Research article

Designing Interactive Multimedia Courses Using STEAM Education

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Abstract.

The Department of Design at the State University of Malang, Indonesia, has four study programs. Two of these are professional design study programs: the visual communication design undergraduate study program and the animation game diploma. In the curriculum of these two study programs there are interactive multimedia courses. With the number of students ranging from 750 at minimum, it is necessary to design a capable and innovative learning model for these interactive multimedia courses. STEAM education can be used as a framework to develop a lesson plan that is adaptable, benchmarked, and strongly reinforces learning standards in a unique and engaging way that improves student competence in the world of design professionals. This was descriptive research which used a procedural model development design. Borg and Gall explained that design development can be carried out through several stages, which were those used in this research, namely preliminary studies, research planning, initial product development, limited field tests, limited field test revisions, wider field test, feasibility test, revision of the results of the feasibility test, and dissemination and socialization of the final product. As a result of this research, a learning innovation was produced which combines several media and platforms, such as presentations, teaching materials, videos, mobile applications and WhatsApp. This learning innovation was implemented in the UM learning network information system (SIPEJAR) and the APK mobile application.

Keywords: STEAM education, learning network information system, mobile application

1. INTRODUCTION

Universities in their educational programs are always required to progress in their teaching, so as to produce graduates who are fast on time and of high quality. The existence of educational rules or guidelines so that learning can produce graduates who have an attitude, skill, and creativity, as in the Decree of the Minister of Manpower of the Republic of Indonesia, Number 107 of 2018 concerning Indonesian National Work Competency Standards (SKKNI) Category Information and Communication Class

Principal of Motion Picture Production, Video and Television Programming, Sound Recording and Music Publishing in Multimedia.

The Interactive Multimedia Course (MMI) is one of the spearheading courses in the Department of Art and Design where 2 study programs namely Visual Communication Design (DKV) and Game Animation (GA) study programs in the 2018 curriculum contain this course. Based on this, it is necessary to design a special teaching material that is able to accommodate the outcomes of this Interactive Multimedia course. The MMI course is a project base course where students are expected to find clients or real problems that will be raised as the final result of this course.

Submission of material in MMI courses is carried out through the preparation of teaching materials/modules at each meeting followed by material presentations. In accordance with the competency target of SKKNI Dikti through LSP P1 UM, there has been a Competency Test Scheme in the Interactive Interactive Multimedia field as a benchmark for implementing competency certification for students at the State University of Malang.

Reflecting on this, improving the quality of material in MMI courses is very necessary to be relevant to the competencies allocated according to the SKKNI in the certification test for the Competency Test Scheme for Interactive Multimedia Interactive as well as in accordance with the needs of the business world and the Indonesian industrial world.

The need for learning innovations in MMI courses that are in accordance with the SKKNI in the certification test of the Competency Test Scheme in the Interactive Interactive Multimedia field as well as conformity to the needs of the business world and the Indonesian industrial world through the concept of implementing STEAM Education.

Topics emerging from scientific meetings are of great importance to higher education institutions in a globalized worldview. In scientific conferences, including the idea of bringing together the "art" in STEM – science, technology, engineering, and mathematics – by realizing STEAM [1]. Working closely with researchers from two Indonesian states in Malaysia who unite the vision to develop STEAM in various fields. One of the educational topics discussed in the forum was related to STEAM's contribution to the development of education related to culture and the arts. A popular platform for digital creators to experiment, share/show off and collaborate on creative ideas and results with Art, Design and Technology skills. There are various graphing software from various STEAM practices, following material agents as boundary shifters so that we can know their accumulation [2].

Besides that, this needs to be done related to the results of joint evaluations with Stakeholders in the field of Animation and Visual Communication Design in 2017, which

several points of discussion are the need for improvements and evaluations related to student competencies in the fields of animation and Visual Communication Design.

This underlies the need to improve the quality of learning for MMI courses. The application of the STEAM Education concept as a pattern of developing learning innovations is due to the demands of the increasingly rapid learning concept that is supported by the implementation and use of technology in learning [3].

The Interactive Multimedia course is a 3 credit course and is presented in 3 hours. This course has a description to foster students to understand and master the concept of making interactive multimedia including the use of images, the use of video, the use of sprites, the use of sound, the use of buttons, the use of interaction control in the implementation of interactive media design. This course has the following objectives: 1) Understanding the Concept of Flow Diagrams and Needs Analysis; 2) Understanding of Scirra Construct 2 Working Media Introduction; 3) Understand the introduction of Sprites, Buttons and animates; 4) Understand the introduction of action scripting.; 5) Understanding the concept of environment, behavior; 6) Understand about exporting Media. This course is presented with the implementation of interactive multimedia implementation based on real projects so that students can improve their competence directly in solving problems in the Visual Communication Design and Game Animation study program.

