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Research paper

ICT Competency Analysis of Pre-Service Science Teacher in the Teaching Kit Using Web-Based E-Portfolios Blog on Science Instruction in English Courses

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Abstract

An analysis of different frameworks for 21st-century learning show consensus about the skills that are needed for living and working in the 21st century. ICT competency is one of the 21st skills that are considered essential as the same as with collaboration, communication, citizenship, problem-solving, critical thinking, creativity, and productivity. The study aims to analyses and explores the ICT competency from pre-service science teacher through the teaching kit using the web-based e-portfolios blog on Science Instruction in English courses. The standard ICT competence measurement was conducted through a survey. The novelty of this study is that the ICT capability measurement in this study was done through the analysis of products produced by students. The products are portfolio on the web blog. The subject of research is the sixth-semester students who receive Science instruction in English course. Research type is descriptive qualitative. The results showed the value: Regarding ICT in e-Teaching Kit Using Web-Based E-Portfolios Blog competency, 20% of PST Teachers are at very high level, 75% are at high level and 5% are at sufficient level. The indicators in ICT competency that pass the knowledge creation are productivity tools, authoring tools, administration, and communication & collaboration. But no one passes knowledge creation indicators they are the internet and educational software.

Keywords: *ICT Competency; Pre-Service Science Teacher; Teaching Kit; Web-Based E-Portfolios Blog*

1. Introduction

The use of the 2013 curriculum containing 21st-century skills in Indonesia eliminates ICT as a subject but makes ICT integrated into all subjects including science subjects. In other words, prospective teachers with any subject must have ICT skills. This is as proposed by [1], four characteristics of the 21st century have implications in the field of learning. First, the availability of information anywhere and anytime implies that the learning model is directed to encourage learners to find out from various sources of information rather than being told. Second, the computational feature, namely the use of machines that causes everything to be faster, requires that learning is directed to be able to formulate the problem [ask] and not just solve the problem [answer]. Third, the characteristic of automation, which can reach all routine work, make learning must be directed to train analytical thinking [decision making] and mechanistic thinking [routine]. And, fourth, the character of communication is increasingly fast, demanding learning emphasizes the importance of cooperation and collaboration in solving problems

In reality, however, [1] the awareness of the importance of ICT in learning through participation in various opportunities in training, workshops, coursework or attending peer tutoring. [2] Government supports the implementation of ICT-based learning, especially in the addition of ICT facilities and infrastructure. Also, the government and the school play a role in conducting ICT training in a planned and gradual with the active empowerment of existing ICT personnel for subsequent implementation in learning so that students obtain effective learning. Need to increase the frequency of ICT-based learning to minimize Weakness of teachers in implementing ICT. Based on these suggestions, the world of education, especially those that educate prospective teachers should improve by preparing prospective teachers of science in addition to having the skills to teach science also must have ICT skills. As stated by, UNESCO [2011], the use of ICT in the 21st century in the learning process should provide students opportunities to learn actively; have new knowledge/skills and be able to share it with others; and participate as closely as possible both as an expert and as an individual learning together with other students. Based on the above background, then needed a way, so that prospective science teacher has ICT competency. One way is to integrate ICT in lecturing process. The course used is Science Instruction in English. This course is a teaching practice course with the English language of instruction. Before practice teaching, students are required to make learning tools in the form of a syllabus, lesson plans, teaching materials, worksheets, and instructional media as a preparation for teaching. Integration of ICT is done in this lecture is by instructing students to collect learning tools as a portfolio task by using the blog. Students must create blogs using the Blog facilities and social networking UNNES. Based on this background then the formulation of the problem in this study are [1] How is ICT competency level of PST after using the web blog as e-portfolio? [2] What is the level of PSTs for each indicator of ICT competences?

