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DEVELOPMENT OF TEACHING MATERIALS "QUANTITATIVE RESEARCH METHODOLOGY FOR STUDENTS BASED ON QR CODE

Etin Solihatin[1], Roby Ibnu Syarifain[2], Jhoni Lagun Siang[3], Raharjo[4], Moch. Sukardjo[5]

[1,4,5]Universitas Negeri Jakarta

[2]Universitas Padjadjaran

[3]Institut Agama Kristen Negeri Manado

Email: [1]etin_solihatin@unj.ac.id, [2]syarifainroby@gmail.com,

[3]jhonilagunsiang@yahoo.co.id, [4]raharjo@unj.ac.id, [5]msoekardjo@unj.ac.id

ABSTRACT

The problem in research that you want to find a solution to is 1) How is the development of "Quantitative Research Methodology" teaching materials for students based on QR Code? 2) how is the effectiveness of "Quantitative Research Methodology" teaching materials for students based on QR Code? The operational objective is to improve quantitative research proposals. The research method used is Research and Development with the Dick and Carey's model. The results showed that the average learning score of the research methodology, after using QR Code-based research methodology teaching materials, was higher than the learning outcomes before using QR Code-based quantitative research methodology teaching materials. $7 = 8.41 > 7.03$. Based on the t-test calculation, it is obtained tcount = $(11.67) >$ t table (2.05). Which means a significant increase in learning outcomes Research Methodology using QR Code-based Quantitative Research Methodology teaching materials. A combination of text and QR Code leads to better learning than just text. Which means that the results of learning Research Methodology will be better if QR Code-based Quantitative Research Methodology teaching materials are used, when compared to reading the material alone.

INTRODUCTION

Good education is education with complete supporting factors such as semester learning plan, learning media, evaluation tool, both main, and

supplementary book. Inside learning process with various method according to learning material, media, both supporting facilities and infrastructure.

But in reality, learning in the "Research Methodology" course with a weight of 3 credits for students, there are no supporting instructional materials according to the semester lesson plans made by the lecturers, as well as student needs, and Indonesian National Qualifications Framework standards. So far, learning uses various supporting books, according to the material to be taught. Lecturers are busy looking for compilation materials for the material, so that when learning they seem not ready.

Therefore base on urgent problem, research and development it is needed to be carried out. This research is supported by a letter (196/UN39.5.PS/TU/2020) from state university of Jakarta Magister Program which said that research should produce instructional materials at 8 January 2020. Ministry of Research and Technology said that every research must have product such as books or teaching material with ISBN, journal article and Intellectual Property Right.

Teaching material produced must be accordance with 4.0 industrial revolution, including QR Code-based teaching material. QR Code is a matrix and dimensional symbol composed of squares arranged in a pattern. The extent of this square pattern will determine the version of the QR Code (ISO / Iec 18004, 2000). QR Code (Quick Response Code) is a two-dimensional barcode. Basically, QR Code is developed as a code that allows its contents to be translated at high speed (Rouillard, 2008).

The differences in teaching material product that produced in this research include theory and practices example such as quantitative research proposals. How to make instrument, examples, and more. In general, research method books are only theoretical. Thus it is expected that students can understand quickly and not misconceptions. This is because learning theory is accompanied by concrete examples. Furthermore, it is hoped that learning research methodology will be be relatively easy and fun. However, only quantitative research methodology, this is to be more focused and in-depth.

Based on the limitation of the problem mentioned above, the problem of this research can be formulated in two point. Firstly, is how to develop QR-code quantitative research methodology instructional materials. Second, is the efectivity of QR-code quantitative research methodology instructional materials toward college student.

This research is a development research that will produce "Quantitative Research Methodology" instructional materials for students based on QR Code with two objectives. First objective is to describe the procedure for developing QR-code based quantitative research methodology instructional materials. Second objective are to acquired data about the effectivity of QR-code based quantitative research methodology instructional materials.

The results of this study are expected to be useful for improving the learning outcomes of "Quantitative Research Methodology", and producing instructional materials for "Quantitative Research Methodology" based on QR Code.

