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The 1ST International Conference on Science, Mathematics,
Environment, and Education (ICoSMEE)

Surakarta, 16-17 September 2017

**"New Challenges and Perspectives of Innovative Research in
Science, Mathematics, Environment and Education for Sustainable
Life continuing the spirit United nation worldwide Decade of
Education for Sustainable Development (DESD)"**



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21th Century Skills in Learning Science Based E-Portfolio

M Lukitasari¹, J Handhika², and W Murtafiah³

¹ Lecture of Biology Program, UNIPMA, Indonesia

² Lecture of Physics Program, UNIPMA, Indonesia

³ Lecture of Mathematics Program, UNIPMA, Indonesia

E-mail:

marheny@unipma.ac.id

Abstract. The specific skills 21st century have observed the ability of analyze the source of scientific references, metacognition, and communication skill. Instruments used in this research were questioners, unstructured interviews, tests and documentation. The sample of this research were students of biology, physics and mathematics educational program of UNIPMA. This research was conducted for one semester using e-portfolio. The results have reveal the ability of communication skill, analyze the source of scientific references and metacognition after used e-portfolio.

1. Introduction

21st century skills require recurring alignment and training in learning activities that are helpful enough for students to be more successful in their work and in life. Descriptions of 21st century skills which is an important part of facing the challenges of the millennium era [1] have three important components, namely: 1) Information and communication skills, 2) Thinking and problem solving skills, and 3) Interpersonal and self-directional skills. 21st century science learning is vital to be developed through the use of technology as an essential part of training students' ability to access much of the required supporting information [2].

Supporting the development of 21st century skills as conveyed, cannot be separated from the role of technology and its use given the increasingly widespread use of in every aspect as well as the dynamics of life. Especially for science learning that requires active learning, the use of technology will greatly support the learning process so as to develop student skills in a sustainable manner. [3] it shows that the lecturer's perspective in the development and application of e-portfolios in universities is very positive to make students participate actively in learning.

The integrated e-portfolio in ICT-based learning has efficient facilities and functions through diverse performance types, creative, communication with sharing and reflection and evaluation. The main function of e-portfolio is to enhance the individual's ability to evaluate its learning activities through ICT-based learning [4,5]. Basically the use of technology in the field of education as well as e-portfolio is a new challenge in supporting the learning process [6] [7]. The argument presented [1] shows that the use of e-portfolio is a tool capable of supporting learning activities in the 21st century that are able to develop user capabilities in terms of experience and utilization of technology, discussion and communication, development and improvement of concepts, as well as the ability to conduct selection. The science learning of e-portfolio use has a positive impact on Biology learning [8] [5], in this case it appears that the use of e-portfolio specifically fosters the thinking of science students.

Supporting the use of technology in the form of e-portfolio to improve the learning process of science is an absolute use in the function of equipping 21st century skills for

students [9]. [6] the use of e-portfolio is a new challenge in its application in education that proves to be able to make students feel challenged to be more creative in thinking so it is a good stimulus to improve the ability of high-level thinking. E-portfolio as a web-based system has an advantage to record student learning outcomes so that recorded improvements obtained in the learning process that has been done. The purpose of this study is to describe 21st century skills measured on the metacognition component, media usage and communication skills after the application of science learning by using e-portfolio.

2. Method

This research uses descriptive qualitative method. The research is conducted with the important stages of studying and teaching the technical use of integrated e-portfolio in ICT as a form of 21st century skills literacy. At this stage the activities are carried out as follows.

- Introduce the use of integrated e-portfolios in ICT during the learning process, and to be done in the first two weeks of learning.
- Arrange tasks based on learning objectives with 21st century skills indicators measured on metacognition ability, media usage and communication skills.

Indicators of 21st century skills measured after the use of integrated e-portfolio in ICT, are:

Table 1. Indicators of 21st century skills in This Study

Component of the 21 st Century Skills	Instrument
Metacognition	Test
Communication skills	Observation Sheets
Media literacy (source of scientific references)	Observation Sheets

The sample was 101 students consisting of three classes of science, Physics education program (32 students), Mathematics (47 students) and Biology (42 students). The study was conducted for one semester using e-portfolio. Instruments used in this research were questioners, unstructured interviews, tests and documentation. Unstructured interviews were used to determine the impact of e-portfolio use after being applied in the learning process of UNIPMA science students. Data analysis was done in descriptive qualitative technique.