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2 Literature Review

Ways that can be used to anticipate and respond to changes that are and will happen in the future are improving the quality of education [2]. One of the efforts is to develop ICT competence for prospective teachers. The university must commit to always improve ICT competency from departmental, dean, and university level[3]. Three recommended ways to teach ICT competency, i.e., enable pedagogical innovation with digital competence [1] Teacher education. ICT integration in teacher education does not only provide ICT skills but also train teachers to use ICT in the learning process. It also provides opportunities for students to use ICT in achieving learning objectives in a course. [2] In learning digital competence within context, students should be allowed and encouraged to use ICT for their learning, information searching, and creating tasks. In this way, they learn to use and be creative with digital tools and media in different subject fields, taking into account the subject-specific considerations, such as searching for relevant information, evaluating online information reliability, IPR aspects, the critical attitude in publishing online content. [3] Innovative learning approaches also support digital competence. Mainstreaming ICT in education and training through innovative teaching and learning approaches are independent of the subject. ICT for learning has the potential to put learners at the center and engage them actively in the learning process, promoting discovery and experiential learning, problem-solving skills, etc. These bring forward at the same time skills related to advanced digital competence, such as online collaboration with the confident and critical use of the digital tools [4].

The portfolio is a collection of material that has a specific purpose, organized, which shows the development of a person's skills either in the form of knowledge and skills from time to time. The content, organization, and appearance of the materials in the portfolio vary depending on the audience and their purpose in making the portfolio. Portfolios are used in a variety of professions including architecture, art, and education. The learning portfolio is an example of a portfolio that features the professional competence of a person who is a teaching professor. The teaching portfolio is made by teachers who work in elementary, junior, high school and university level. In addition to the portfolio for high school level, lately, portfolios in college are beginning to be frequently used. The teaching portfolio contains several artifacts/materials from the lesson. These materials include curriculum units, syllabi, a message for parents/students [letters], examples of student work, photo learning process, and interaction video in the classroom. In addition, letters of recommendation from superiors certificate values [5]and evaluation of learning [6]. A digital learning portfolio or commonly referred to as Multimedia portfolios, electronic portfolios, e-folios, web folios and electronically-augmented portfolios contain the usual teaching portfolio, but the material is in digital format. The contents of digital teaching portfolios on learning processes or artifacts are displayed using a combination of multimedia technologies. Learning portfolios also include voice recordings, hypermedia programs, databases, spreadsheets, videos, and web pages. The portfolio can be placed on hard drives, CDs, zip disks, or files accessible on the website [5-7]. E-portfolio of learning tools using blogs as an innovative master will create a new learning design to improve the old learning process. This process can be recorded either through e-portfolio in this ePPST [e-portfolio for prospective science teacher] based on UNNES blog. EPPST [e-portfolio for prospective science teacher] e-portfolio using UNNES blog that contains tasks that must be completed by students as prospective science teachers to have mastery of learning tools and innovative character. The work is in the form of lesson plan [component of mastery of learning strategy], teaching materials and media and worksheet, affective and psychomotor assessment sheets [assessment component] [8]

Blogs or classroom weblogs are becoming increasingly popular with teachers and teacher education. Many experts predict that blogs will eventually become more successful teaching tools than websites. The blog is a web page that has short posting content, is updated frequently and arranged chronologically according to the content of newness. The content and purpose of the blog itself vary greatly depending on the creator's competence. For instance, there are content about companies, people, ideas, photos, poems, essays, problems or the latest products or fiction stories. The most important thing of a blog is a link to another site, or it could be to another blog.

