DEVELOPMENT BLENDED E-LEARNINGSTRATEGY TO IMPROVE PRE-SERVISE BIOLOGY TEACHERS' PROFESSIONAL EDUCATION SKILL

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Abstract

Mastering of Science Biology and learning professionals Biology to carry out the study of Biology is one of Biology education program goals.The rapid growth ofInformationand technologyare increasingly demanding high ICT skills of every citizen.Efforts to meet these needs by combining e-learning and konvensional (blended learning) strategy.Through this research, students can not only improve their professional ability but also gradually increase their ability to use ICT both in accessing, managing, integrating, and creating information. This research is used the principle ofDevelopmental Research Design.Application of blended learning is equipped with a media that is valid and practical so that it can be used independently of students.Improved preservise learning outcomes seen after implementation of blended learning program. The Student Professional Ability (PCK) also increased, though both were still in the category of pre PCK, but after the application of blended learning, the student has reached the upper limit of the pre PCK categories.This suggests that blended learning can improve learning outcomes and the professional ability of student teachers.

Keywords: Biology, ICT, E-learning Blended Model, Pre PCK, Teachers' Professional

1. Introduction

Indonesian education futures is expected to produce human resources that can Compete in the global market.In the Ministry of National Education Strategic Plan 2005-2009 period on the policy of improving the quality, relevance and competitiveness.To be Able to compete internationally Indonesian human resources would have to mastery of a foreign language (especially English) and Also technology.Biology is a subject that is important to the mastery of technology.Therefore the quality of biology needs to be improved in order to provide the basis of technological development.Both the poor quality of learning is strongly influenced by the quality of teachers.

The rapid development of information and technology can not be separated from human life. The world in the future willincreasingly high demand of ICT skills of every citizen.ICT literacy is not just capable of using ICT equipment, but

includes the ability to access, manage, integrate, evaluate, and create information to be Able to play a role in the science community (International ICT Literacy panel, 2002).Through this study they graduallyreviews their enhanced professional capabilities by utilizing ICT, students can not only improve their professional abilities but also skilled in accessing, managing, integrating, and creating information.Currently educational institutions in almost all over the world, especially in developed countries increasingly use theinternet for educational activities (Urhahne, Schanze, Bell, Mansfield & Holmes, 2010).Many countries, includingIndonesia, that advocated using of the Internet for learningtherefore today many schools have internet facilities.

The problems that need to be observed in the implementation of teaching biology in Indonesia, that is related to the use of ICT facilities.Most universities have ICT facilities, but its utility is very limited, for example, to type and search for information.Many Indonesian people who have ICT skills, but simply used for social communication, has not reached the utilization to support learning (Suharno, 2008).One of the things that can be done to maximize the use of ICT by developing a web-based resource center that can Facilitate faculty and students to learn biology more completely.Based on some of reviewsthese reasons, it is necessary to research on the development of general biological based on blended e-leaningmodels.

2. Method

The research is based to development research cycle. Activities undertaken by the principle of the cycle of *Developmental Research,* which comprises: 1. Phase analysis of the conditions and needs of professional biology teachers; 2. Stage of development and testing of products; and 3. The testing phase in the field and continued with the improvement of the product (Borg & Gall, 1989). The study was planned in three stages, plan of research activities at each stage are as follows. Model ICT-based lecture is applied to students taking courses in general biology. ICT-based teaching materials that have been developed can be used by all students that taking courses in general biology. Content and media developed is applied to students who take courses inGeneral Biology.

The first stage

The measures to be taken at this stage are: 1). Perform analysis SAP and syllabus General Biology lectures and student activities 2). Specifies the web-based competency standards. The results are set in the mapping program.

Second stage

The second stage is the stage of development and testing based teaching materials *blended e-learning* 1). Developing materials and lectures models; 2). Develop teaching materials and web-based training; 3). Setup website.

