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## Development of E-Learning Oriented Inquiry Learning Based on Character Education in Multimedia Course

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**Abstract:** The study aimed to: 1) determine the e-learning design oriented inquiry learning based on character education in multimedia courses, 2) find out the feasibility of e-learning oriented inquiry learning based on character education in multimedia courses, 3) identify the effectiveness of e-learning oriented inquiry learning based on character education in multimedia courses. This study employed the research and development design. The research and development model used is the Borg & Gall model. The subjects involved in the feasibility test were 8th semester and 2015-2016 academic year students, while the subjects included in the effectiveness test were the 7th semester and 2016-2017 academic year students of Educational Technology Department Universitas Pendidikan Ganesha. The instruments used to collect data in this study were questionnaires, learning outcome tests, and character behavior observation sheets. Descriptive statistical analysis and inferential statistics (t-test) were used to analyze the data. The results indicated significant differences in learning outcomes of the 7th semester and 2016-2017 academic year students learning multimedia courses, before and after using Edutech Smart e-learning. The study concluded that the learning media developed are effective to enhance the quality of learning in multimedia learning. Efforts should be made to develop e-learning by optimizing more varied presentation methods.

**Keywords:** *E-learning, inquiry learning, character education, multimedia.*

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### Introduction

Higher education is organized to prepare students as the community members who have academic ability, develop or create science, technology, and art. These abilities are trained through a learning process that develops independent learning abilities. Today, the arising problems in education are the students' weak skill of thinking to solve problems, think, and work on their own initiative. Students tend to be given a variety of knowledge that requires memorization, while the world of work, in general, requires individual's skill to work collaboratively or in a group and the ability to give birth to innovative ideas. Students should be trained to have the ability to solve problems with knowledge. Learning is no longer a "Transfer of Knowledge", but must be able to develop students' potentials consciously through more dynamic and applicative abilities (Rasyid & Asrori, 2006).

The results of research conducted by Mustaji (2012) showed that the causes of non-optimal learning in higher education, namely 1) learning is less able to organize learning processes needed in the development in the learning technology field, 2) learning is wrong in viewing the learning process, and 3) learning uses learning concepts that are irrelevant to development learning technologies. Therefore, innovation in learning is necessary to optimize the process and learning outcomes. Learning innovation is carried out by using or utilizing the Information and Communication Technology (ICT) that has grown and positively contributed to various fields. Learning innovation here means the things improving students' ability to solve problems and develop creativity.

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The ICT development has provided various facilities to humans. Munir (2008) stated that the information and communication technology developed today has an influence on various life aspects, including in education. The development of information and communication technology, especially internet technology, lately, has been widely used in learning activities in developed countries. One example of ICT-based learning innovation is e-learning. E-learning stands for electronic learning (Sohn, 2005). Gilbert & Jones (2001) defined e-learning as sending learning material by using electronic media, such as intranet/extranet, the Internet, satellite broadcast, CD-ROM, interactive TV, audio/video tape, and computer-based training (CBT). Australian National Training Authority (2003) also defined e-learning as including processed and applications using various electronic media, such as audio/video tape, the Internet, CD-ROM, and interactive TV to send learning materials more flexibly. Urdan & Weggen (2000) stated that e-learning is part of distance learning, while on-line learning is included in e-learning. In addition, the term of e-learning includes various applications and processes, such as computer-based learning, web-based learning, virtual classrooms, etc. Meanwhile, online learning is part of technology-based learning that utilizes internet, intranet and extranet resources (Suartama & Tastra, 2014).

Some universities organize electronic learning activities in addition to subject matter presented regularly in class. However, several other universities hold e-learning as an alternative for students who, for one reason or another, are unable to attend face-to-face lectures. In Indonesia, e-learning is expected to be one of the solutions solving a lot of issues in education because e-learning is adaptable to the needs, as a complement, supplement, or substitute for classroom learning activities. E-learning can also be combined with various methods and learning models used by teachers in learning activities.

Nevertheless, the use of e-learning is also inseparable from various shortcomings. Various criticisms delivered by Bullen (2001), among others, are 1) the less interaction occurring between the teacher and students or between students. This less interaction can retard the building of values during the learning-teaching process; 2) the academic or social aspects are tended to ignore, and vice versa stimulate the business/commercial aspect growth; 3) the learning-teaching process is likely towards training instead of education.

Nowdays, the learning process is demanded not only to prioritize intellectual intelligence, but also to build character values, so the learning process needs to be improved and innovated. The innovation carried out in this activity is to build character through the internalization of values into learning by using e-learning. According to the experience of researchers in utilizing e-learning to manage learning in multimedia courses, input from students is conveyed through the academic information system of the Universitas Pendidikan Ganesha, that learning has been dominated by lecturers, is less active for students, needs to be designed in the future learning, as well as can activate students without ignoring the development of students' characters.