Blogs tend to match the owner, or may be collaborative with others who have certain topics or specifications but there is only one purpose in a learning process. However, teachers have several ways to use blogs, including putting material into blogs as e-learning materials, expanding communication networks with other teachers, sharing learning tips for students and announcements. The most important thing is about knowledge management because learners can also take part in the blog such as writing reflection, submitting tasks, collaborative work, e-portfolios, and sharing of reading sources related to learning materials. The management of the blog is easy so that it can attract teacher because it does not need complicated site programming. Teachers can build a blog by typing the text into the box and click the share button. Such ease of use is the primary reason to predict that blogs are more successful teaching tools than websites [9]

During this three-year research project, the researchers and teachers developed new approaches to and understandings of how to best integrate the new technologies and new pedagogies associated with integrating an electronic portfolio in the elementary classroom. Several essential lessons we have learned from this study are: [1] It is a new and creative way to introduce pedagogical knowledge by integrating new technology in a class by utilizing portfolios, [2] ePEARL developed can improve the learning process and students' contribution. [4] the use of portfolio is useful to improve six skill elements of the 21st century [10].

Researchers establishes the standards teachers must have in mastering ICT such as [1] Demonstrate eloquence in producing ICT and use it **to** support student innovation and knowledge creation; [2] Provide an atmosphere to assist students in constructing and developing innovative products; [3] Develop students' ability to criticize and evaluate the accuracy and usefulness of sources of information coming from the web to support learning objective; [4] Using communication and collaboration technologies to access information, people and resources to solve problems and to develop collaborative projects both locally and globally; [5] Use systems to manage, monitor and assess the development and progress of student learning and projects; [6] Evaluate and use educative software to support the acquisition of students' knowledge, thinking, reflection, planning and creative processes. [11].

Table 1: ICT competency indicators

	emerging	**Technology literacy**	**Knowledge deepening**	**Knowledge Creation**
Productivity Tools	Explain how a lesson can be designed or adapted for the use of technology to research and gather online information and to create digital products	Describe and demonstrate basic features of presentation software and other digital sources such as typing, text editing, text formatting and printing	Operate a wide range of open-ended software packages appropriate to the IPA teaching field, such as visualization, data analysis, role playing, online simulation and reference	Describes the function and purpose of making ICT and educational tools [multimedia recording and production equipment, editing tools, publication software, web designer tools] and using as a supporter of student innovation and creativity

Authoring Tools	Research and discuss how students use digital tools and resources to improve creative and innovative thinking skills	Describe the basic purpose and function of image software and use it to create a simple image display	Using software to design online and offline material	Provide opportunities for students to use ICT to demonstrate creative thinking, construct knowledge and create innovative products.
Internet	Explore and demonstrate the use of the internet to search and retrieve information	Explain the internet and www, outlines its usefulness and describe how a browser works and use URLs to access websites and use search engines	Evaluate the accuracy and usefulness of information from the web to support subject-based learning	Empower students in evaluating the accuracy of the web sources to support the achievement of learning objectives
Communication and Collaboration	Research and demonstrate the use of ITC to communicate and collaborate with students and peers	Create email accounts and use them for correspondence, using technology commonly used to communicate and collaborate such as email, SMS, video conferencing and web-based collaboration and social media	Use search engines, online databases, social networks and emails to find people to do collaborative projects	Engage the network / social media to support student collaboration both inside and outside the classroom
Administration	Explore and demonstrate the usefulness and benefits of a student management system to check attendance and record student activities	Use software to check student attendance, submit grades and maintain student records	Use appropriate networks and software to manage, monitor and evaluate	Describe the function and purpose of using virtual learning and building knowledge through virtual learning and then using it to support knowledge upgrading and understanding core material as well as developing offline and online communities
Education Software	Describe the function and purpose of tutorials, drill, and practice of using the software to support students in learning the subject matter	Look for tutorials, drills and practicing software to check the accuracy of the web source with applicable curriculum standards	Employ ICT to communicate and collaborate with students, friends, parents and other communities to stimulate students in learning	Describe the function and purpose of planning, thinking and using the tools used to support student creation and planning their learning activities to always reflect on thoughts and actions