The practical benefits of this research finding can be used as a reference material for lecturers to complete the learning process by making QR Code-based instructional materials through research. Thus researching as well as making teaching material products. Gradually, the learning that is being taught will be relatively better. Thus in the end the task of Tri Dharma especially the fields of research and education / learning will continue to be fulfilled properly.

LITERATURE STUDY
Research on the development of instructional materials "Quantitative Research Methodology" for students based on QR Code is in line with the Jakarta State University Research Strategic Plan, particularly theme 1 on educational technology. (2016-2020: 10). Besides that, the research roadmap for the Education Technology Study Program is about "learning" research.

Some Research Result in Journal Article

No	Years	Research in journal article	Result
1	2009	Teachers Perception of The Role of Media in Classroom Teaching in Secondary Schools. The Turkish online Journal of Educational technology, 8(1) (Taiwo, 2009:75)	There is a significant difference between students who have a high intensity of utilization of learning resources and students who have a low intensity of utilization of learning resources regarding learning achievement
2	2006	Utilisation and Bonefits of Instructional Media and Teaching Social Studies Course as Verceived by Omani Student. Malaysian Online Journal of Instructional	The use of textbooks in the classroom is still very dominant
3	2010	Hu,L; Wang, Y; Li; D; and Li, J. A Hubrid client/server and browser/server mode-based universal mobile Ticketing System. In IEEE International Conference on Information Management and Engineering, Pages 691-695. (Hu, L; Wang, Y; Li & Li, 2020)	This system will provide convenience and comfort for users in making ticket transactions, thus implementing a data security system on tickets using QR Code media.
4	2011	Vendini Release New QR Code Capapibilty for Mobile	The customer response is very positive to the use of

		Ticketing. Journal of Communications, Pro Quest Document ID 900988114 (Wireless News, 2011)	QR Code in the form of tickets, because they find it easier by only showing proof of the QR Code ticket from the smartphone they are carrying.

Based on several studies of research results that have been published in journals, the novelty of this research is QR Code-based instructional materials. So far, QR codes are used in electronic companies in Japan. Thus, searching for QR Code-based instructional materials will be faster.

Teaching Material Development

The focus of development which is devoted to research and development and the products produced is expected to be able to answer various needs related to learning. According to Spranger and Wilhelm Dilthey, quoted by Semiawan, development is triggered by the existence of "Verstehen" as an understanding and sensitivity to symptoms, events and incidents that are the focus of attention in certain situations (Semiawan, 2008). Sensitivity is the basis for development in understanding each condition, so that the products of development research are needed to answer the demands of improving the quality of knowledge, attitudes, and skills.

According to Sanjaya (2010), learning materials are anything that becomes the content of the curriculum has to be mastered by students according to competencies in order to achieve competency standards. This means that instructional materials are an important part of the learning process.

According to Purwanto and Panen P. (2001) instructional materials are systematically designed based on a certain curriculum, and are packaged in the smallest learning unit, and allow to be studied independently in a certain time. Prastowo (2013), Dick & Carey (2009), instructional materials are all forms of materials used to assist lecturers / teachers in carrying out learning activities.

Ministry Research and Technology (2008); Muslich (2010) states that instructional materials are a set of knowledge, skills, attitudes that students must learn according to basic competencies in order to achieve predetermined competency standards. So teaching materials are lecture materials that are systematically arranged which are used by lecturers and students in the lecture process.

Instructional material or learning materials also include visual aids such as hanouts, overhead slides, which consist of text, diagrams, images, photos, other media such as audio, video and animation (Butcher and Davies, 2006). Teaching materials / instructional materials seen as materials provided for learning needs which include textbooks, videos, audio tapes (Kitao, 2012). So what is meant by instructional material is a set of materials that are

systematically arranged for learning needs, both printed material and audio, visual, multimedia and Web-based material.

The success in achieving learning objectives has many factors, one of which is teaching materials or teaching materials. Teaching materials must be viewed as anything that can be used by lecturers and students to facilitate learning activities. Hamdani defines teaching materials as a set of materials that are systematically arranged written or unwritten, so as to create an environment or atmosphere that allows students to learn (Hamdani, 2011).

