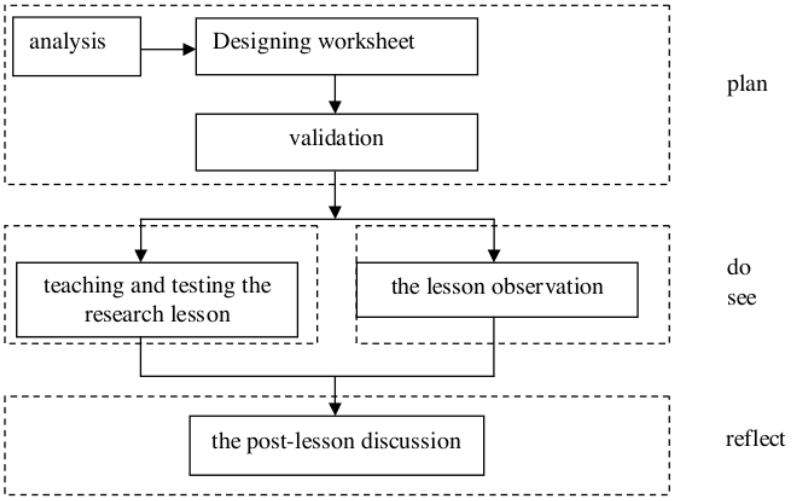
a. The most comfortable font size to read is 16 (Naggar-Smith, 2008: 3).
b. The font size should not be smaller than 12 points (Chee & Wong, 2003: 120).
c. The front style Arial or Comic Sans is better than Times New Roman style for variation (Naggar-Smith, 2008: 3).
d. The colored material can increase the attractiveness and give a positive stimulant (Rule, Arthur, Dunham, et 2007: 50).
e. On the other hand, the worksheets do not need colour, as this makes photocopying easier and less expensive (Naggar-Smith, 2008: 3).

Designing student's worksheet is not easy to do. Designing student's worksheet is inherently different for each lecturer depending on the lecturer's experiences, ideas, and conceptions, as well as the curriculum being used. So that, we need 'Developing Student Worksheet of Differential Equations Courses for Higher Education with Lesson Study'

Research Method

In recent years, a number of models for instructional development have employed the common steps of analysis, design, and evaluation (Twelker, Urbach, & Buck; Thiagarajan, & Semmel, 1974: 5).

According to the Lesson Study Cycle, steps of this research and development can be drawn as:



Data analysis was used to evaluation the quality of worksheet:

a. alidity
The components of the material should be based on state-of-the art knowledge (content validity) and all components should be based on consistently linked to each other (construct validity) (Nieveen, 1999: 127)

b. ractically
Teachers (and other experts) consider the materials to be usable and that it is easy for teachers and students to use the materials in a way that is largely compatible with the developers' intentions (Nieveen, 1999: 127)

c. effectiveness
The effective materials is consistency exists between the intended and experiential curriculum and the intended and attained curriculum (Nieveen, 1999: 127).

Instrument of these research is:

a. validation sheet
   validation sheet was used to estimate the validity of worksheet.
b. observation sheet
   observation sheet was used to estimate the practically of worksheet.
c. test
   test was used to measure the effectiveness of worksheet.

Result of the research project and discussion

Based on the evaluation of worksheet provided to colleagues at the time of plan, obtained some conclusions about the quality of the products development.

Table 1.
The result of the expert judgement

Worksheet in meeting:	Actual score			Avererage of actual score	Criteria
	Expert 1	Expert 2	Expert 3		
1	74	78	79	77,00	Valid
	Valid	Valid	Valid		
2	74	78	79	77,00	Valid
	Valid	Valid	Valid		
3	76	78	78	77,33	Valid
	Valid	Valid	Valid		
4	73	78	80	77,00	Valid
	Valid	Valid	Valid		

The results of the analysis conducted can be concluded that the developed student worksheet have met the minimum criteria for a valid, so it can be tested for the class to see other eligibility criteria in learning activities

Analysis on the practicality of learning is done on the learning observation sheet. The results of learning observation sheet are presented in Table 2 below.

Table 2.
The result of observation sheet

Meeting	1	2	3	4
Average scoreof each meeting	16,7	12,1	14,9	14,2
Category	Very practical	Practically enough	practical	practical
Average	14,48			
Category	Practical			

The results of the analysis conducted can be concluded that the developed student worksheet have met the minimum criteria to be used in practical learning activities.