3 Methodology/Materials

This research uses descriptive qualitative research method percentage. The reason researchers use descriptive qualitative method percentage because this method helps researchers in finding data and describe the results of research. To determine the sample size in this research used purposive sampling. This research technique is used with several considerations such as resource constraints, time, licensing, and facilities owned by Science Education Study Program. The sample in this research is the sixth-semester students who take the SIE course. The technique of collecting data in this research is by observation technique. Observation technique is done to see the real state of the blog conditions generated by students so that the data obtained by the reality. The variables analyzed in this study is the ICT competency skills. Data analysis technique used descriptive statistical analysis percentage, that is statistic used to analyze data which have accumulated by way of describing data without intending to make a conclusion which applies to the public [Sugiyono, 2008]. The presentation of data analyzed using descriptive statistical analysis is the percentage calculation. This research uses the help of Microsoft Excel software in data processing. As for ICT competence, this study uses descriptive analysis. Criteria for qualitative research on the subject of ICT indicators is level 1 [emerging], level 2 [technology literacy], level 3 [knowledge deepening] and level 4 [knowledge creation]. The steps taken are as follows: [1] Determine the highest and the lowest score; [2] Alternative answer choice of each question item consists of 4 answers. Highest score = 4/4 x 100% = 100% , Lowest score = 1/4 x 100% = 25%; [3] Determine the range of data that is the highest score minus the lowest score, Data range = 100% - 25% = 75%; Determining the length of the interval class, Range [class length] = range of data : 5 = 75% : 5= 15; [5] Segment the score interval and complete it with the qualitative category.

Table 2: Categorization of Research Score

Interval	Category
86% -100%	very high
71 % - 85%	high
56 % - 70 %	medium
41 % - 55 %	low
25 % - 40 %	Very low

4 Results and Findings

In this study, PST was given treatment that is by integrating lecture tasks in the form of learning devices as tasks based on ICT or on the other words the students were given the task to collect tasks based e-portfolio collected through the blog. 20 blogs have been created as a portfolio of student e-tasks [8]. Students must design their blog as a place to collect tasks in the form of a syllabus, lesson plan, learning media, worksheets [e.g., syllabus and lesson plan in Ms. word, media must load video and ppt]. Additionally, students must also make their blog has links with social networking provided by UNNES as a place to communicate with other students.

Based on the research results, it is obtained that ICT competency is categorized into the scores with the following criteria as in Figure 1.

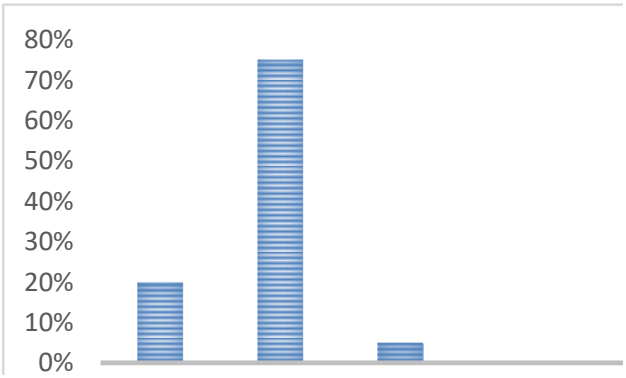


Fig 1: ICT competency of Prospective Science Teacher

There are several must-have teachers in mastering ICT, but the benchmarks here are ICT competency based on CFT-ICT UNESCO. Based on figure 1, about 20% of students are in the very high category, with score 87. While 75% of students are in the high category, and 5% are in the medium category. Overall, the students have four categories in ICT competence: the productivity tools, authoring tools, internet indicator, communication & collaboration indicator, while the two categories of administration indicator and educational software indicator are still not maximal. Here are the results of the analysis:

Table 2: ICT Competency of PST

Variables	Emerging	Technology literacy	Knowledge deepening	Knowledge creation
Productivity Tools	0%	0%	0%	100%
Authoring Tools	0%	0%	55%	45%
Internet	0%	0%	100%	0%
Communication and Collaboration	0%	0%	30%	70%
Administration	30%	0%	65%	5%
Education Software	0%	75%	25%	0%