Provision of e-learning systems can be conducted with several options. Haryono (2011) stated three ways in providing e-learning systems, namely 1) developing the system, 2) buying an available system, 3) employing an open source of Learning Management System (LMS), and 4) customizing. One of the most widely used LMS in creating online learning is Moodle because Moodle has complete features and attractive as well as simple appearance (Suartama et al., 2019). In producing quality e-learning, Newby et al. (2000) stipulated that e-learning must consider three things, namely: 1) methods, namely techniques and procedures used in learning (collaboration, games, presentations, or discussions); 2) media, namely media used in learning to attract students' interests ( videos, texts, pictures, and animations); and 3) materials, namely learning content including motivation, orientation, information, application, and evaluation. Correspondingly, Walker and Hess (cited in Arsyad, 2009) stated that excellent e-learning must fulfill the criteria, namely: 1) the content and objective qualities, that include importance, accuracy, completeness, attractiveness, balance, fairness, and suitability to the students' conditions; 2) instructional quality including providing learning opportunities and assistance for learning, motivating quality, instructional flexibility, relationships with other teaching programs, the tests and assessments quality, giving effect on students, teachers and their learning; and 3) technical quality, including readability, ease of use, display quality, quality of dealing with students' responses, program management, and documentation.

Inquiry learning strategies in e-learning are needed to overcome the students' weak ability to use their thinking skills in solving problems and working on their own initiative. Several main characteristics of inquiry learning models, according to Sanjaya (2007), are first, the inquiry model emphasizes students' activities maximally to research and discover, meaning that in the inquiry model, students are placed as subjects of learning. The students, in the learning process, do not only receive the lesson explaining by teachers verbally, but also they should find their own the subject matter core. Second, all activities undertaken by students are oriented to answer to the questions by themselves. In other words, those activities are expected to foster confidence (self-esteem). Thus, in students' learning, inquiry learning strategies place the teacher not as a learning source, but as a motivator and facilitator. Third, using this model aims at developing intellectual skills as part of mental processes.

The concept of character education in e-learning needs to be implemented in the learning to anticipate the tendency of neglecting academic or social aspects and inhibiting the formation of values. The process of character education for students, at this time, is more appropriate to use learning models based on social interaction (interaction models) and

transactions. This interactional learning model is implemented based on some principles, such as (a) involving students actively in learning; (b) basing on individual differences; (c) linking theory with practice; (d) developing communication and cooperation in learning; (e) increasing the students' courage in taking risks and learning from mistakes; (f) enhancing learning while doing and playing; (7) adjusting the lesson to the level of cognitive development that is still at the stage of concrete operations. Besides, presenting the subjects of morality given to children should be based on some following principles, namely (a) from easy to difficult, (b) from simple complexity, (c) from concrete to abstract, and (4) emphasizing the environment closest to the child to the wider social environment (Zubaedi, 2011). On the other hand, according to Elfindri et al., (2012) improving aspects of character education is concerned with several aspects, namely: 1) building educational communication skills; 2) building teamwork skills; 3) building leadership; and 4) building relationships.

The development of e-learning carried out based on design principles and following systematic steps is expected to produce viable e-learning. Utilizing appropriate e-learning in learning activities is expected to create quality/effective learning to help to solve the learning problems faced by students to achieve optimal learning outcomes. Based on this explanation, this study e-learning was developed based on inquiry learning based on character education in multimedia courses at the Educational Technology Department Faculty of Education Universitas Pendidikan Ganesha.

## Methodology

### *Research Design*

This research used a research and development or product-oriented model. This study developed web-based learning media in the form of 1) e-learning portal developed with Moodle LMS, 2) e-learning courses for multimedia courses, with learning design oriented to inquiry learning models based on character education.

The used development model adapted the steps of research and development, introduced by Borg and Gall (1983), consisting of (1) needs analysis and information collection, (2) product planning, (3) first product development, and (4) evaluation. The learning design model used in the initial product planning stage adapted the model proposed by Dick and Carey (2005). Meanwhile, the early product development adapted the design of e-learning development according to Surjono, (2010). The product evaluation design used the media program evaluation model of Sadiman et al., (2009), namely at the stage of formative evaluation in the form of expert validation and field evaluation, and effectiveness tests in the form of measurement of cognitive and affective learning outcomes (students' characters). These models are used because they are simple, complete, and tested.

### *Procedures*

According to the predetermined development model, the procedures of development were classified into four steps, as presented in Figure 1 (Adapted from Borg & Gall (1983), Dick & Carey (2005), Surjono (2010), and Sadiman (2009)).