Instructional materials could be made by lecturer or downloaded from internet but has throughout the study of syllabus. Instructional materials determine success in learning process. Instructional materials has great role in crearing conducive learning atmosphere. Therefore, lecturers' skills are needed in developing interesting, varied, not monotonous instructional materials that could increase student learning enthusiasm.

College student could gain knowledge only from lecturer but also from various supplementary learning sources. Learning sources according to the Association for Educational Communication and Technology (AECT) in Sitepu consist of data, people and certain forms that could be used in learning, either separately or in combination which could make it easier for college student to achive learning outcomes (Sitepu, 2014: 19).

Yamin (2007) defined self-learning as learning activities that was carried out by student independently to achieve their learning goals with freedom in determining learning obkjectives, direction, sources.

Hargis (2000) states that there are four benefits associated with student independence in learning activity:

1)   Student with high independence tend to learn better at self-learning compared controlled learning.
2)   Student with high independence has ability to monitor, evaluate, or manage their learning activity effectively.
3)   Self-learning is able to reduce learning time requirement to complete learning process
4)   Student with high independence able to manage learning process and learning time effectively

According to Prawiradilaha (2012), there are several absolute requirement atself-learning consist of delivery and activites consist of

1)   Learning process objectives formulas (general/ specific) or compentencies must be clear.
2)   Formulation of syllabus have to suitable with the learning objectives/ competencies (competency-based curriculum).
3)   The availability learning program such as various forms of material, training, games, virtual laboratory, and learning resources

4)   Materials developments are package into small segments. The learning design principle applied is the analysis of tasks and levels of learning. This is done by referring to competencies, so that the coverage of each segment of teaching material is in accordance with specific objectives. After that, the material is categorized into a variety of knowledge in order to determine the appropriate presentation technique.

5)   Availability of a tutor for online questions and answers

6)   The learning activity guide itself consist of:

a)   Learning cues such as verbal guides that emphasize how students absorb the material, such as inserting conclusions, certain warnings and certain signs

b)   Navigation such as facility that digitally available and optimized therefore student could explore the teaching material yourself through visual symbol such as icons

c)   Clear and immediate feedback

d)   Self-pacing

7)   Learning assessment

8)   assessment and improvement program.

Student-centered learning allows students to build knowledge in their own minds. Lecturers can facilitate this process by presenting meaningful and relevant information for students, by providing opportunities for students to find and apply their own ideas and / or strategies for learning. Learning theory based on this idea is called constructivist learning theory (Slavin, 2011: 3).   The main theories associated with the constructivist approach are Piaget and Vygotsky. These two approaches are associated with constructivism, Piaget with cognitive constructivism, namely how learners develop cognitive abilities and Vygotsky with social constructivism emphasizes how meaning and knowledge grows from social interactions (Khine, 2006).

QR Code

QR Code is a two-dimensional matrix symbol consisting of a string of squares arranged in a more square pattern big. The extent of this square pattern will determine the version of the QR Code (ISO / Iec 18004, 2000).

Quick Response Code or commonly referred to as QR Code is a two-dimensional barcode that was introduced by the Japanese company Denso Wave in 1994.This type of barcode was originally used for inventory data collection for vehicle spare parts production, and is now used in various fields of business services and also for marketing and promotional activities. Basically, the QR Code is developed as a code that allows its contents to be translated at high speed I (Rouillard, 2008). The advantage of QR Code is that it is able to store information horizontally and vertically. Therefore, QR Code can accommodate more information than one-dimensional coding (David, 2007).

Currently, using QR Code has been implemented in the form of QR Code Raider and QR Code Generator applications, so that it is very easy for someone to make information in the form of a QR Code and get the information they want to know just by scanning and scanning data through the media from a smartphone camera. (Anastasia, Istiadi, and Hidayat, 2010).

