

Development of Innovative Teaching Materials through Scientific Approach

**Suarman
Hendripides, Nurul Hikmah**

Economic Education Studies Program, Universitas Riau
Pekanbaru, 28293, Indonesia
Email: suarman@lecturer.unri.ac.id

Abstract. This study aims to develop teaching materials of economic learning assessment through scientific approach. The research used Research and Development (R&D) method that developed by Thiagarajan, Semmel, and Semmel that includes defining phase, design stage, and development stage. Data were collected from the assessment of three experts through an expert validation sheet and responses from 40 students through student response questionnaire. Data analysis using quantitative descriptive technique. The result of the research showed that the teaching materials are suitable for learning through the scientific approach on the course of the Economic Learning Assessment. of material experts with an average score of 89.47% (very good) and student response results with an average score of 86.45% (very good). Some suggestions from the experts include in the teaching material description section added with illustrations in the form of drawings or schemes; and equipped with concrete examples in accordance with the contextual situation. While the suggestions from the students are also in line with the advice of the expert team that is also equipped with concrete examples to be more reproduced.

Keywords: *Assessment, Scientific Approach, Teaching Materials,*

1 Introduction

Development of teaching materials is done by a lecturer to solve the learning problem by paying attention to the target or the students and also adjusting to the competence that must be achieved (Haryanto, 2016) and also the learning innovation by the lecturer. Teaching materials are materials, information, tools/ media that used by lecturers to carry out learning including creating an atmosphere that encourages students to learn. The form of teaching materials can be printed and non-printed materials. Printed teaching materials may take the form of lecture material, problem solving guides, and learning guides, whereas non-printed teaching materials may take the form of audio, video/ film, or other multimedia required in the learning process.

The teaching materials are prepared with the objective of providing materials for learning in accordance with applicable curriculum demands taking into account the needs of students covering the characteristics and environment of the students. Teaching materials can help students find alternative of learning materials in addition to textbooks that are sometimes difficult to understand. Good teaching materials should always follow the development of technology, art and the reality of life in a society that is always global (Ho, et al., 2009; Jungnickel, 2009). The development of teaching materials by integrating the scientific approach is intended to produce teaching materials by applying several models with scientific approach and the use of technology as a media to innovative and interactive teaching materials.

The use of teaching materials in the learning activities not only looked at the activity of teachers, but also involved students actively in learning. Using teaching materials also creates an independent learning process (Sukiminiandari, et al., 2015). In learning using teaching materials, students learn individually in the sense that they can adjust their learning speed with their respective abilities. Students with fast learning ability will complete their learning ahead of their friends without any obstacles from their slower friends.

Learning innovation needs to be developed and implemented in order to prepare students of economics teachers who are ready to play themselves as educators (agent of education) as well as researchers (agent of research and development) and ready to face the challenges of the 21st century. According to Kennedy et al. (2016) basic skills are needed by educators related to these skills are: critical thinking, problem solving, collaborative learning, learner-centered and digital literacy teaching.

Development of this teaching material used scientific approach because it was expected to put more emphasis on personal experience of students on lecturing lesson. Teaching materials with a scientific approach is a learning that is designed in such a way that students can find facts, build concepts and theories with process skills and scientific attitude of the students themselves.

2. Methodology

This research used Re-search and Development (R & D) model, developed by Thiagarajan, Semmel and Semmel (1974) consisting of four stages known as 4-D model. In this study the 4-D model is modified to 3-D; the defining stage, the design stage, and development stage.

This research involves subject of research for limited trial, that was student of Economic Education Program, FKIP, Universitas Riau, class of Accounting Education and Economic Education/ Cooperative. The research instrument used an expert validation sheet and a student response questionnaire. Data obtained through questionnaires from material experts and student responses in the form of quantitative data transformed into qualitative data. Based on the results of validator assessment and student response questionnaire can be known the feasibility of teaching materials that have been made. Instrument assessment criteria using the criteria put forward Widoyoko (2012) as in Table 1.

Table 1. Rating scale criteria

Category	Value	Percentage (%)
Very Good	4	76 - 100
Good	3	51 - 75
Not Good	2	26 - 50
Bad	1	0 - 25

3. Results and Discussion

Development of Innovative Instructional Materials through Scientific Approach to the Economy Learning Assessment Class to Assessment System Material has through the stages of 3-D: 1) definition (define), 2) design (design), and 3) development (develop). Based on the results of research that has been done, explanation of the stages are as follows.