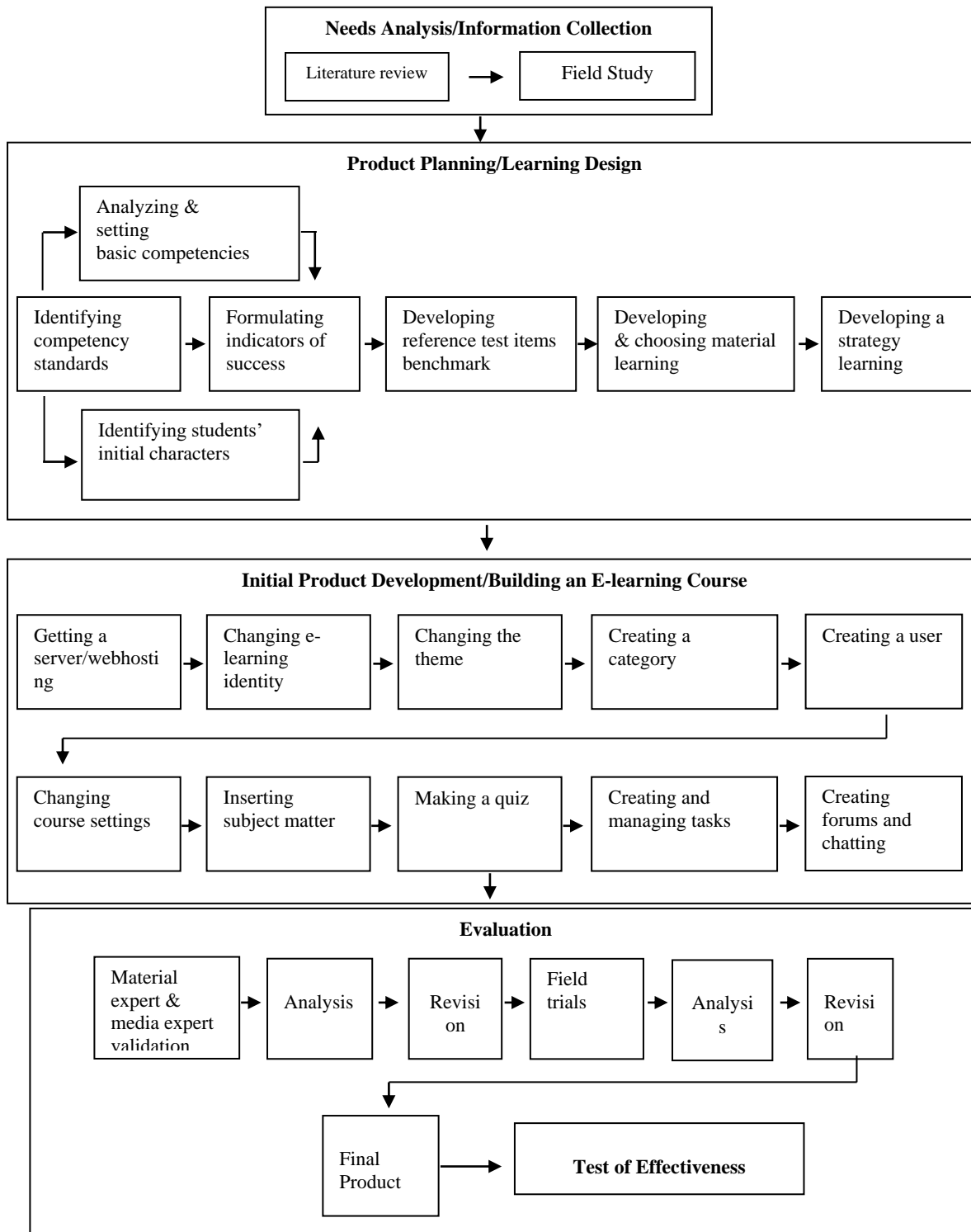


Figure 1. Procedure of Developing E-Learning Oriented Inquiry Learning Based on Character Education in Multimedia Courses

*First stage:* Needs analysis, including: literature review, and initial survey of research sites. Literature study is conducted to gather information, by studying the guidelines and curriculum of Educational Technology Department, Faculty of Education, Universitas Pendidikan Ganesha relating to the characteristics and description of courses, and the available semester hours. The field study was conducted to directly observe the condition of Educational Technology Department, its potentials, the lecture process, and the documents of students' learning outcomes.

*Second stage:* Developing learning designs. At the development stage of this learning design syllabus is developed as a basis for developing learning multimedia. The development of this syllabus consists of eight steps, namely: a) determining competency standards, b) determining basic competencies, c) conducting learning analysis, d) formulating indicators, e) developing assessment instruments, f) developing learning materials, g) developing learning strategies,

and h) design evaluation. The lecture system design is carried out by meeting in the five classroom meetings (face-to-face), not limited to space and time, as well as nine meetings via the internet, once Midterm Examination and once Final Semester Examination. The details of the e-learning system design are as follows:

a. Face-to-Face Learning

Face-to-face learning between students and lecturers in the classroom required five meetings, with multimedia subject content, the methods and approach of learning used oriented to inquiry-based learning of character education. Students were required to be present and active in class meetings. Meeting activities included lecture, laboratory activities, tutorial activities, and field studies.

b. Online Learning/E-learning Process

Learning through e-learning requires at least nine activities in one semester. Activities opportunities in e-learning are not limited by time and place, thus allowing meetings via the internet more than face-to-face meetings in the class. Online learning is undertaken by orienting inquiry-based learning of character education. Students and lecturers are required to actively access lecture material, dialogue with lecturers/students, dialogue with friends through e-learning in the Educational Technology Department (Edutech Smart). Learning through e-learning includes: accessing lecture material, doing task, discussion, reading assignments, presenting materials, dialogue between lecturers and students, dialogue between students and learning resources, dialogue among students through e-learning, students can access lecture materials or other materials appropriate to the lecture materials to answer questions in discussions or do assignments by accessing online sources, Evaluation is intended for students participating in the learning process through e-learning to assess. The details of face-to-face and online activities are presented in Figure 2.