RESEARCH METHOD
This research use *Research and Development methodology based on* Dick and Carri's (2009: 6-8). Dick and Carey's methodology covers ten stages which can be illustrated in the diagram below.
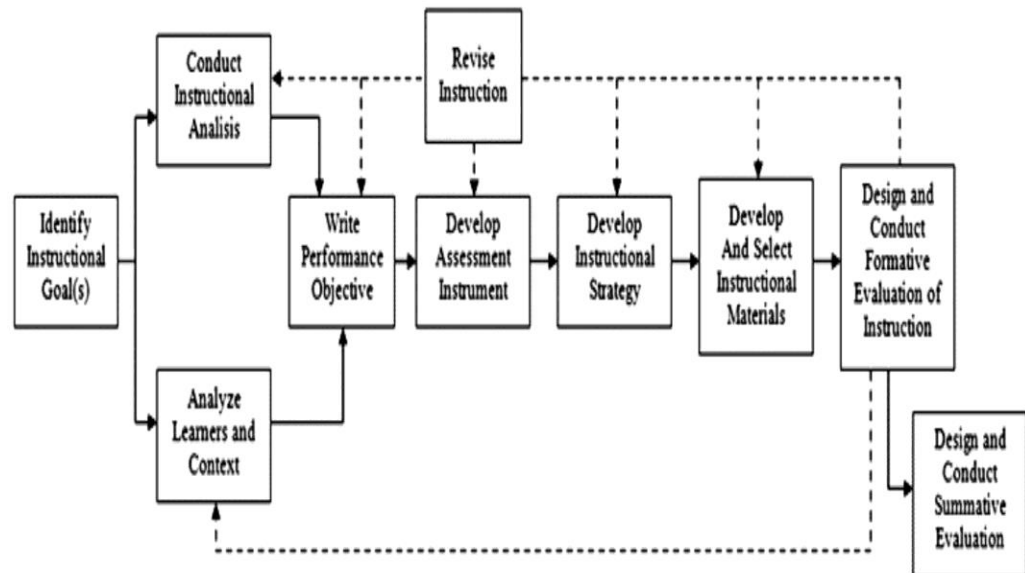

Diagram 3.1. Model Dick and Carey's

QR-code instructional materials are developed in ten stages. The first stage is a needs analysis to determine learning objectives. Needs analysis is carried out by observing lecturers on campus and interviews to determine what students can do after participating in learning that can help researchers formulate the most appropriate and useful in the process of developing QR-code instructional materials.

Second stage is carried out by doing learning analysis. The function of this stages was carried out to identify student skills that would be reached in learning and determine the requirement of skills and knowledge to achieve goals.

The third stages is analyzing students and the environment, which is to identify students' individual qualities therefore they could be used as a guide to describe learning management strategies.

The fourth stage is specify learning objectives to understand material that would be learnt by students and provided facility in achieving learning goals. College student has to master instructional objectives based on competences on instructional analysis.

The fifth stage is develop an assessment instrument as a signpost to determine the appropriateness of student performance in objectives. Students' success in this test determines whether the student has achieved the specified goals or not.

The sixth stage is developing teaching materials which include pre-instructional activities (motivation, objectives and behavioral input), presentation of information (instructional sequences, information, examples), student participation (practice and feedback), testing (pretest and post-test).

The seventh stage is to implement a learning strategy through quantitative research methodology teaching materials. In this learning strategy, it explains the general components of a learning material device and develops the material procedurally in order to find it easier to learn.

The eighth stage is designing and conducting formative evaluation to identify whether learning is working effectively. The results of formative evaluation can be used as input or input to improve the draft program, in other words, because through formative evaluation, there will be found deficiencies in learning activities. so that these deficiencies can be corrected.

The ninth stage are revises the learning program with the aim of perfecting QR Code-based teaching materials, so that they are more attractive and effective when used, making it easier to achieve predetermined learning objectives.

Tenth stage are designing and developing summative evaluations. Summative evaluation is an assessment carried out at the peak of the Dick and Carey model activity. Where the assessment decisions are based on effectiveness and efficiency in learning activities. Therefore, summative evaluation is directed at the success of achieving the stated goals.

