

**ABSTRACT PROCEEDING**  
**INTERNATIONAL SEMINAR**  
**ON**  
**CONTINUING PROFESSIONAL**  
**DEVELOPMENT**



**The Faculty of Teacher  
Training and Education**

**Conference Hall, Rectorat  
UNIVERSITY of BENGKULU (UNIB)  
Bengkulu, December 6, 2008**

# THE PREPARATION AND CONTRIBUTION FIRST GRADUATE PROGRAM OF SCIENCE AND TECHNOLOGY IN EDUCATION PROFESSIONAL CAREER

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## ABSTRACT

The preparation and contribution first graduate program of science and technology in professional education career. Preparation of professionals in science education at the undergraduate level of education is very important flyer, for career development and competency mastery of his science through *e-learning*. With the advanced development of the world information and communication technology, education must be prepared as an agent of knowledge for knowledge transfer in the absence of extreme changes in national culture. Readiness for workers who work in science education is very important to equipped, especially for the education level of strata 1 (undergraduate science education) in order not to stutter technology. Some models and ways of provisioning are advised through the revision or modification curriculum and prospective educators in science syllabus, the gradual training to master the stock of highly enough to have the skills and able to operate various programs that fundamental principal, in particular: the mastery of software and hardware, as the principal media for learning / ICT-based science education approach in the form of Internet, Websites Portals, e-learning, blogs, face book, etc. A rational approach in accelerating the provisioning of ICT capability can be done through workshops, training and ongoing consultation guidance.

## I. INTRODUCTION

### a. Background

Information and Communication Technology Development in an Era of Globalization in present are very significant. Advancement of Information and Communication Technology has opened a new chapter for the public to obtain information independently. Limitations information on its own initiative not disappears by individuals who want to know more about what is happening around him. Everyone has access to sources of information anywhere in the world. Consequently, the community became a critical and responsive to the developing world.

The development of information technology world so rapidly has brought tremendous benefits to the advancement of human civilization. Communication activities that had previously demanded that the equipment is so complicated, now has been replaced by automatic machines. Employment system has transfer to technology tools with the enlargement of human muscle power and amazing acceleration. Likewise with has been the discovery of new formulations of various computer capacities, as shift the position of the human brain's ability in various fields of science and human activity. Information and communication technology advances have achieved now truly recognized and felt to give a lot of convenience and comfort for human life.

The development ICT is considered as the solution of existing problems. While people even worship it as a liberator who would liberate them from the confines of the world's mortality. In addition, it is also believed to give mankind happiness and immortality. Contribution of information and communication technology to civilization and human welfare can not be denied. In the modern era, the role of information technology in daily life must be very influential. The ICT often supported by information technology itself is capable of answering the demands of the job quicker, easier, cheaper and save time.

Advances in technology be the answer of the progress of globalization that increasingly enveloped the world. A progress which would give effect to the civilization of student life. Undeniably, we now have become "slaves" of information technology civilization itself. Many students who once served as users of information and communication technology, proving that the life them never escape the role of information technology. Faced with these circumstances, students need to be directed at the attitude of "technology aware" or "technological literacy". Progress is often interpreted as modernization, promising the ability of humans to control nature through science, improve the material well-being through technology and improve the effectiveness of students through the application of an organization based on the consideration of consciousness. Because the science of information and communication technology as well, people can do things that have not been previously imagined.

## **b. Issues**

### **b.1 Positive Impact of Information technology**

The world order are slowly beginning to change from the former industrial era turned into the era of information and communication behind the influence of globalization and information technology that makes computers, internet, and the rapid development of information technology as the main part there should or should not lack in education. In entering that era, the school has the responsibility to prepare students to face all challenges that are rapidly changing environment of their lives.

The ability to speak a foreign language and computer literacy are two criteria that often prompted people to enter the era of globalization both in Indonesia and worldwide. And with computers that have been infiltrating every human life, it requires a very high responsibility for our education system to develop students' language skills and computer literacy.