Definition Stage

At this stage, the researcher found one of the problems, namely the unavailability of Innovative Instructional Material Development through the Scientific Approach of Economics Learning Assessment on the Assessment System Material that can guide and assist students in the practice of developing HOTS (Higher Order Thinking Skills)-oriented assessment instruments. Based on these problems, then it is necessary to develop student teaching materials in implementing the assessment system based on curriculum of 2013 of 2017 edition. The form of these teaching materials is printed media in order to facilitate every student to be able to have it.

Stage Design

The design of learning materials should consider the feasibility aspects to be applied in the field. At this design stage there are four steps taken. The first step was the preparation of learning materials needs map by referring to the learning outcomes of Economic Learning Assessment subjects that exist in the Curriculum of KKNI (Indonesia National Qualification Framework). In this step can determine the number of learning activities to be made.

The second step, namely the formulation of items that aim to determine the title of learning activities in accordance with Achievement Sub of Learning or Competence Sub in Semester Learning Plan of Economic Learning Assessment Subjects. Teaching materials developed in this study consists of 6 parts with details are as follows: (1) Part One: The Concept of Learning Assessment, which consists of the Learning Activity 1. Definition of Assessment 2. Appraisal Approach, 3. Assessment Principles, and 4. Assessment System (attitude, knowledge and skills) ; (2) Part Two: Preparation of the Test Lattice Grid; (3) Part Three: Practice of Preparing the Assessment Instrument (attitude, knowledge, and skills); (4) Section four: Testing Instruments; (5) Section Five: Implementation and Test Practice; and (6) Section six: Utilization and Follow-up of Assessment Results.

The third step, namely the selection of presentation format; which aims to produce learning materials that are good, interesting and easy to apply. The writing of this manuscript refers to the study of making libraries of teaching materials such as criteria of good teaching materials, compulsory components, feasibility aspects, and so on. The selection of teaching materials presentation format refers to the Guidebook of Teachers Incentive Program and Learning Guidelines published by the Directorate of Learning, Directorate General of Learning and Student Affairs of the Ministry of Research, Technology and Higher Education, in 2016.

The fourth step, namely the script writing teaching materials. The teaching materials was prepared with the help of Microsoft Word applications. Writing of teaching materials was divided into 3 stages, namely: 1) Writing content of teaching materials consisting of the title of teaching materials, learning activities that contain material descriptions, summaries, and exercises, 2) Writing introductory pages containing cover, introduction, and list content, 3) Editing, after the draft of teaching materials is written and then discussed with members of the research team to get suggestions and inputs as materials for improvement.

Development Stage

This stage of development was a stage that aims to produce the final product after going through a process of validation, revision, and limited trials in the field. In this development stage, the teaching materials are validated by the material experts from the academic/ lecturers. Based on the results of the assessment and comments/ suggestions provided from the expert validation sheet, the next teaching material was revised and then tested is limited to the students as users to get input directly.

Expert Validation Results

Material validation aims to obtain input from the material expert so that it can be used as an improvement material so that the validity of the resulting product can reach the standard. Assessment by material experts includes aspects of teaching material structure, material writing organization, and language.

The feasibility of teaching materials can be known from the validation of Lecturers as follows: Teaching materials can be said to be suitable if the percentage of feasibility on the aspects of teaching materials structure, material writing organization, and language reaches $\geq 76\%$ (Widoyoko, 2012). The data from the results of expert material assessment can be seen in Table 2. Based on the assessment of material experts as shown in Table 2 shows that the teaching materials developed in this study average very good for each aspect so that it can be said feasible to be forwarded to the limited test phase.

Table 2. Material Expert Assessment Data of Each Aspect

Validator	Assessment Results of Each Aspect			Category
	1	2	3	
A	88,17	83,45	90,12	Very Good
B	90,56	88,78	89,19	Very Good
C	91,34	92,12	91,24	Very Good
Average Score	90,02	88,11	90,18	Very Good

As for suggestions from the material experts as a material improvement, namely on the part of the material description of teaching materials added by: 1) illustration in the form of drawings or schemes; 2) is given examples concrete in accordance with the contextual situation. While in terms of structure and language there is no principle except in terms of improved formatting and typo format.