Reliability Test by Experts

Data sourced from linguists, media experts and material experts. Linguists validate the systematics and language style of QR Code-based teaching materials, media experts validate the media display that has been developed thoroughly by experts in the field of educational technology. Material experts validate the adequacy of the material in teaching materials. The data used in this study is in the form of test results data using a feasibility test instrument in the form of a questionnaire. The data obtained from the questionnaire is in the form of expert test data. From this data, an assessment and input can be obtained that can be used as material for improvement or revision of teaching materials.

RESULT AND DISCUSSION
RESULT

Based on the instrument of analyzing the needs for developing teaching materials "Quantitative Research Methodology" based on QR Code, through

interviews and observations to research methodology lecturers and students (students). From the results of the needs analysis it was identified that the implementation of research methodology learning, lecturers / educators still experience difficulties in learning according to the needs of students. This has an impact on the learning process to be passive, not communicative, so that students feel bored, learning is considered difficult, and lecturers (educators) support the provision of QR Code-based quantitative research methodology teaching materials.

The result of students' need analysis was identified that they were still having trouble making a research proposal. In fact they support learning quantitative research methodologies with QR code, therefore student could study everywhere and every time with QR-code

Therefore, the research team is interested in making teaching materials in order to activate students in the learning process. The research team hopes that the use of QR Code-based quantitative research methodology instructional materials is expected to make it easier to understand abstract concepts and learning materials that are realized in concrete forms, with several examples.
First, researcher identified learning general destination based on needs analysis with learning outcomes:

1)   Identifying various problems, existing research methods there, such as quantitative research, development research, qualitative research.
2)   Review research articles that have been conducted by previous researchers to see the novelty of the research that will be carried out.
3)   Compiling research ideas and designs through the making of research proposals according to the Educational Technology area of interest to each.

Needs identification is done by field study. At the planning stage, it is carried out by analyzing the use of teaching materials on the campus of the State University of Jakarta. Field situations are used to see the situation on campus directly by conducting questions and answers to the parties involved. In this case the lecturer (educator) of the research methodology course and several students (students). From the identified data, the researcher concluded that there had never been any teaching materials for quantitative research methodology based on QR Code, even though classroom learning used other research methodology books.

Second is doing a learning analysis consist of classified learning objective that already obtained. In learning process, various sources of research methodology books are used, not books made by the lecturer (educator) who teach the subject, according to the RPS made.
Third is analyze the characteristics of college student in the environment in the form observational regarding their educational background. Many magister students of education technology did not has education technology background when they were in bachelor.

Fourth is indicator formulated. Based on the results of the learning analysis, competencies or instructional objectives that are controlled by students are developed to achieve instructional goals. In formulating indicators that are specific or in the form of achievement criteria in accordance with basic competencies.

Fifth, develop developing instruments or test kits. Evaluation sheet on the pretest and post-test function to measure the ability of students in learning QR-code based quantitative research methodologies.

Sixth, developing teaching materials. The teaching materials used are the development of QR Code-based teaching materials. Teaching materials are used to motivate students and are expected to contribute to the implementation of learning quantitative research methods, facilitate students' learning and increase the absorption rate of quantitative research methodology material. Along with the increasing level of absorption of learning materials, student learning outcomes also increase.

Seventh, developing and selecting learning media. At this stage the researcher designed a learning program by implementing a learning strategy in the media to be used, the media developed was based on QR Code. With media that is attractive and easy to understand, it is hoped that it can be a solution to the limitations of learning media.

Eighth, designing and developing formative evaluations. After the draft or design of the learning program has been developed, the next step is to design and carry out a formative evaluation. Formative evaluation is carried out to collect data related to the strengths and weaknesses of QR Code-based teaching materials. The purpose of formative evaluation is to improve or assess the progress of a product and its design or design. The results of the formative evaluation process can be used to determine the feasibility of a product and its design or design.

Ninth, revising learning. After the researcher conducts a formative evaluation, the next step is to make revisions. The data obtained from the formative evaluation procedure are summarized and interpreted to determine the weaknesses of the QR-code based research methodology teaching materials. After the trial, the teaching materials will be revised according to the input and results obtained.

Tenth, designing and implementing summative evaluations. Summative evaluation is an assessment made at the peak of the activity.