3. Result

The results obtained in this study demonstrate 21st century skills as evidenced by a) metacognition ability, b) communication skills and c) media literacy capabilities after the use of e-portfolio. The results of the research are detailed as follows:

- Metacognition skills with tests that are then classified using a special rubric (Corebima, 2007) show the result that e-portfolio use has an impact on the increased of metacognition ability of science students. The results are shown in Figure 1. below.

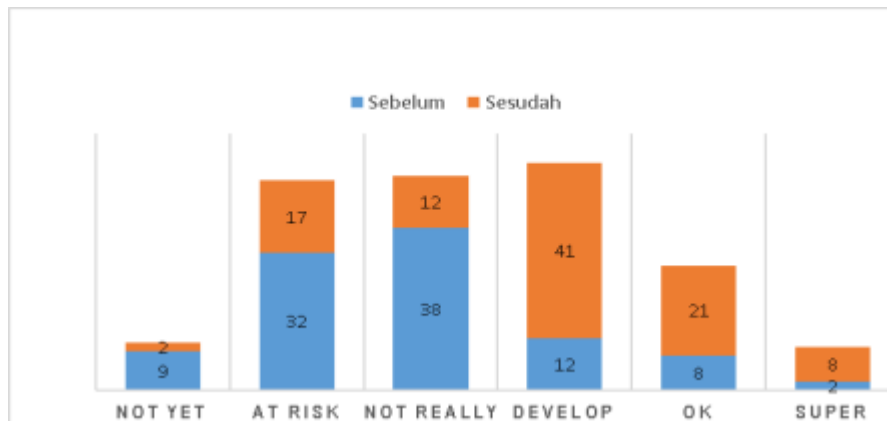


Figure 1. Condition of metacognitive ability of science students before and after learning using e-portfolio implementation

Figure 1 explains that science students have not realized and optimized their metacognitive ability well, which appears with the dominant conditions in the not yet, at risk and not really categories. During the implementation period and the use of e-portfolio shows that students' metacognitive skills are improving with more and more students in the metacognitive categories of develop, ok and even super.

This study shows the important results that the use of e-portfolio on science learning in college provides benefits to students, especially improvement of metacognition, ability to use and utilize media and communication skills. Students who use e-portfolio claim to get many benefits including in the use of technology and information. The learning outcomes they collect in e-portfolios become one of the most important parts that can be used to support mandatory task work. This positive response indicates the development of metacognition ability as students become more reflective toward the given science material. Fenton, Alex explains that the evidence of workmanship produced and stored in the e-portfolio is an important part that is able to develop the ability of 21st century students.

The results of the study provide evidence that metacognition ability shows improvement after application of e-portfolio, the findings are in line with the results of the study [10]. Metacognition ability with the application of technology with e-portfolio becomes an important part in the development of 21st century skills through the application of habituation in science learning. In accordance with the metacognition rubrics (Corebima, 2007) used to measure, it appears that students have improved in terms of understanding the science materials through the answers of the given description test.

- b. The communication skills viewed from writing and communicating using multimedia in various variations [10] are shown from the task of drafting concept maps uploaded in the e-portfolio of student project proposals. One example of the product produced in the e-portfolio appears in the following figure.

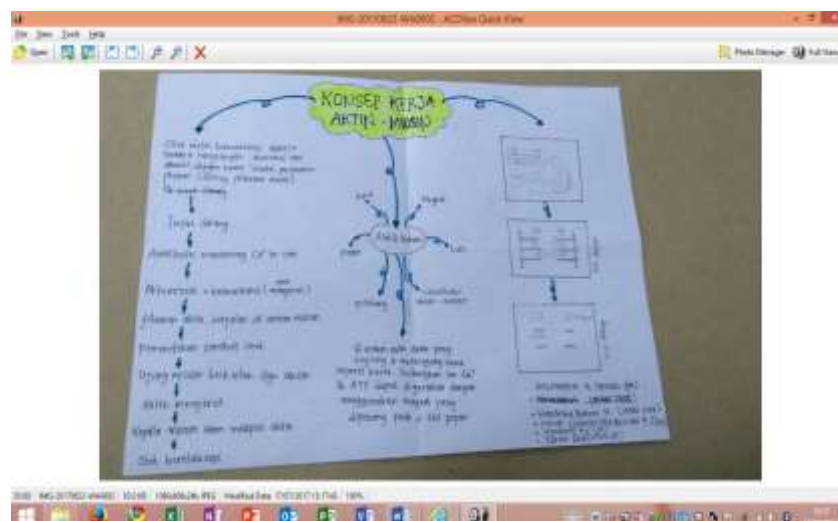


Figure 2. The form of a concept map job in an e-portfolio showing the ability to communicate in a structured manner

The student concept map is based on a project plan designed from the beginning of the lecture. Impact of improving the ability to communicate is shown by the process of revision of the initial form of concept maps generated. Students conduct discussions in e-portfolio and get advice, feedback from other friends and also from lecturers. The use of e-portfolio is a great tool to assist students in facilitating the completion of project tasks. The process of task demonstration in the e-portfolio provides an initial boost to the stimulus and motivates the student to complete the task better [10]. It is an important part of supporting and improving students' thinking skills and continuing to train them during the learning process.