Productivity tools refer to any software associated with computers and related technologies that can be used as an instrument for personal, professional, or classroom productivity [e.g., Microsoft Office Word and Presentations]. Based on web blog e-portfolio, 100% of PST is in level creation in producing Ms word or ppt. This can be seen from worksheets in the format of ms word/learning media with ppt format which is uploaded into each student blog the web. As stated by [12] based on the survey, 75.17% of teachers have mastered Ms. word and 60.32% have mastered Ms. Power Point. This also happened to prospective science teacher whom 100% of them already master Ms. Word and Ms. Power Point.

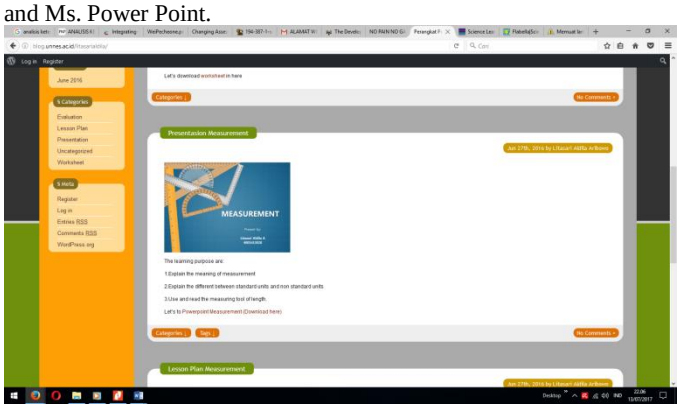


Fig.2:. The example or PPT slides uploaded to the blog

Authoring tools refer to Allows the user to create multimedia artifacts like websites, simulations, DVDs, virtual worlds for integration into presentations, lectures, lessons, and assessments. 55% of PST is in level 3 or knowledge deepening, or on the other way, offline and online materials designed and created by using authoring tools. They used video downloaded from youtube and uploaded in the PPT slides. At the same time, 45% of PST could make videos using programs in here; students are in the level creation. It is because of students' uses of ICT authoring tools to demonstrate creative thinking, construct knowledge and develop innovative products.

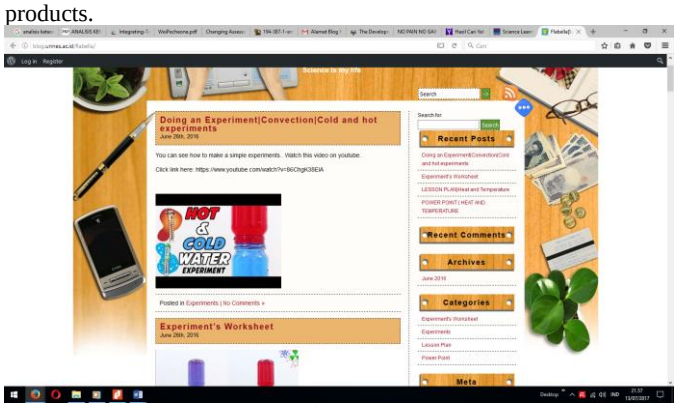


Fig.3: The example of videos uploaded to blog

The Internet develops student capacity to critically evaluate the accuracy and usefulness of web resources to support learning goals and strategies. The K13 curriculum learning approach is scientific with the characteristics of observing, asking, exploring, associating, communicating gives students an opportunity to analyze data by comparing different sources to get accurate data. 100% of student candidates get to level 4 because all students practice lesson plan with a scientific approach. Therefore prospective science teachers can self-reflect to evaluate the accuracy of references coming from the web to support them in determining the learning objectives as well as the teaching and learning strategies they use. This result as the same way with research result of Media electronic portfolio to improve student achievement trend that proposed Electronic Portfolio was able to describe and improve student achievement with a good trend of each project as well as the products of learning undertaken during the lectures. [13]