Third stage

Figure 1.Procedures and steps to implement research

Stage	Study	Method	The Steps of Research		
I	Theoretical	Study documentation	Theoretical analysis of the Syllabus and SAP		
	Empirical	descriptive Study	Analysis of the needs of general biology lecture		
		descriptive Study	Selection of Content		
	Theoretical	Development Study	Development blueprint lecture -based models of blended e-learning		
	Theoretical, Empirical	Development Study	Development of lectures a blended e-learning -based models		
II	Theoretical	Development Study	development of web-based teaching materials	Development quiz program	Setup web -site (consulting services)
	Empirical	pre Experimental	Limited Trial		
		Descriptive	Analysis and improvement		
	Empirical	experimental Study	Testing in the field		
III	Empirical	descriptive Study	Data Analysis		
			Improvement		

The third stage is the stage of testing the effectiveness of the products developed and continue to improve products. At this stage it will do the following things: 1). Field test; 2). Analysis of the outcome; 3). Improving models of all the accessories; and 4). dissemination of web-based learning resources. The third stage of the study can be seen in the study flow chart in Figure 2 and 3 activities at this stage include the testing of products (implementation of blended learning) can be seen in Figure 1 below. In the picture it appears that the activities developed during

to 16 times the activity, which includes the sharing of material (pdf, ppt, video, animation, links you tube), quiz / test online, and discussion forums .

3. Results and Discussion

Development Content and Media

In this research, there are two activities, the development of media and implementation blended e-learning. Development of instructional media is done through the stages of Research and Developmentthatmodified, the needs analysis, planning and media development, validation expert constructs and content, small group testing, revision, the final product.

Planning and Development Learning Media

Planning and development of instructional media for e-learning were adjusted according to the needs. Based on the needs of students and the materials that are difficult to learn, learning media will be made include interactive Power Point Slide, namely evolution, metabolism, heredity, cell, ecology. Before the development of the media created first storyboard (sketch making the media) (one of them on the attachment). Once the storyboard, then this design will be realized with the use of specific computer programs, namely Microsoft PPT slides, Macromedia Flash 8, Camtasia. Media that has been made then performed the evaluation stage, the expert validation and testing of a small group. The tests showed that for materials rated an average of 4, 35, and construction rated 4.29. This shows that the media were made already in the category of good (valid) and a decent test. Media tested on a group of students of the same age, in this case the media is tested on students taking courses in general biology.

Application of *Blended Learning*

Application of *Blended leraning* done after midterms (UTS). Through this *learning blanded* students in addition to gaining an understanding of the material, are also beginning to understand how to teach the material. Student Guidance and Counseling is not only required to understand the material but also to understand how to deliver the material. For such needs, require more time. Implementation e-

learning will give students the opportunity to re-focus on learning outside the hours of face to face, so that learning is done after the midterms is open pages of e-learning. Through e-learning-based learning is intended that 80% of students gained grades A larger or equal to 86. At the end of thebiologycontent, students are asked to start thinking about strategies to teach the material.

The Result of Test before Implications *Blended Learning* Program (pre-test)

During early lectures, students were asked to complete a test regarding the material of cell metabolism, followed by plans to teach the material. The topic chosen is the material of the cell metabolism is the process of photosynthesis and respiration. Based on information from peers, e-learning provides the opportunity for students and professors to interact though outside the hours of face-to-face. Then the lecturer of the course prepares instructional media such as PPT, learning videos that can be downloaded and studied students of e-learning that has been prepared. At the end of learning (given a grace period to reexamine the topic that has been downloaded), the students will answer a quiz which was prepared deadline to do it. Results of tests before deploying blended learning program can be seen in Figure 2.
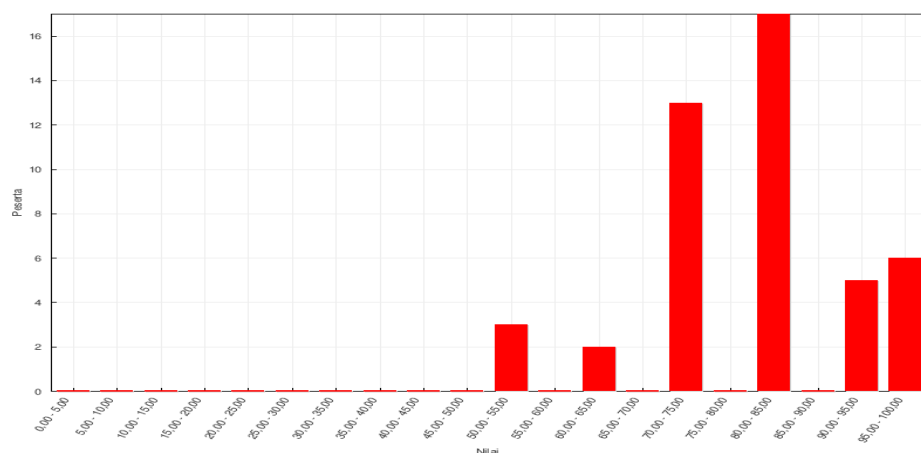