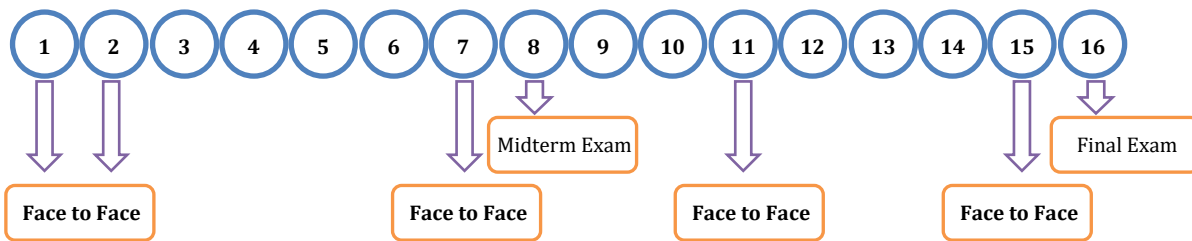


Figure 2. Class Breakdown

Information:

Face-to-Face (Offline) in class : five times  
 Online : nine times  
 Examination : twice (midterm and final)

c. Students' Activities

One online lecture activity was conducted within seven days (for example: lectures are scheduled for Monday, the range of activities is Monday to Sunday). Students were free to carry out activities, such as gathering assignments, conducting forums and quizzes within those seven days. There was no scheduling of certain days and specific times to carry out online lectures between course professors and students. Activities in online learning are downloading teaching materials, forum, quiz/training (weekly), chatting, this activity is not required to be carried out by lecturers or students participating in the course; it is only a complement to activities in online learning.

*Third phase:* Building an e-learning course. This step consists of: getting server/webhosting, changing e-learning identity, changing the theme, creating a category, creating user, changing course settings, entering resources, making activity, making a quiz, creating and managing tasks, and creating a discussion and chat forum

*Fourth stage:* Formative evaluation consisting of validation, testing, and product revisions. The steps at this stage are as follows:

- Validating the product carried out by material and media experts, followed by data analysis, and product revisions based on the review of those material and media experts. A material expert and media expert validated the developed product. The material expert covered the aspects of learning and content/material, while the media expert included the aspects of appearance and programming. Expert validation is significant to obtain input for the improvement of the product being developed and guarantee that the initial product developed is suitable to be tested on students.
- Conducting a field trial on twelve students, continued by data analysis and product revisions following the field trial results to create the ultimate product.

*Fifth stage:* Summative evaluation. To identify the effectiveness or function of the product or the final program in enhancing the learning quality in the form of improving the achievement of learning outcomes, a summative evaluation was carried out. The summative evaluation was undertaken after the formal evaluation and revision of the program according to the standards used by the developer. The effectiveness is identified by viewing the difference in scores of learning outcomes in multimedia courses before (pre-test) and after (post-test) using e-learning; the effectiveness can also be investigated from the affective aspect (students' characters) during and after participating in learning using e-learning.

#### Research Subjects

The subjects involved in the development of e-learning are a material expert, a learning design expert, and a media expert at the stage of media validation. Each expert is 1 expert. In the product trial formative evaluation phase (due diligence), the subjects of the trial were twelve 2015-2016 students from Educational Technology Department Universitas Pendidikan Ganesha. The number of students involved in the formative evaluation was 12 students. The summative evaluation stage (test of effectiveness) involved 37 students in seventh semester and 2016-2017. The number of lecturers involved in both the formative evaluation and summative evaluation stages was 2 lecturers.

#### Data Collection

This study collected qualitative and quantitative data. Qualitative data in this study were obtained from responses regarding aspects of the materials, learning, display, and programming from various sources, namely material expert, media expert, and students. These qualitative data were framed (scoring) so that those data were transformed into quantitative data. Other quantitative data were attained from students' scores on the pre-test and post-test as well as scores from the students' character assessment.

#### Research Instrument

The instruments used to collect data in this study were questionnaires, learning outcomes tests, and character behavior observation sheets. The questionnaire was prepared to identify the feasibility of e-learning. The learning achievement test was used to obtain the pre-test and post-test learning outcomes in the class applying e-learning. The observation sheets were utilized to identify the students' characters in learning applying e-learning. All instruments used had adequate construct and content validity because they were prepared through the instrument preparation mechanism as follows: (1) document analysis, (2) making specification tables (grids), (3) consultation with experts (material and media), and (4) consultation with colleagues.