Results of Student Response

After passing the validation by the material expert and declared eligible to be used as a learning material, then the teaching material was tested on the students who have taken the course of Economic Learning Evaluation last semester, to get the assessment response from the students. To get the result of student response, students was required to fill out student response questionnaire given when the students have gained knowledge and learning using teaching materials. After all students fill out the response questionnaire, then the student response questionnaire was calculated and analyzed. The assessed aspects of teaching materials are the presentation of materials, language, and benefits.

Based on the assessment from the student response questionnaire it appears that the teaching materials developed in this study are rated in very good

category for each aspect so it can be said worthy to be used as teaching materials. The complete student response was shown in tables 3 and 4.

Table 3. Student Response Data of Each Aspect

Aspect of Assessment	Score Total	Percentage Total	Category
Presentation of Material	520	81,25	Very Good
Language	560	87,50	Very Good
Benefits	580	90,63	Very Good

Table 4. Overall Student Response Data

Respondents	Statement Total	Score Total	Percentage Total	Category
40	12	1.160	86,45	Very Good

Suggestions and feedback from students as users who have summarized that: 1) In relation to the presentation of the material in general respondents said it was very good, but it would be better for the material that requires training as in the preparation of instruments starting from the grille is equipped with examples and attached operational verbs for each aspect (cognitive, attitudes and skills), as well as the analytical material of the experimental knowledge appraisal trials required further explanation along with the calculations example. Next input from the respondent is: an explanation of the preparation of lattice-based HOTS (Higher Order Thinking Skills) test is somewhat difficult to understand, especially for the C4, C5, and C6 categories. The respondents' suggestions should be specific about the HOTS-based test-making guidelines should made its own teaching materials; 2) Relating to the language aspect in principle no one gives input except in relation to typographic and print outs that are less readable; and 3) From the aspect of benefits, most respondents give positive response and feel the benefits of this resource. The respondent's expectation because this new material covers one of the basic competence of the Lecturing Material of Economic Learning Assessment, the respondent expects to be made a comprehensive teaching material from the whole subject matter or basic competence of this course.

The material expert gives an assessment of three aspects, namely the structure of teaching materials, the organization of material writing, and the language. Based on the data obtained from the questionnaire, the feasibility of teaching materials to the three aspects reached the average score percentage 90.02, 88.11 and 90.18 means it is very suitable for use in learning. However, revisions are still in accordance with the advice and input of expert material. In addition to the assessment from the expert point of view, also conducted a limited trial in the field with the subject is the student as a potential user.

Based on limited trials of 40 respondents of students of Economics Program Universitas Riau academic year 2017/2018 has been obtained the average percentage of the feasibility score of 86.45% which means that the material

is very worthy of use as a teaching material for the study of Economic Learning Assessment on Assessment System Material. From the assessment of the two perspectives, it can be concluded the teaching materials of Assessment System in the course of Economic Learning Assessment was appropriated to be used as a teaching material for the students of Economics Study Program which take the course of Economic Learning Evaluation, and it was expected to facilitate the performance of the lecturer in assisting the students and also expected to motivate students to learn more independently.

The results of this study are consistent with research conducted by Sukiminiandari, et al (2015); and Poerwanti Hadi Pratiwi, et al (2016) that teaching materials are designed as supporting and alternative teaching materials for scientific-based learning in learning. Besides, it is mentioned also that the importance of teaching materials as instructional materials in accordance with the needs of the curriculum and characteristics of learners is also put forward by Widyaningrum, Sarwanto, and Karyanto (2013) through the findings of the research they conducted. Conclusion from the research that the teaching materials can be made as wrong one reference in developing teaching materials. However, skills are required in making teaching materials, as well as validation from competent experts to produce good teaching materials.

Based on the results of this study, an average score of 89.47% is obtained from expert judgments. This means that the material produced substantially/material is feasible to be used in the learning process. This is also supported by the result of the student response of 86.45%. Teaching materials produced in this study of course is also supported by appropriate learning methods for teaching materials can be used effectively and effectively students using a scientific approach. This is in accordance with the results of research conducted by Fadillah and Jamilah (2016) that the use of teaching materials should be combined with the use of learning models for teaching materials developed can be used optimally.

Based on the curriculum analysis done at the initial stage of this research (defining phase) mentioned that the curriculum of KKNI (Indonesia National Qualification Framework) which is currently used in Economics Education Program, Faculty of Teacher Training and Education, Universitas Riau based on learning outcome or learning achievement that must be mastered by students after following certain courses. For this reason, prospective teachers who will implement Field Experience Practice in partner schools have the obligation to master the skills in carrying out the assessment .