STEAM Framework Definition: Science and Technology is understood as the basis of what the world has to go forward, to be analyzed and developed through Engineering and the Arts, with the knowledge that everything rests on elements of Mathematics. It is a contextual curriculum in which subjects are coordinated to support each other in a formal way how the educational structures of science, technology, engineering, mathematics and the broad spectrum of the arts all relate to one another in reality [4]. This framework includes not only aesthetic and design arts, but also the liberal arts, language, music, physical and manual divisions. The STEAM structure describes how all education and life divisions work together; it therefore offers a formal place in the STEM structure for Language Arts, Social Sciences, and the purposeful integration of exploratory subjects including Arts, Music, CTE and the Physical Education division of public education. STEAM Education has a lesson plan framework that shows how it is adaptable, benchmarked, and easily reinforces standards in unique and engaging ways [1], [5].

2. METHOD

This research is descriptive by using a procedural model development research design. Borg WR & Gall MD explained that design development can be carried out through several stages, namely preliminary studies, research planning, initial product development, limited field tests, limited field test revisions, wider field test, feasibility test, revision of the results of the feasibility test, and dissemination and socialization of the final product [6], [7]. The products referred to in teaching materials and interactive multimedia competencies are based on SKKNI no 107 of 2018.

The data needed in this research is data sourced from observations, interviews, documents, and literature [13]. (1) Observation of participants, namely researchers besides observing as well as guiding and assisting students of the Visual Communication Design Study Program and animation games. This observation technique requires the extent to which difficulties in guiding and students' difficulties in studying MMI course material, (2) Informal Talk Interviews, conducted through questions that depend on the researcher's spontaneity in asking questions. The relationship between researchers and informants is in an ordinary and reasonable atmosphere, so that questions and answers are like daily conversations, (3) Library data obtained through the library is literature whose sources are from books that have been printed or online books with ISBN, proceedings and the latest published scientific journals related to MMI subject matter. (4) Document data is obtained from activities and assignments that have been written by students, as well as inputs obtained during the exam, including the scores obtained.

The data obtained is carried out by a triangulation process so that the data obtained is more valid, then: (1) Data reduction is carried out if the results are from various sources in the field, then data are summarized, coding, formulating themes, grouping, and presenting stories in writing. (2) Data presentation is a structured solid information construction through a data reduction process as the basis for meaning. (3) Conclusions and verification in the interpretation process, determination of the final data presented. (4) The results of this data analysis are the basis for developing learning products

This research develops learning innovation: 1) Developing E-module-based Learning Innovations containing text, images and videos of material implementation packaged per meeting (to be applied in SIPEJAR UM).; 2) Develop all materials in 2 forms of E-books and Mobile-based Applications.

Development: Develop initial media in the form of teaching materials per meeting into information and technology (interactive) media in the form of E-Modules which contain
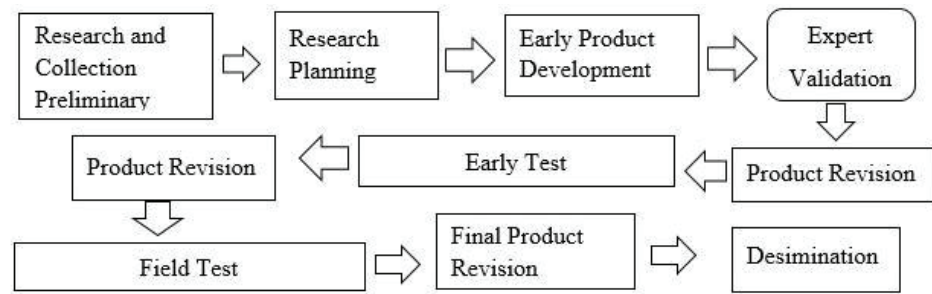
Figure 1: R&D Model (Borg & Gall).

text, images and videos of material implementation packaged per meeting and in one package that can be accessed via mobile platforms [8], [9].

Research Activities: 1) Evaluate the previous teaching media.; 2) Analyzing the presentation media in the form of video through the STEAM concept.; 3) Develop and combine through the concept of STEAM Education all materials and apply them in SIPEJAR UM and mobile platform applications.

Innovation Concept: The concept of teaching based on STEAM (Science Technology Engineering Art and Mathematics) is to combine the implementation of the use of STEAM in the preparation of teaching materials to the way the material is delivered. By utilizing E-module-based materials containing text, images and videos of material implementation packaged per meeting (to be applied in SIPEJAR UM) also packaged all materials in 2 forms of E-books and Mobile-based Applications. Application of applications can support efficiency in various fields of public life, education and industry [10]–[12].
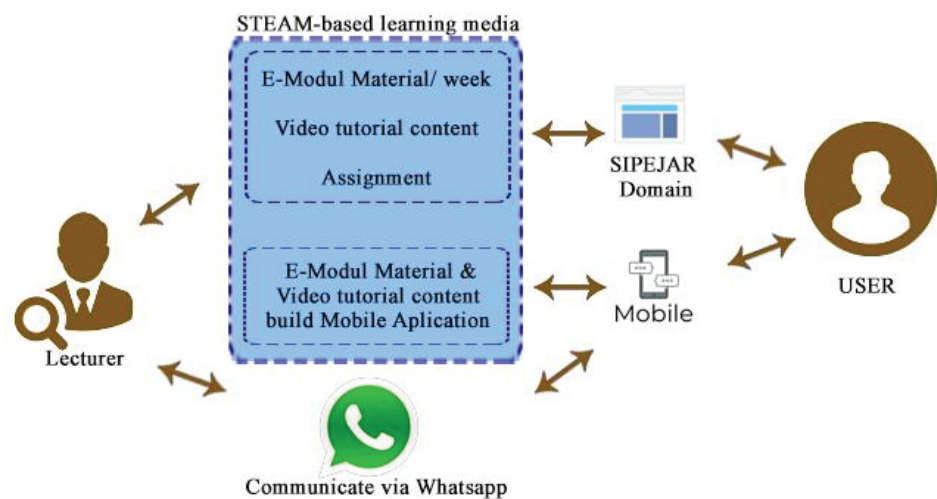