#### Data Analysis

This research and development used qualitative descriptive analysis, descriptive and inferential statistical analysis techniques. Qualitative descriptive analysis techniques were executed by material and media experts, as well as students, to evaluate the data. The qualitative data were grouped into input, criticisms, responses, and suggestions for improvement stated on a questionnaire. The analysis results were then used to revise e-learning. Descriptive statistical analysis techniques were employed to process data obtained through questionnaires in the form of scores converted into scores or categories referred to tables adapted from Sukardjo (2010) as displayed in Table 1.

Table 1. Scores Converted to Scores on a Five-Scale

Score/Category	Score	
	Pattern	Calculation
Very good	$X > \bar{X}_i + 1,80 \text{ Sdi}$	$X > 4,21$
Good	$\bar{X}_i + 0,60 \text{ Sdi} < X \leq \bar{X}_i + 1,80 \text{ Sdi}$	$3,40 < X \leq 4,21$
Pretty good	$\bar{X}_i - 0,60 \text{ Sdi} < X \leq \bar{X}_i + 0,60 \text{ Sdi}$	$2,60 < X \leq 3,40$
Not good	$\bar{X}_i - 1,80 \text{ Sdi} < X \leq \bar{X}_i - 0,60 \text{ Sdi}$	$1,79 < X \leq 2,60$
Very Poor	$X \leq \bar{X}_i - 1,80 \text{ Sdi}$	$X \leq 1,79$

#### Where:

Average ideal score ( $\bar{X}_i$ )	$= 1/2 \times (\text{maximum score} + \text{minimum score})$
Sdi	$= 1/6 \times (\text{maximum score} - \text{minimum score})$
Maximum score	$= 5$
Minimum score	$= 1$
Average ideal score ( $\bar{X}_i$ )	$= 1/2 \times (5 + 1) = 3$
Standard deviation ideal score (Sdi)	$= 1/6 \times (5 - 1) = 0.67$
X	$= \text{Actual score}$

In this research, a minimum "Good" worthiness was identified, as a result of an assessment both from the media and material experts, as well as student assessment. If the final assessment (overall) outcome in every learning aspect,

including content/material, appearance, and technical aspects, showed the smallest value of "good" by experts, then the developed product was categorized suitably usable as a learning resource. In relation to the students' characters, a minimum "good" value was also set so that it can be said that the developed e-learning could improve the students' characters. The effectiveness of the created products could be identified in the form of the differences between pre-test and post-test scores. The analysis used is pre-experimental, namely comparing data before treatment and after treatment, in this case the learning outcomes before and after using e-learning. To find out if there were differences in learning results, then the t-test formula was used and assisted with the SPSS program. Before the t-test is carried out, the data has been tested for normality *Kolmogorov-Smirnov* and the results show that the pretest and posttest data have a normal distribution (significance value/probability of 0.200 and 0.200 which is greater than 0.05).

## Results

### *E-Learning Design*

The developed product of this study is an e-learning portal and course based on inquiry learning based on character education in multimedia courses at Educational Technology Department, Faculty of Education, Universitas Pendidikan Ganesha. The process of e-learning development could run smoothly, quickly, and more organized because it relied on plans made previously and the readiness of the necessary materials in accordance with the users' characteristics. The procedures for developing a portal and e-learning course for multimedia courses went through five stages, namely needs analysis, developing learning designs (inquiry-based learning based on character education), producing e-learning, formative evaluations, and conducting summative evaluations.

Broadly speaking, the results of the e-learning product of this development contain components allowing teachers (lecturers) to manage portal identity, change themes, create categories, create users, raise user status, register as users, change personal profiles, change course settings, enter resources forms including text page (composing a text page), web page (composing a web page), links to files or websites, directories (displaying a directory), labels (inserting a label), enter activities in the form of creating quizzes, creating and managing tasks, conducting discussion forums, and entering chats. The e-learning portal home page display is presented in Figure 3.