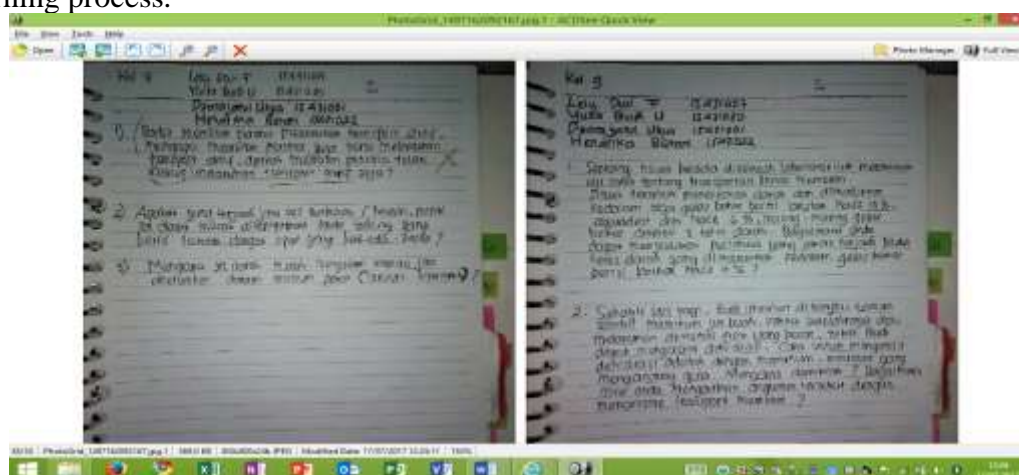


Figure 3. Results of student assignments in e-portfolio to compile analytical questions based on Biology Cell themes

Other forms of communication are shown in the completion of the task of composing the questions based on Biological Cell material. When first uploaded (Figure 3.A) the task is limited to C2. Suggestions and feedback are presented in the task through e-portfolio and impact on the task revision so that it becomes better (Figure 3. B). The development of the form of the compilation of questions made by the students gives an overview of the increased understanding of the material after the communication through e-portfolio tools

in learning. The development of forms and types of questions becomes more detailed with the description and illustration to direct the reader to the material.

The form of communication is delivered by arranging the concept map of the given project task. The skill of preparing the concept map is basically a form of communication of thought result in the form of a systematic and easy to explain image. When a concept map task is uploaded in an e-portfolio, and when another friend response to the task, the communication becomes a form of intense communication and discussion. On the other hand the use of e-portfolio is also a form of student practice to be responsible for every task that is given. This shows that the use of e-portfolio as well as a means of reflection so that the achievement of learning objectives become more clear and specific [11].

- c. The ability of media literacy through the selection of references from the results of publications with the same idea to the project task given to show a good improvement by students. They recognize that the ease of media search with the application of technology becomes an important part of learning activities. The integrated e-portfolio in e-learning enriches students to know and deepen the material in more detail. Students are accustomed to using the technological means as shown in Figure 4 below.