Test of Research Instrument Requirements

The instrument for the feasibility of displaying teaching materials for quantitative research methodology based on QR Code by students (students) was tested for its validity and reliability. Of the 15 statement items, the

numbers declared invalid (dropped), namely item number 4 and number 9. Thus, 13 numbers were declared valid.

Based on the calculation of the reliability of the instrument, the feasibility of displaying teaching materials for quantitative research methodology based on QR Code, by students, by calculating its reliability r_{11} = 0,940 inside category (0.800 – 1.000), then the instrument has very high reliability.

The instrument of learning outcomes test for quantitative research methodology before being used to search for data in the field, first tested its validity and reliability.

Based on the initial test instrument learning outcomes of quantitative research methodology based on QR Code, there are 25 items (questions). Based on the results of the calculation of the validity test, the item items dropped (declared invalid) are questions number 4, 6, 11, 19, 23. Thus, there are 20 valid item questions that can be used further.

From the calculation of the reliability results r_{11} = 0.992 termasuk dalam kategori (0.800 – 1.000), then the instrument has very high reliability.

Test Data Analysis Requirements

Based on the calculation of the normality test with the Lilliefors formula, data on learning outcomes of research methods before using QR Code-based research methodology teaching materials can be assessed as L_{count} of 0.128 and L_{table} for n = 45 with a significant level of 0.05 is 0.132, then L_{count} <L_{table}. Thus, it can be concluded that the data on the results of learning research methodology before using quantitative research methodology teaching materials based on QR Code are normally distributed.

Based on the calculation of the normality test with Lillefors data on the learning outcomes of research methodology after using QR Code-based research methodology teaching materials, it is found that $L_{count\ is}$ 0.126, with L_{table} for n = 45 with a significant level of 0.05 is 0.132, then L_{count} <L_{table}. Thus, it can be concluded that the data on the learning outcomes of research methods after using quantitative research methodology teaching materials based on QR Code are normally distributed.

Based on the results of the homogeneity test F_{count} (1.05) <F_{table} (1.65), then the population variation between groups 1 and 2 (before and after using QR Code-based quantitative research methodology teaching materials is homogeneous.

Data Analysis of Research Results

To see the effectiveness of QR Code-based quantitative research methodology teaching materials, a pretest was carried out on 45 students. The scores of the research methodology learning outcomes before using QR Code-based

quantitative research methodology teaching materials were: (on average) the learning outcomes of the research methodology were 7, 03 and standard deviation (SD) = 0.7103. While the learning outcomes of the research methodology after using QR Code-based quantitative research methodology teaching materials (average) are 8.41 with standard deviation (SD) = 0.6932. - the average learning outcomes of research methodology using quantitative research methodology teaching materials were higher (8.41> 7.03) that methodsdo not use quantitative method teaching materials (calculation results see attachment).

Based on the t-test calculation, it is obtained t_{count} of 11.67 with t_{table} of 2.05, then t_{count} (11.67)> t_{table} (2.05) means that there is a significant increase in learning outcomes of research methodology using methodological teaching materials. Quantitative research based on QR Code.

Researchers concluded that the use of quantitative research methodology teaching materials based on QR Code, made it easier for students to understand learning materials and encouraged reading diligently.

The findings of the research team are in line with Meyer (2001: 63) that a combination of text and visuals leads to better learning than just text. This is in line with research conducted by Tricia Bingham and friends (2016: 5) that the use of media is very effective in use, because this media integrates text, images and narration.

CONCLUSION
From the results of the research that has been carried out, it can be concluded that there was increasing of learning outcomes averages from 7.03 before using QR-code based quantitative research methodology instructional materials to 8.41 after using QR-code based quantitative research methodology instructional materials. Based on t-test, obtained t_{count} (11.67) is higher that t_{table} (2.05) that indicated there was significant improvement of learning outcomes by using QR-code based quantitative research methodology instructional materials. In other word the combination of text and QR-code leads to more efficient learning process that by using text only. Which means that learning research methodology result would be better if QR-code based quantitative research methodology instructional materials are used compared to the conventional instructional material alone.

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