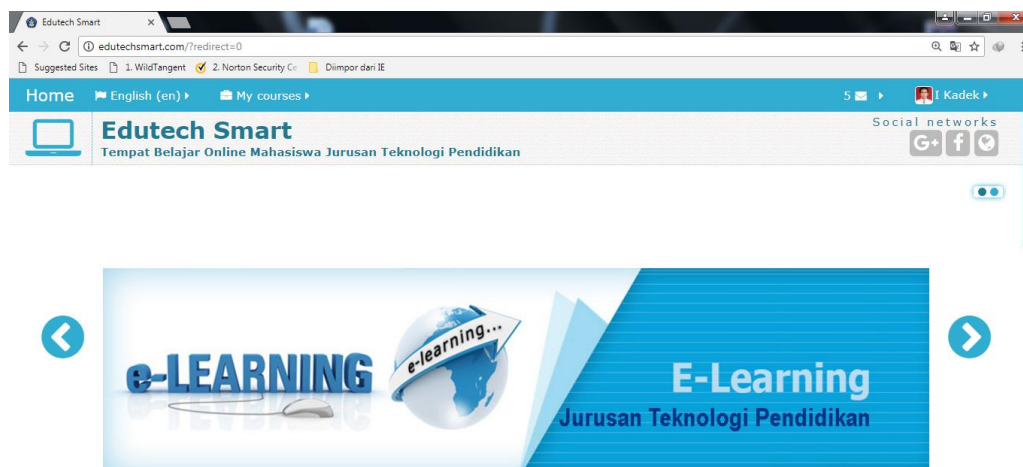


Figure 3. Home E-Learning Portal

Figure 3 shows that the final product of this development research is the e-learning portal called Edutech Smart. In this portal, there are eight course categories, and multimedia course as objects of this research are in semester VII categories.

The initial appearance of multimedia courses, multimedia learning resources provided, and students' activities in online discussion forums are presented in Figure 4, 5, and 6.

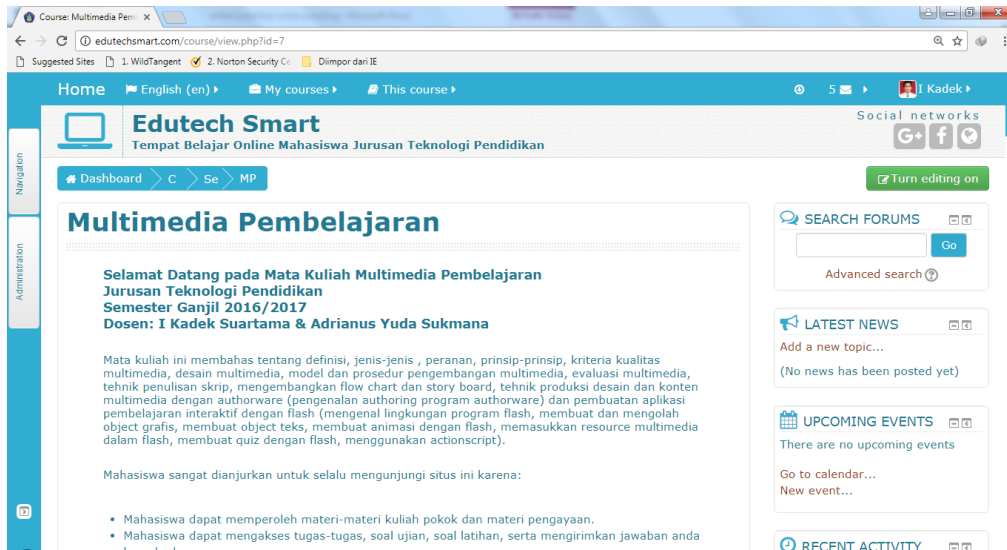


Figure 4. Multimedia Learning Courses

Figure 4 shows that each learning segment in a multimedia course consists of the delivery of learning scenarios, learning resources and learning activities.

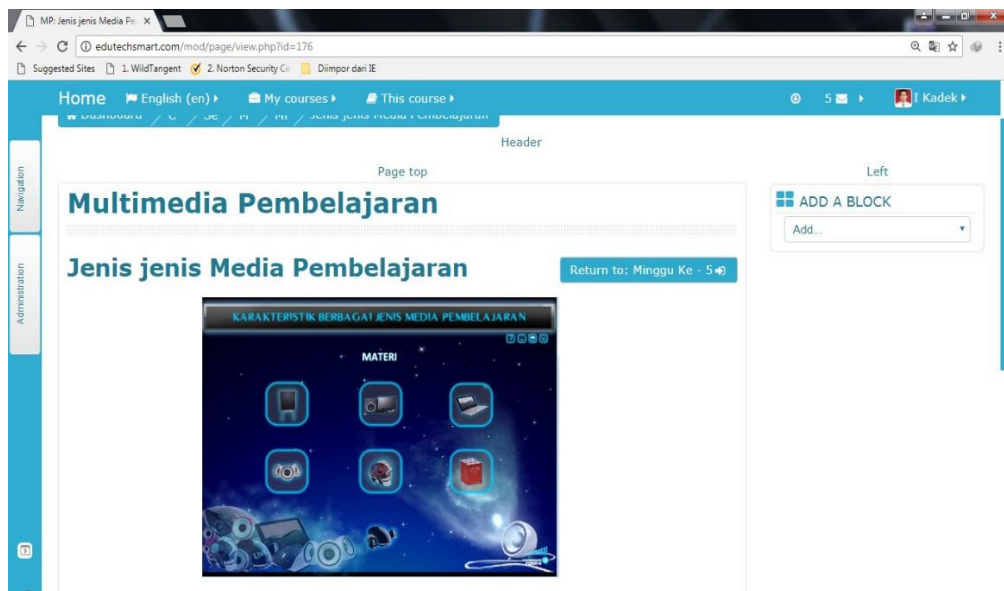


Figure 5. Multimedia Resources/Teaching Materials

Figure 5 shows that one of the learning resources used in e-learning is multimedia learning. Multimedia learning is important given to facilitate the diversity of student learning styles.