Approximately 30% of prospective science teacher use search engines, online databases, [social networks], and email to find people, resources for collaborative projects so it can be said that this science teacher candidate is on knowledge deepening level. About 70% they engage the network to support student collaboration within and beyond the classroom By linking social networking into web blogs, and activating comment fields so that other students who act as students can comment and engage in discussion about a project through the web blog. In addition, prospective science teachers have mastered the technology to communicate and collaborate, which is commonly done, among others, messaging, video calls using a variety of social media such as Whatsapp, BBM, and Line. They can use common communication and collaboration technologies, such as text messaging, video conferencing, and web-based collaboration and social environments.

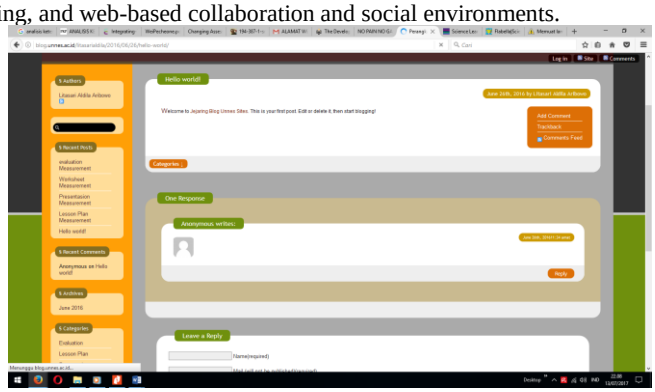


Fig. 4: Link to the blog to UNNES social network

The percentage of administration indicator in level 1 is 30%, level 2 is 0%, level 3 is 65%, and level 4 is 5%. In administration competency, the average of PST in examining and show the use and advantages of student management systems for presence and student records are 30% of PST in emerging. 65% of PST can manage, observe, and assess the developing of various student projects by used a network and suitable software. So, they are on the 3rd level or deepening knowledge level, but most prospective science teachers do not try to discuss a material to improve students' understanding through online media with the community they have created. Only one person or 5% is at level 4 or creating knowledge level.

Students of educator candidates have the ability to utilize technology only to the level of sufficient to develop mathematics multimedia learning [14].The development of computer-based learning software should have three skills as follows, first: mastering the field of study, second: mastering the process of media development, third: mastering the technical skills required in computer programming as well as mastering computer languages Hardianto [15]. Making educational software is difficult to do if students do not get programming material. Therefore, for this indicator, 75% of prospective science teachers are at level 2 or up to have technology literacy. Therefore, they can use existing software to promote students' knowledge gain, thinking, reflection, planning and creative processes. They can also communicate and collaborate with students, peers, parents, and the larger community to keep student learning. About 25% of PST can describe the utility and aim of planning and thinking tools and use them to promote students' creation and planning of their learning activities and their continuous reflective thinking and learning. Based on additional interviews with students, they mentioned that no course accommodates about programming.

5. Conclusion

From the results of the research, it can be concluded that regarding ICT competence of IPA Teachers in Teaching E Book Using Web-Based E-Portfolios Blog, 20% of them are at very high level, 75% are at high level, and 5% are at sufficient level. While indicators of ICT competence are [1] 100% PST in the productivity tools are in knowledge creation; [2] 56% and 44% of PST are in knowledge deepening and knowledge creation of authoring tools indicator; [3] 100% of PST in knowledge deepening of Internet indicator and [4] 67% and 33% of PST in knowledge deepening and knowledge creation of Communication & collaboration indicator, [5] 100% PST are in emerging of Administration indicator, at the end [6] 25% and 75% of PST are in knowledge deepening and technology literacy in Educational software indicator.

From the analysis of blogs produced by students, it is known that the ICT competence is not maximal because there are still many indicators contained in ICT competence that has not been fulfilled especially on the indicators of administration and education software. To fullfill the needness of all the indicators of ICT competency, science education program have to create a e learning or programmer course.

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