The educational system based on the development of science and technology it is expected that students can compete and keep pace with the students in the other countries without losing the values of humanity and culture. So, the learners in basic education should be directed to technology and education provided to the public that "technological literacy" that is characterized as capable of knowing, understanding, selecting, using, maintaining, repairing, assessing, producing a simple technology, and care about issues related to technology.

In modern civilization, if information technology can uncover all the secret veil of nature and life, does not mean information technology is synonymous with truth. Because it is only capable

of showing reality. While the human truth that must be more than just objective reality. Of course, information technology and communications knows no moral humanity, therefore it can never form the standard of truth or the solution of humanitarian problems. The stronger the symptoms *dehumanisation*.

Information technology and communications also have a profound in terms of means learning. Because, that the information and communication technology has now penetrated into the education curriculum. One thing that is certainly a buzz in the world of education in the event of an increase in potential students. In addition the wave of progress and development of technology in education has brought about changes in the lives and lifestyles of students are more dynamic. Given this, the students always turn on and channeling the spirit of science to explore the unknown.

## **b.2 Negative Impact of Information technology**

Information technology can also lead to the dark side prone to worrying stage with concern the developments in technology crime itself is associated with "cybercrime" or mayantara-crime. Cybercrime problem is deservedly gets the attention of all parties thoroughly on future technological developments. Because of this crime, including one extraordinary crime, and even felt well as a mysterious crime that can threaten people's lives. Criminal act or crime is the worst in modern life of society due to rapid advances of technology with increasing incidents of computer crime, pornography, digital terrorism, "war" junk information, biased information, hackers, and crackers and so on.

As with the events that cybercrime on the site of military, Agency for the Assessment and Application of Technology, Police and the Ministry of Foreign Affairs of the Republic of Indonesia is an evil dark side of information technology that utilizes the Internet sophistication. Also, the Microsoft site, NASA and the Pentagon did not escape from the rogue hackers who disrupt information systems and data held by the United States. In addition, ATM case by mischievous hackers also becomes one of the negative impacts of information technology.

The negative impact of information technology is perceived by the students. The number of students who fall asleep with the facilities of information technology entertainment websites such as *facebook*, chat, twitter, etc., make them set aside their obligations, they even make it as a hobby that is done without knowing the time. Consequently, students will become lazy and increasingly blinding them about the importance of conscious awareness of the technology.

However, we should not worry about the development of information technology and communications. Be intelligence utilize these media and choose a positive value. Take the things you need and make things that are negative for consideration and comparison.

## II. DISCUSSION

### a. ICT Education Program for the Science Educator

One form of ICT products is rapidly growing Internet in the late 20th century and on the verge of the 21st century. Her presence has a considerable impact on the lives of mankind in various aspects and dimensions. Internet is one of the instruments in an era of globalization which has made this world a transparent and connected very easily and quickly without knowing the limits of territorial or nationality.

Through the Internet everyone can access to the global world to obtain information in various fields and in turn will influence the overall behavior. Within a very fast the last few decades there has been a revolution of the Internet in various countries as well as its use in various areas of life. The existence of the Internet today is already a staple of modern humans in meeting the challenges of global development. This condition will certainly have an impact on the style and patterns of life of mankind as a whole.

Communication Technology (ICT), has an influence on the world of education, especially in the learning process. The increased use of ICT there are 5 (five) a shift in the learning process, namely:

- (1) of the training to the appearance,
- (2) from the classroom to where and anytime,
- (3) of the paper to the "on line" or channels,
- (4) the physical facility to facility networks,
- (5) of the cycle time to real time.

E-learning is the use of Internet technology in the delivery of learning in a broad-based range of 3 (three) criteria, namely:

1. e-learning is networked with the ability to renew, store, distribute and share teaching
2. materials or information, delivery to end users through a computer using a standard Internet technology,
3. Focuses on the broadest view of learning behind traditional learning paradigms.