Figure 6. Activities/Online Discussion Forums

Figure 6 shows that discussion forum activities always begin with conveying rules of order in conveying opinions related to aspects of communication, cooperation, leadership, hard work, discipline, honesty, and openness, this will be able to form good character in students.

#### Feasibility of e-learning

After an internal test to check whether the product run smoothly, the evaluation phase was then proceeded, namely (1) validation by material and media experts, and (2) trials of twelve students. The experts' assessment of the product quality resulted in some average scores presented in Table 2.

Table 2. Experts' Assessment of the Four Aspects in Developing E-Learning Subjects for Learning Media

Expert	Assessment Aspects	Average Score	Category
Material Expert	Learning	4.36	Very good
	Content/Material	4.08	Good
Media Expert	Display	4.28	Very good
	Programming	4.44	Very good

Table 2 reveals that the material expert assessment of the product quality revealed the average scores of 4.36 (very good category) and 4.08 (good category) in terms of learning and content/material aspects. The assessment of the media experts of product quality showed that the average scores were 4.28 (very good) and 4.44 (very good) from the aspect of display and programming. The results of the assessment of the field trials on 12 students are presented in Table 3.

Table 3. Students' Assessment of the Four Aspects in Developing E-Learning Subjects for Learning Media

Assessment Aspects	Average Score	Category
Learning	4.61	Very good
Content/Material	4.55	Very good
Display	4,56	Very good
Programming	4.67	Very good

Table 3 reveals that the overall assessment of aspects in the field trials resulted in 4.61 (very good), 4.55 (very good), 4.56 (very good), and 4.67 (very good) for learning, content/material, display, and programming aspects.

#### Effectiveness of E-Learning

Data on students' learning outcomes in testing the effectiveness the products used in learning are displayed in Table 4.

Table 4. Comparison of Students' Learning Outcomes

		Paired Samples Statistics				
		Mean	N	Std. Deviation	Std. Error Mean	
Pair 1	Pre-test	61.25	37	8.935	1.469	
	Post-test	74.23	37	7.508	1.234	

		Paired Samples Test							
		Paired Differences			t	df	Sig. (2-tailed)		
		Mean	Std. Deviation	Std. Error Mean				95% Confidence Interval of the Difference	
					Lower	Upper			
Pair 1	Pre-test - Post-test	-12.980	9.664	1.589	-16.203	-9.758	-8.170	36	.000

At the product utilization test phase, it was found that the portal and e-learning course in this multimedia learning subject matter could increase the effectiveness of learning instructional media courses. T-test results showed Sig. (2-tailed) of  $0.000 < 0.05$ . Calculation of effect size for single group/one group based on the data on Table 4 obtained a score of 1.45 which means the effectiveness of the e-learning used has a very strong effect. These results indicated significant differences in learning outcomes before and after using Edutech Smart e-learning in seventh semester students of the 2016-2017 academic year learning multimedia subjects. Besides, the e-learning oriented inquiry-based learning of character education in Multimedia courses at Educational Technology Department, Faculty of Education, Universitas Pendidikan Ganesha could improve students' character behavior with an average rating score of 4.18. This score is the overall average of aspects of character behavior which includes: communication, cooperation, leadership, hard work, discipline, honesty, and openness.

### Discussion

The development of inquiry-oriented e-learning based on character education in multimedia courses at the Educational Technology Department, Faculty of Education, Universitas Pendidikan Ganesha has been completed. The feasibility test on the developed media included several stages, namely validation by material and media experts, as well as field trials.

The material expert assessment of the product quality revealed the average scores of 4.36 (very good category) and 4.08 (good category) in terms of learning and material/content aspects, respectively. The assessment of the media experts of product quality showed that the average scores were 4.28 (very good) and 4.44 (very good) from the aspect of appearance and programming, respectively. The overall assessment of aspects in the field trials resulted in 4.61 (very good), 4.55 (very good), 4.56 (very good), and 4.67 (very good) for learning, content/material, display, and programming aspects, respectively.

Based on students' responses regarding the developed e-learning course, the advantages of this product included being very good and having a good level of interactivity and enabling students to be active in the learning. Students' interest in learning media is an indicator of students' motivation and an excellent symptom towards improving learning processes and outcomes (Demir & Akpınar, 2018). Appearance elements that can be seen as interesting from e-learning products include the home page, ease of navigation, and the harmonious combination of text and background colors. In addition, in each subject, this media is equipped with examples of images, animations, and videos so that students or users can better understand the subject. This case is in line with the findings of Triwahyuni et al., (2020) stating that interesting image media became a stimulus in classroom learning. An interesting picture can foster students' way of more critical thinking about real things when learning.