Students who will perform Field Experience Practice must be prepared in accordance with the demands on the ground (partner schools). The importance of preparing students who will carry out Field Experience

Practice is also put forward by Hadiprayitno, et al (2016) that the result of professional competence analysis of Field Experience Practice students on five aspects, that is able to relate between the concepts taught to the real life environment, convey the material easily understood by the students, apply the scientific method according to the subject matter, deliver the material attractively and appropriately, carry out an authentic assessment and selection of language that is both understandable and easy to understand.

The results obtained in this study provide an illustration that to meet the demands of students' pedagogic competence, especially in carrying out authentic assessment and also at the same time preparing Field Experience Practice students in designing learning appraisal instruments need to be improved, because indirectly play a role in improving the quality of teacher training institute graduates. Lecturers as teachers, mentors, and facilitators should continue to innovate in preparing teaching materials that are certainly needed by the students

4. Conclusion

The learning aids were designed using the Re-search and Development (R & D) model consisting of four stages known as 4-D models and modified into 3-D, then in the validation by experts/ academics and asked student response through questionnaire. The results of the expert assessment of the material with an average score of 89.47% (very good) and the results of student responses with an average score of 86.45% (very good), thus the teaching material were feasible to use in learning in course Learning Assessment of Economic.

The results of this study also add empirical evidence that teaching materials were needed by students as a guide or guidance in lecturing activities. In addition, several things that need improvement done in order to obtain maximum results when students use this teaching materials is among designing of teaching materials in accordance with the structure or organization of material writing, using language that is easy to understand, and provide examples of questions that vary according to the concept and assessment system to students can implement independent learning individually or in groups effectively and efficiently.

For researchers who are interested in the research of designing teaching materials with R & D model, especially related to Pedagogical and Learning materials besides validating with academic team, should also be involved relevant teachers as validation team, and test try not only done in limited but implemented in full and repetitive.

References

- Akbar, S., 2013, Instrumen Perangkat Pembelajaran. PT Remaja Rosdakarya, Bandung.
- Fadillah, S., Jamillah., 2016, Pengembangan Bahan Ajar Struktur Aljabar untuk Meningkatkan Kemampuan Pembuktian Matematis Mahasiswa, *Jurnal Cakrawala Pendidikan*, 35(1), 106-113.
- Guliker, J.T., Bastiaens, T.J., Kirschner, P., 2004, A Five Dimensional Framework for Authentic Assessment, *The Journal of Educational Technology*, 52, 67-86.
- Hadiprayitno., 2016, Kompetensi Profesional dan Pedagogi Mahasiswa dalam Pelaksanaan Program Pengalaman Lapangan, *Jurnal Cakrawala Pendidikan*, 35(2), 292-300.
- Haryanto., 2016, Pengembangan Bahan Ajar Cetak, UNY Press, Yogyakarta, 105-133.
- Heru, P., Insih, W., 2016, Pengembangan Bahan Ajar dan Instrumen Penilaian IPA Tema Indahnya Negeriku Penyempurnaan Buku Guru dan Siswa Kurikulum 2013, *Jurnal Prima Edukasia*, 4(1), 67-78.
- Ho, S.S.S., Kember, D., Lau, C.B.S., Yeung, M.Y.M.A., Leung, D.Y.P., Chow, M.S.S., 2009, An Outcomes-based Approach to Curriculum Development in Pharmacy, *Am J Pharm Educ*, 73(1), 14-19.
- Jungnickel, P.W., Kelley, K.W., Hammer, D.P., Haines, S.T., Marlowe, K.F., 2009, Addressing Competencies for the Future in the Professional Curriculum, *American Journal of Pharmaceutical*, 73(8), 1-15.
- Kennedy, I.G., Gloria, L., Hélie, J., 2016, Education Skills for 21st Century Teachers: Voices From a Global Online Educators' Forum. SpringerBriefs in Education, London.
- Sukiminiandari, Y.P., Budi, A.S., Supriyati, Y., 2015, Pengembangan Bahan Ajar Pembelajaran Fisika dengan Pendekatan Saintifik, *Prosiding Seminar Nasional Fisika*.
- Thiagarajan, S., Semmel, D.S., Semmel M.I., 1974, *Instructional Development for Training Teacher of Exceptional Children: A Source-book*. Minneapolis, Indiana University.
- Widoyoko, E.P., 2012. *Evaluasi Program Pembelajaran*. Pustaka Pelajar, Yogyakarta.
-