Currently e-learning has evolved in various models of ICT-based learning such as CBT (Computer Based Training), CBI (Computer Based Instruction), Distance Learning, Distance Education, CLE (Cybernetic Learning Environment), Desktop Videoconferencing, ILS (Integrated Learning system), LCC (Learner-Centered Classroom), Teleconferencing, WBT (Web-Based Training), and so forth.

This is actually the worst that can not be avoided and hidden from the advances in information technology today. Therefore we must be careful about the negative impacts, because impacts can change the paradigm negative students in the era of information and communication technology.



(a)



(b)

**Figure 1.** Location of internet rent (a) and mobile phone as a media (b)  
<http://www.nytimes.com/2009/04/27/technology/start-ups/27global.html>

The graduate programs in *Education, Mathematics, Science and Technologies (EMST)* prepare students to understand and improve learning and instruction in mathematics, science, and technology across the life (with emphasis on middle-school through university). These programs seek fresh insights into major educational problems using the perspectives of cognitive science, socio-cultural theory, and the resources of modern technology. In the programs, students are :

1. Develop scientific understandings of learning and instruction in mathematics, science, and technology;
2. Build frameworks and theories (of knowledge organization, of problem solving, of teaching) as well as contributing to the empirical scientific knowledge base for education;
3. Conduct “design experiments” in which innovative instructional strategies, materials and technologies are crafted in theoretically principled ways, and studied as they are used in classroom settings.
4. Work in partnership with teachers and with natural scientists.

The program is unusual in emphasizing *both* conducting research that makes fundamental contributions to the field’s understanding of thinking, teaching, and learning, while *also* contributing to the solution of practical instructional problems. Faculty program have included the development of instructional units at middle-school, secondary, and collegiate levels; studies of highly effective instruction; and studies of transformative uses of new technology.

The EMST program uses an "apprenticeship" approach to graduate studies. In their first semester, students affiliate with one or more research groups, and are increasingly involved in planning and carrying out research projects. Many EMST courses have empirical projects, which are often the basis for students’ first- and second-year projects and papers for their qualifying examinations. Such coursework and projects establish the base for, and often evolve into, dissertation projects. Students mastering in the theories and methodology underlying this interdisciplinary specialty through classes, seminars, colloquia, and research in three areas:

1. Individual and collective cognition (e.g., conceptual change, genetic epistemology, embodied cognition, and meta-cognition),
2. Learning and knowledge in the disciplines (e.g., the nature of mathematical problem solving, programming and problem solving), and
3. Design of instruction (e.g., cognitive consequences of technology, principles of effective physics learning environments productive apprenticeship in disciplines).

Students with strong backgrounds in mathematics, science, engineering, computer science, psychology, cognitive science, or technology may apply to obtain an M.A. or Ph.D. The Ph.D. prepares students for careers in university or college research and teaching, professional design of instructional materials, and research for policy and other private or governmental organizations.

Education, Mathematics, Science and Technology (EMST) is a unique, pioneering program of studies in mathematics, science and technology education. It must be features as :

1. A research focus on fundamental problems of learning and instruction.
2. A parallel concern for principled renewal and innovation in wide-spread educational practice.
3. A basis in cognitive science, including anthropological and sociological inquiries into the ways in which learning takes place in situ.
4. A commitment to the rigorous use of a wide range of evidence and methods for understanding thinking and learning.
5. A commitment to discipline-specific approaches (e.g., mathematics, physics, biology, computer science) to education.

The development and use of appropriate advanced technology to transform learning and the institutions of education include studies of mathematical thinking and problem solving, cognition in the sciences, cognition, analysis and design of "local cultures" for learning both in and out of school, and the development of distributed and individual computational environments to enhance learning.

The faculty has an especially deep expertise in explorations of individual and collective cognition and the study of learning in particular scientific disciplines. The program draws on complementary expertise from across the School of Education. Students interested in applying to the program should examine faculty web pages and read the sample papers linked to them, in order to get a sense of the work that is done in EMST.