This e-learning product has another advantage, which is the direct feedback of assignments from the lecturer to the students. This feedback is in the form of positive and negative reinforcement from lecturers. Feedback is provided based on assessment, allowing students to measure their improvement, prepare alternative learning strategies, and predict their own ongoing learning needs (Bonnell, 2008). Diverse evaluation methods and students' access rights to their grades will spur students to continue to study hard so they can show excellent performance in class. This is supported by what was expressed by Alshehri et al., (2019) that an important criterion in the development of e-learning is a varied and adaptive evaluation system.

The practical use of e-learning products was also recognized by students. By simply typing the URL in the browser, the students could already use this e-learning portal. Through e-learning, we can access materials more quickly, whenever and wherever. Also, the materials can be added with diverse learning resources, such as multimedia updated fast by lecturers. The students also conducted monitoring, communication, and collaboration. On the other hand students can, of course, download the learning material, do assignments and quizzes, and participate in chat and discussion forums.

Online learning that provides various teaching materials, adequate information, learning activities that can be done anytime and anywhere according to the characteristics, needs and desires of students can improve academic performance and productivity (Suartama et al., 2020).

The design of learning in e-learning uses an inquiry model based on character education. Learning emphasizes more on the students' activities to search and find (placing students as subjects of learning). During learning process, students do not only receive the lesson explained by lecturers verbally, but they also should find their own core of the subject matter. All students' activities are led to search and discover their answers to the questions independently, to foster confidence (self-esteem) and improve intellectual skills as part of mental processes.

The e-learning portal and course for multimedia learning subjects can increase the effectiveness of multimedia learning courses. This case is evidenced by the existence of significant differences regarding the learning outcomes of multimedia learning courses before and after using e-learning. T-Test results showed sig of 0.000 or less than 0.05. These results indicated significant differences in learning outcomes of the seventh semester students of the 2016-2017 academic year, before and after learning multimedia course using Edutech Smart e-learning. The mean score of the learning outcomes before using e-learning was 61.25, while after using e-learning the mean score was 74.23. In other words, the students' learning outcomes after using the Edutech Smart e-learning as the developed product were better than students' learning outcomes before using the final product that had been developed in the form of Edutech Smart e-learning. Those outcomes indicated that the learning media developed were effective and could enhance the learning quality in multimedia learning courses.

Furthermore, the e-learning oriented inquiry-based learning of character education in Multimedia courses at Educational Technology Department, Faculty of Education, Universitas Pendidikan Ganesha could improve students' character behavior with an average rating score of 4.18. This figure, based on the Table of quantitative data conversion to scale 5 qualitative data, is categorized as "good". The students' character could be improved because the design of learning in the e-learning had integrated character values triggered through various ways, such as, 1) learning is possible based on the users' or students' needs; besides. the learning speed could also be set by the users; 2) the relationship between user and administrator or students and lecturers. Learning activities are designed in an atmosphere that can shape student character such as communication, cooperation, leadership, hard work, discipline, honesty, and openness. In this study, the lecturer provided student character modeling. Student character can be formed through modeling by lecturers. Modeling is an appropriate method for teaching attitudes, values, and behavior (Septiani et al., 2020).

Adjustment of learning, easy access, use of electronic devices that have been implanted conceptualized character values in each process, of course this should not be separated from the participation of teachers/lecturers as administrator. The teacher or lecturer, as an admin, is one of the parties who have essential role in the fluency of internet-based learning or e-learning, and thus demands more precision and newfound.

### Conclusion

The analysis results and discussion of this study concluded the following matters: 1) the procedure for developing portals and e-learning courses in this learning media course through five stages, namely needs analysis, developing learning designs, producing e-learning, conducting formative evaluations, and conducting a summary evaluation; 2) the portal and e-learning courses, in this learning media course, were considered suitable as learning media, 3) E-learning in multimedia learning subjects could improve learning effectiveness.

### Recommendations

Based on the findings and discussion of the results of this study, the recommendations that can be given are:

- This e-learning product needs to be implemented in the seventh semester group of S1 FIP Undiksha majors as the main target during multimedia lectures.
- For students who are using e-learning for the first time, lecturers should give directions on how to use the e-learning even though it is designed for independent learning for students.
- This e-learning can be disseminated through academic seminars organized by the university, through training activities on learning media, collaboration with learning centers, educational and training institutions, and other various forums so that e-learning is developed, and used by many people who need, especially related to the introduction of multimedia.
- Efforts should be made to develop e-learning by optimizing more varied presentation methods.
- Further research activities need to be sought to identify the effectiveness of the use of e-learning products both with classroom action research methods and experimental research in a broader target group.

### Limitations

The development of e-learning oriented inquiry learning based on character education is limited on:

- The application must use a computer or mobile device.
- Requiring adequate internet access
- Limited to multimedia course material
- The evaluation carried out in this study did not reach the (long-term) impact evaluation stage.
- Assessment of learning outcomes in e-learning is only limited to cognitive aspects.

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