Figure 2: Implementation of the Learning Innovation Concept.

3. RESULT & DISCUSSION

3.1. Interactive Multimedia Learning Material Concept

As for this course, based on the existing study plan, we can derive this learning concept plan as shown in table 1.

TABLE 1

Content	Form	Implementation
Understanding about Introduction to flowcharts	Digital Teaching Materials	**Sipejar & Mobile**
Understanding about Introduction Needs analysis	Digital Teaching Materials	**Sipejar & Mobile**
Understand the basic concepts of images, buttons and animation	Digital Teaching Materials Video Teaching Material	**Sipejar & Mobile**
Understand the concept of layout	Digital Teaching Materials Video Teaching Material	**Sipejar & Mobile**
Understanding about the application of text	Digital Teaching Materials Video Teaching Material	**Sipejar & Mobile**
Understanding about Audio Deployment	Digital Teaching Materials Video Teaching Material	**Sipejar & Mobile**
Understanding about Video implementation	Digital Teaching Materials Video Teaching Material	**Sipejar & Mobile**
Understand about Event & Script Implementation and implementation of object and global variables	Digital Teaching Materials Video Teaching Material	**Sipejar & Mobile**
Understanding Exporting to mobile	Digital Teaching Materials Video Teaching Material	**Sipejar & Mobile**

3.2. Presentation Materials

In the preparation of teaching materials in this learning innovation, around 9 teaching materials were made according to the concept of material in interactive multimedia learning in table 1. These teaching materials were made in 2 formats, namely presentation format and document format.

The presentation format is used for the material

i. Understanding about Introduction to flowcharts

ii. Understanding about Introduction Needs analysis

Figure 3: Example Implementation of the Learning Innovation Concept.

3.3. Analysis of Learning Outcomes

Based on the analysis of student learning outcomes who implemented STEAM learning in the Interactive Multimedia course in the even semester of 2020/2021 as many as 88 students got good and very good results of 77%. With details 45% with very good value and 32% with good value. As seen in Figure 4
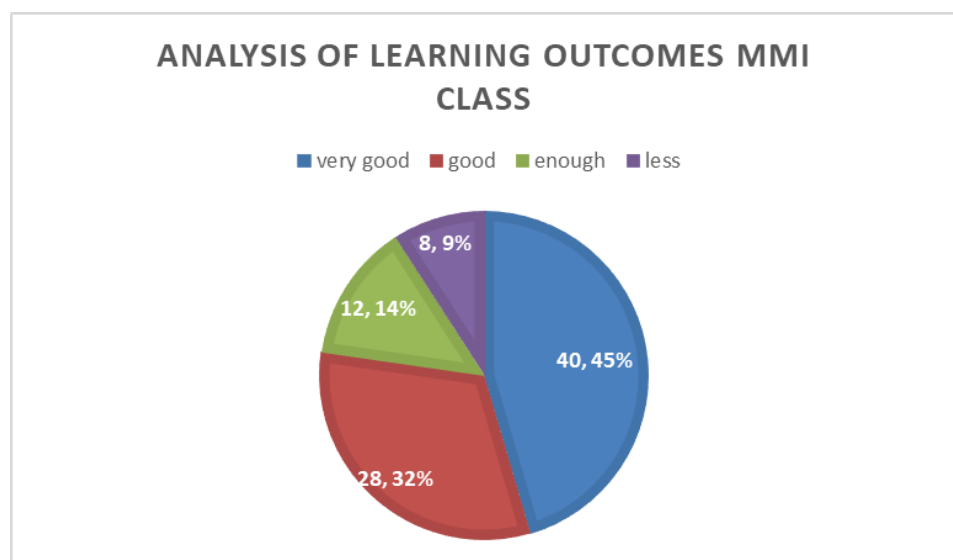

Figure 4: Learning Outcome Graph.

4. Conclusion

This research was conducted as a basis for implementing the implementation of learning innovations using STEAM education in interactive multimedia lessons. Based on the

results of the analysis of implementation learning outcomes at SIPEJAR, it was found that 77% of students could accept the STEAM application model in Multimedia learning courses.

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