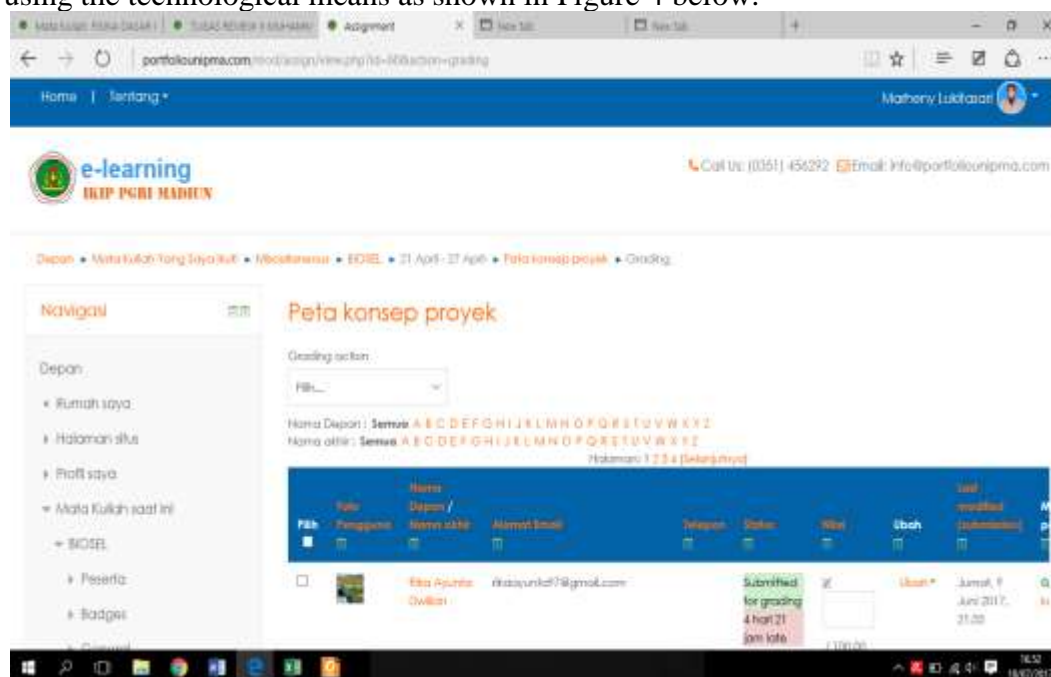


Figure 4. Task forms to enable students in learning using e-portfolio.

Figure 4 shows that students are actively participating in the learning process using e-portfolio. Based on the project tasks delivered, they show interaction by delivering responses to the task in sequence according to the date of instruction and progress report on the results of work tasks which are then delivered in a structured manner. Students feel supported by technology through the use of personal e-portfolio which then can be selected the best task from some revision made to get response or suggestion from other friend or lecturer. [2] Clarify the results of the study by showing that the e-portfolio is the main reference for evaluating students' level of competency based on the direct practice and experience gained during the use of the facility. While the results of work for referral search to support the tasks provided with facilitating e-portfolio are shown in Figure 5 and 6 below.

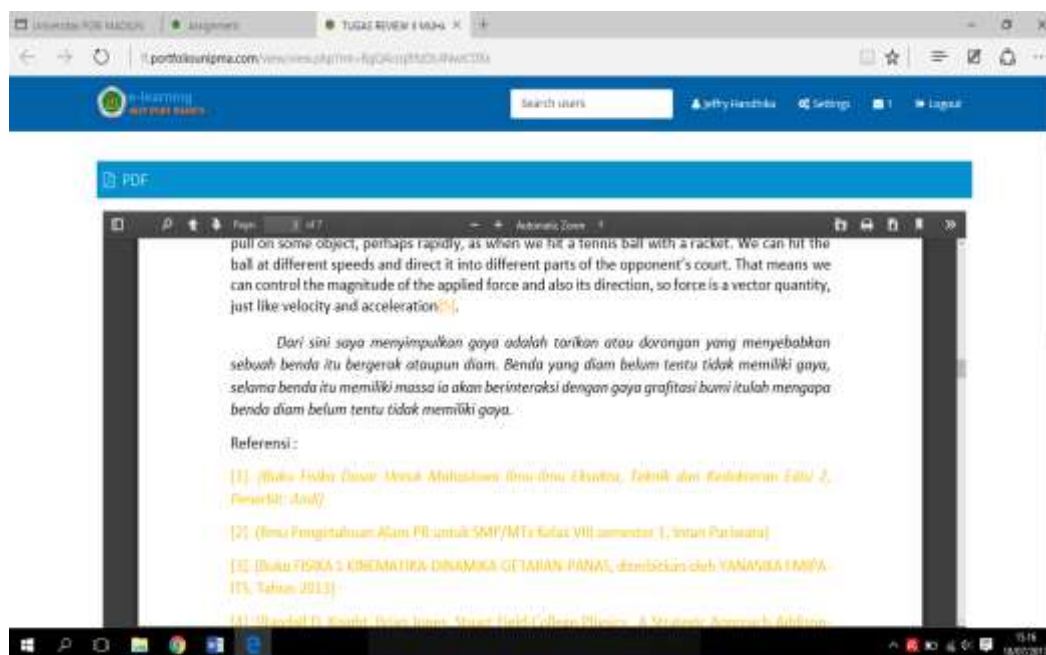


Figure 5. The use of e-portfolio in support of student media literacy capabilities

Figure 5 provides an explanation for the use of e-portfolios to enable students to find sources of information relevant to their tasks. In practice students will easily get a reference source from the link collected and written in the task. The use of technology to find out the source of learning teaches students to study science theories in more detail from many sources. It accelerates the understanding and use of technology in addition to the deepening of science materials. By continuously managing well the e-portfolio content according to their needs, students are increasingly understand what is needed in terms of technicality to better study the science materials. [12] Suggest that the apparent features in our research findings indicate an improvement in 21st century skills required, especially in terms of media literacy.