## **b. The Role an Application of ICT for Professional Science Education Career**

Science teacher view that science is not an end but a means to achieve educational goals. Science teachers comprehension about the issues selected when done implementations need to be packaged as educational material tailored to the target psychology developments, namely the students' junior and senior high school age. Implementation is done through activities in class (*in door*) or outside the classroom (*out door*). Application of ICT in life today can take advantage of computer technology.

Science Learning in Schools Science (IPA) can be interpreted differently according to the viewpoint that used. Lay people often define Science as collection scientific information. On the other part of scientists as a method to test the hypothesis. Meanwhile, philosophers may interpret it as a way asked about the truth of what is known. Science states that essentially are 1) the collection of knowledge, 2) means or way of thinking, 3) ways to investigation. The purposes of each meaning are:

- i. Science as a collection of knowledge. The results of the discovery of the creative activity of scientists for centuries systematically collected and compiled into a collection of knowledge are grouped according to field studies, such as physics, chemistry, biology and so on. In the Physics, a collection of knowledge can be facts, concepts, principles, laws, theories, and models.
- ii. Science as a way of thinking. Science is a human activity which is characterized by thought processes take place in the minds of those engaged in the field it.
- iii. Science as a means of investigation Science as a means of investigation illustrate the approaches used in compiling the knowledge. Several methods in Science, who show effort in astronomy. Another method based on the desires of the laboratory or experiment focusing on causality Science has the typical characteristics, namely:
  1. Objectively, the meaning of scientific knowledge in accordance with its object, means there is compliance as evidenced by the results of empirical observation.
  2. Methodical, meaning that scientific knowledge is obtained by use methods that orderly and controlled.
  3. Systematic, meaning that knowledge is organized in a system, not stand-alone, explain to each other as one unified whole.
  4. Universal or generally accepted, that applies not only by someone or some people, but by the same experiment everyone will gain the same knowledge or consistent.
  5. Natural science must be obtained through means or step or method that is organized and controlled, so that called the scientific method. Some of the scientific attitudes that need to be developed include: curiously, attitude to always put the evidence, attitudes flexible (not rigid), and attitudes reflect critically.

A number of methods used by scientists is based on observation and prediction, for example everyday learning is realized through the comments critical of what already achieved. Based on some opinions as described above, the school strived to optimize critical thinking skills students through a learning activities based on scientific method. Model learning used in teaching science is selected on the type characteristics of science.

Teachers can be creative and innovate incorporate some type of learning model to be applied in class. The approach strategies model are: *Learning Model Problem-Based Learning Cognitive* for more focused learning activity that organizing phenomena and real problems in everyday life. The syntax of the model of this learning is:



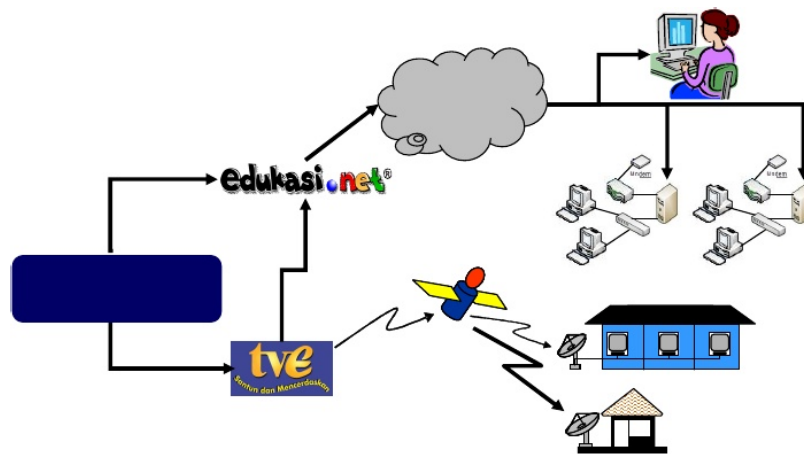
1. Give problems in students
2. Organize students to learn
3. Guiding independence in the investigation group
4. Develop and present the results
5. Analyze and evaluate the process of problem solving.