Figure 2. Results of pre-test on the topic of cell metabolism

In Figure 2 shows that the students' scores were in the range of 50-100 values. The average value in dominance at a mean value 70. This indicates that the student is still around enough range even still not enough. The mean value obtained

by the students after participating in blended e-learning. Students who reach a value of 86 is only 40% of the time, which is reached only 45%. Based on these results, carried reflection that need additional treatment time of learning with e-learning.Results of reflection explains that learning a given video has not provided a clear explanation for the students.

The Results ofprospective teacher learning outcomes (Post test)

Once implemented blended learning program, significant improvements occurred. Results of tests / quizzes can be seen in Figure 3.
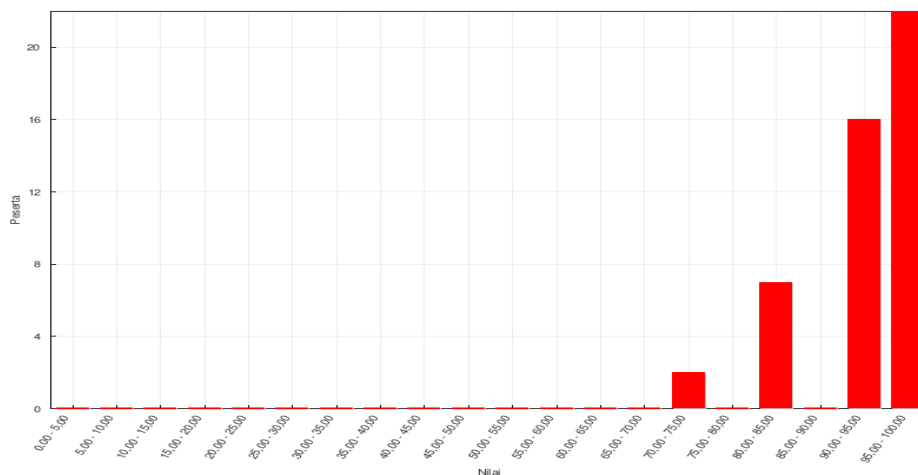

Figure 3. The results of the quiz / test on the topic of metabolism (post test)

Figure 3 shows that the student has been in the range of 70-100 values, but there are still students who received a score of 70, which is only about 3 students. This shows that there are effects caused by the application of *e-learning blended* learning general biology. The results of the test / quiz shows an increase in average student results. The average value obtained after following student learning *blended learning,* students who complete the above KKM increased from 40% to 88% after a learningbased e-learning. This increase was appropriate as expected, ie 85% of the students scored 86. The gain value is 40, its indicates that there is high increase. Based on these results it can be concluded that learning with blended learning can improve student learning outcomes.

The Results of the professional ability of prospective teachers

Professional ability prospective teachers are seen from the results of measurements the *Pedagogical content knowledge* that they make on the sheet CoRes and Pap-eRs. The ability of prospective teachers PCK can be seen from their capabilities related to the development of the number of concepts that are valued by prospective teachers, the ability outlining important concepts and the ability to choose the appropriate pedagogy to teach the concept. Their ability of the structure of the material can be detected from the consideration of prospective teachers in identifying important concepts to be taught. The ability to master the concepts and capabilities describe concepts can be seen from the representation of the content. While the ability of pedagogy can be seen from the consideration of the pedagogy used prospective teachers as measured by using Pap-eRs.