While the results of the observation sheet was analyzed qualitatively learning to see the deficiencies in the form of qualitative devices suggestions from the observer to the next as a provision to revise the learning device.

The quality of student worksheet are also seen by the effectiveness of the device that is implemented in learning. The effectiveness of the learning device is seen through quiz questions presented each end of the meeting.

Table 3.
Student Test Result

Meeting	1	2	3	4
value	77,34	65,63	82,67	78,56
category	Effektive	Quite Effektive	Effektive	Effektive
average	76,05			
category	Effektive			

The results of the analysis conducted can be concluded that the developed student worksheet have met the minimum criteria effectively, so it can be said to be effective for use in learning activities

Conclusion

Based on the results of research conducted on student course differential equations and discussion can be drawn the conclusion that teaching differential equations using student worksheet developed meet a valid category, practical, and effective, so it is worth learning if used in differential equations.

Suggestion

The researchers propose some suggestions to consider:
1. student worksheets developed in the category of valid, practical, and effective so it needs to be used in the study of differential equations in the other class.
2. In developing student worksheet need for collaboration within a team of several experts, or peers, so that the learning can be generated devices with better quality

Bibliography

Brian Doig and Susie Groves. (2011). *Japanese Lesson Study: Teacher Professional Development through Communities of Inquiry*. [versi electronic]. MTED 2011, Vol. 13.1, 77–93

Butcher, C., Davies, C., Highton, M. (2006). *Designing learning from module outline to effective teaching*. London and New York: Routledge Taylor and Francis Group.

Chand, T. (2006). *Educational technology*. India: J. L. Kumar for Anmol Publications Pvt. Ltd

Chee, T.S. & Wong, A.F.L. (2003). *Teaching and learning with technology*. Singapore: Pretice Hall.

David Tall. (2008). *Using Japanese Lesson Study in Teaching Mathematics* (pp. 45-50). Scottland: The Scottish Mathematical Council Journal

Haynes, N.M, Ben-Avie, M.,& Ensign, J. (2003). *How social and emotional development add up*. New York: Teacher College Press.

Madsen, A.L & Baker, K. (1993). Planning and organizing the middle grades mathematics curriculum. Dalam Owens, D.T. (Eds.), *Research ideas for the classroom middle grades mathematics* (pp. 259-279). NewYork: Macmillan Publishing Company

Naggar-Smith, N. (2008). *Teaching foundation mathematics : a guide for teachers of older students with learning disabilities*. USA: Routledge

Nieveen, N. (1999). Prototyping to reach product quality. Dalam J.V. D Akker et.all (Eds.), *Design approaches and tools in education and training* (pp. 125-135). Netherlands: ICO Cluwer Academic Publishers

Rule, A C., Dunham, E., Stoker, J., et al. (2007). Preservice elementary teachers' reflective insights from teaching mathematics during an authentic early practicum experience [Versi electronik]. *Journal of Authentic Learning, 4, 48-58*

Skemp,R. (1971). *The psychology of learning mathematics*. New Jersey: Lawrence Erlbaum Associates, Publisher.

Sutherland, R. (2007). *Teaching for learning mathematics*. USA: Mc GrawHfill

Thiagarajan, S., Semmel, D., & Semmel, M. I. (1974). *Instructional development for training teachers of exceptional children: A Sourcebook*. Minnesota: Central for Innovation on Teaching the Handicaped

student worKsheet seminar UNY

ORIGINALITY REPORT

17%	13%	6%	10%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	math.coe.uga.edu Internet Source	5%
2	eprints.iain-surakarta.ac.id Internet Source	2%
3	www.scribd.com Internet Source	2%
4	Submitted to Sur University College Student Paper	2%
5	eprints.uny.ac.id Internet Source	1%
6	jurnalmahasiswa.unesa.ac.id Internet Source	1%
7	Submitted to University of Brighton Student Paper	1%
8	Submitted to Air Academy High School Student Paper	1%
9	Submitted to Universitas Negeri Surabaya The State University of Surabaya Student Paper	1%

10 Submitted to Swinburne University of Technology

Student Paper

1 %

Exclude quotes	Off	Exclude matches	< 1%
Exclude bibliography	On		