The fifth phase / syntax above seek to develop students' thinking processes. Process thinking involves the interaction between *knowledge*, *cognitive* skills and *attitudes* and *values* within the individual, are:

1. Identify the purpose of the problem.
2. Determine what problems are encountered and what needs to be done
3. Presentation of relevant information (extracting relevant information).
4. Presentation of the problem

Contribution of ICT in Problem-Based Learning the availability of the Internet as a result of the development world of information technology enables students to learn globally. Access to information can occur without constrained space, distance and time. Government through the internet in school programs seeks to provide facilities for learning to be global and is always growing dynamically. Socialization benefits and impact of Internet use was has been done by several institutions.

The shape of the role of government to advancing the world of education through the development of information technology is inclusion of informatics lessons (ICT) into education curricula. The advantages of the internet unlimited availability of information that allows teachers and students to assess a problem faced by the various reference / referral. The teacher can give examples of some of the links that students can use as a reference in analyzing an issue or fact of science. References should always be included in the writing of students' work to be easily tracked truth.



**Figure 2.** Schema of The utilization of ICT in education

Some links in Internet media that requires no requirement enrollment / registration for its users. If found this link this, teachers should remind students to always be careful in provide identification. The role of ICT in this activity is as a source unlimited referrals and media discussions (sharing) between students and students with those observers of the problems being studied. Discussion of activities available at Internet through blogs, chats and social networking sites that allow each people joined in a group in a particular field.

### **c. Preparation Career Human Resources**

The EMST program is focused on research and on students' learning-by-doing from the earliest phases. The EMST course requirements complement the School of Education's requirements to ensure a broad and scholarly preparation. In addition to required course work, students are expected to complete an independent empirical research project in each of their first two years. Students use their empirical projects to write position papers, which are ideally of publishable quality. The student's course work and independent research are intended to be overlapping and synergistic.

Apprenticeship is a core value of the community. Every EMST faculty member has a research group, which is a major vehicle for our form of apprenticeship learning. Students enroll in their advisors' research groups every semester, and participate in ongoing discussions of work, including their own. These groups are not proprietary: many students belong to two or more research groups, learning about various faculties' research and getting feedback from a range of faculty and students on their efforts.

### **d. Career Paths of Graduates**

EMST graduates typically have taken leadership roles in educational research in Schools of Education and other college and university departments across the country. Other graduates have concentrated on teacher training and professionalization. A significant number of graduates have taken positions in "think tanks" or businesses concerned with the development of advanced technology for education.

Through the research activities of science education, students are expected to be able to: (1) Understand and be aware of a number of issues related to local life with the principles of science. (2) Mastering and implementing educational technology in an attempt to solve the problem of local life through learning both inside and outside the classroom. On that basis, the research final project (thesis) will be conducted through two stages of research.

ICT has changed the face of learning that is different from traditional learning process characterized by face to face interaction between teachers and students both in class and outside the classroom. In the future, will increase the flow of information through the Internet network that is global across the globe and require anyone to adapt to the trend, if not outdated. Under these conditions it is education, especially fast or slow learning process can not be separated from the presence of computers and the Internet as a primary tool.

### III. CONCLUSION

The preparation and contribution first graduate program of science and technology in professional education career. Preparation of professionals in science education at the undergraduate level of education is very important flyer, for career development and competency mastery of his science through *e-learning*. With the advanced development of the world information and communication technology, education must be prepared as an agent of knowledge for knowledge transfer in the absence of extreme changes in national culture. Readiness for workers who work in science education is very important to equipped, especially for the education level of strata 1 (undergraduate science education) in order not to stutter technology. Some models and ways of provisioning are advised through the revision or modification curriculum and prospective educators in science syllabus, the gradual training to master the stock of highly enough to have the skills and able to operate various programs that fundamental principal, in particular: the mastery of software and hardware, as the principal media for learning / ICT-based science education approach in the form of Internet, Websites Portals, e-learning, blogs, face book, etc. A rational approach in accelerating the provisioning of ICT capability can be done through workshops, training and ongoing consultation guidance.

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