Table 1.The concepts that students appear before implementation

No.	Concept	Percentage emergence of the concept	
1	understanding photosynthesis	√	√
2	chloroplasts	√	√
3	thylakoids		√
4	Grana		√
5	mesophyll		√
6	chlorophyll		√
7	equation of photosynthesis		
8	Pigment		
9	Wavelength		
10	light spectrum	√	
11	photosystem I		
12	photosystem II		
13	Light reaction	√	√
14	Calvin cycle		
15	Understanding fototosintesis	√	
		65%	35%

Total concept that emerged is still very low, most students only raises four important concepts, the rest there are some concepts that are not essential concepts. Student teachers have not been able to determine the concepts that are essential concept mapun attribute concept. The ability of teachers to determine the essential

concepts and attributes of the concept is very important that the teacher can determine concepts ordinate and subordinate concepts (Novak, 1977). The number of concepts that appear likely to focus not seen with the emergence of sub-sub concept and attributes of the concept. Some students actually very minimal raises essential concept to be taught. Understanding of the content and pedagogy is still limited cause prospective teachers can not pick and choose the essential concepts to be taught to high school students. The competence of pedagogy can be seen from the strategy used to teach photosynthesis concepts, and 50% of prospective teachers with a practical answer. The strategythat used was limited to one method. Students are not able to explain the reasons for the selection of methods, not be linked to the characteristics of the material and students.

The results of teacher professionalismcompetences

Professional ability prospective teachers are seen from the results of measurements The *Pedagogical content knowledge* that they make on the sheet CoRes and PaPers., Given in the form of on-line tasks. Giving and collection of duties provided online as a pdf.

Their ability of the structure of the material can be detected from the consideration of prospective teachers in identifying important concepts to be taught. The ability to master the concepts and capabilities describe concepts can be seen from the representation of the content. While the ability of pedagogy can be seen from the consideration of the pedagogy used prospective teachers as measured by using Pap-eRs. The number of concepts that emerged has led to essential concepts, as indicated by 75% of student teachers who bring up the concept of the understanding of photosynthesis, chloroplast, photosystem I, photosystem II, the light reaction, cycle calvin, most students only raises four important concepts , the rest there are some concepts that are not essential concepts. The ability of the student determine the essential concept is already better than the pre test (Table .2)

Table 2. Number of students essential concept that emerged after treatment

No.	Concept	Percentage emergence of the concept	
1	understanding photosynthesis	√	√
2	chloroplasts	√	√
3	thylakoids		
4	Grana		
5	mesophyll		
6	chlorophyll		√
7	equation of photosynthesis		
8	Pigment		
9	Wavelength		
10	light spectrum	√	
11	photosystem I		√
12	photosystem II		√
13	Light reaction	√	√
14	Calvin cycle		√
	The percentage of students	25%	75%

In the test results after implementation of blended learning programs, the ability of the student determine the learning strategies have been better. Lectures by using *blended learning* increased pedagogical students in designing learning as has been done by supported by Osgusthorpe& Graham (in Uzun&Senturk, 2010; Yoon & Lim, 2007) that *blended learning* can improve pedagogical, increased access to knowledge, foster social interaction, increase personal presence, cost effectiveness, and ease to revise.

Students have to combine multiple learning methods, such as lectures and lab methods, methods of discussion and practicum. Ability is not accompanied by precise reasons why using such methods. The ability of students' PCK still minimal, as shown by the ability to identify objectives with consideration still limited and not in accordance with the standards set out in the curriculum, students are still not able to distinguish the methods, media and learning model, important less relevant to the material. From the results,the PCK's students teacher are in the pre PCK category but has entered the upper limit (Anwar, 2014).

4. Conclusion and Remark

Application of blended learning is equipped with a media that is valid and practical so that it can be used independently of students. Improved student learning outcomes seen after implementation of blended learning program. Learning outcomes of students increased from only 35% of students who received grades greater than or equal to 86, 80% of students gained grades greater than or equal to 86. The Student Professional ability (PCK) also increased, though both are still in the category of pre PCK, but after the application of *blended learning,* the student has reached the upper limit of the PCK pre categories. This shows that blended learning can improve learning outcomes and the ability Profesional student teachers.

The lecture-based *blended e-learning* is expected to enhance student motivation and improve the quality of learning, the effect on improvement of professional abilities of students' biology education, it is recommended to be developed on different subjects.

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