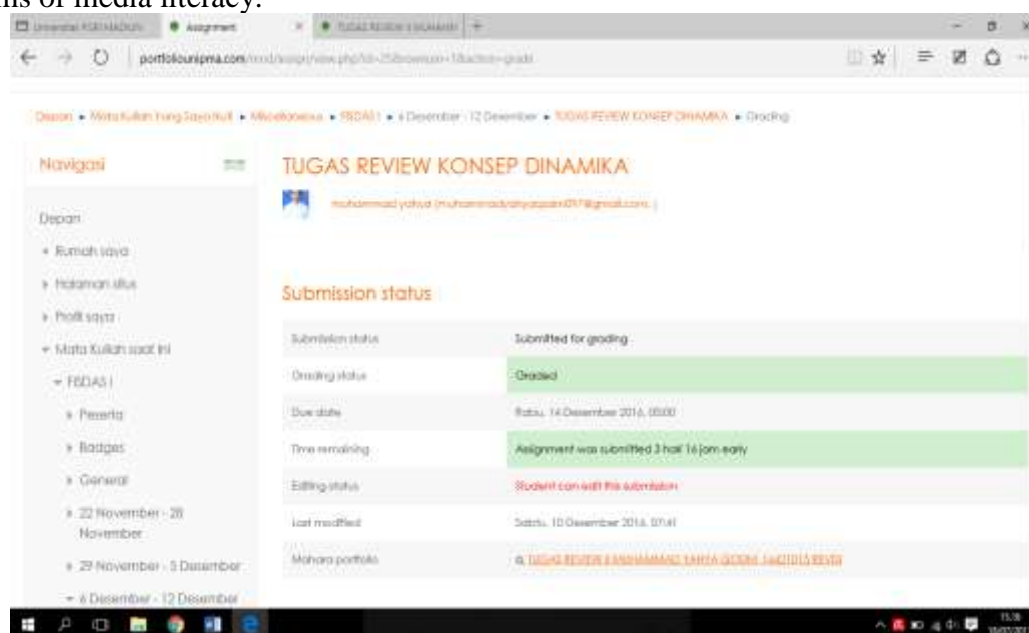


Figure 6. an example of reviewed task uploaded by student

Figure 6 shows one of the forms of tasks that a student has uploaded in an e-portfolio. Indirectly the process becomes habituation for students in using ICT-based facilities. The condition is important to continue to be implemented considering the development of technology is the main base in all lines of life. Similarly in support of 21st century skills then the use of technology is inevitable [13], especially in science learning.

The search for learning resources is done by optimizing the search of internet-based learning resources that support the project tasks prepared by the students. The assignment basically helps the student to focus more on relevant referral search by utilizing e-portfolio. [10] It shows that the results of tasks collected in e-portfolios provide in-depth reflection for students to enable them to improve their tasks for the better. The process means that students become more sensitive in every process and task stages and have an impact on the improvement of their work. [14] The important thing to note is the readiness of lecturers and students in applying and using e-portfolio to support 21st century skills that will support students' ability to solve problems.

4. Conclusion

Based on the results obtained, it can be concluded that the use of e-portfolio is able to develop and improve the ability of the 21st century is described through the ability metacognition, communication skills and media literacy. The condition shows that the use of e-portfolio integrated in e-learning is an important means to improve the learning process including the evaluation stage. We recommend to continue to develop the use of e-portfolio and be used to support the learning process in universities to face the challenges of 21st century progress. In this discourse, awareness and active role of lecturers and students are needed as the main actors to familiarize the use of e-portfolio in learning.

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[This Certificate is awarded to]

Marheny Lukitasari

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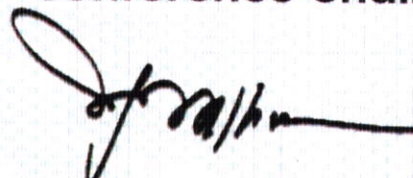
Presenter in The 1st ICoSMEE (International Conference on Science, Mathematics, Environment and Education) 'Faculty of Teacher Training and Education', Sebelas Maret University



Dean of
Faculty of Teacher Training and Education
Sebelas Maret University


Prof. Dr. Joko Nurkamto M.Pd

Conference Chair


Puguh Karyanto, S.Si., M.Si., Ph.D

