

## Utilization Open Educational Resource (OER) in learning chemistry

Sandra S. Adji and Tita Rosita

sandra@ut.ac.id

tita@ut.ac.id

### abstract

The information technology provides wide opportunities in delivering chemistry learning. One of teaching learning aids provided by UT is the online tutorial. The purpose of this study was to obtain the extend students were able to answer the task given in the Online Tutorial through the use of Open Education Resources (OER). The study was conducted at the UT courses tutorial activities of Environmental Chemistry, Inorganic Chemistry 2, Chemistry Topic Materials Curricular for Junior & Senior High School during the past four registration periods or period of 2011.1, 2011.2, 2012.1 and 2012.2 exams at the UT. Students are required to use OER to respond to the tasks given by the tutor. There were 150 students' answers for tasks at Online Tutorial. Data were analyzed into qualitative descriptive. The results showed that: 1). All students had used literature study could make references through a variety of literacy resources or exploring Open Education Resources (OER). 2). Approximately 86,67% of students made reviews of literacy/ article obtained through OER, but less than 50,56 % of them were able to make the analysis of the text. 3). Many students gave a positive impression on OER searching, 4). A few students still met difficulty in getting access to the internet due to weak network

Keywords: utilization of OER, chemistry learning, a tutorial on line

## I. INTRODUCTION

The Open University provides a range of learning support services in implementing the learning program. One of them is an Online Tutorial. Online Tutorial is internet-based learning or web-based tutorial (WBT), offered by UT and attended by students through the internet (General Guidelines for Implementation Tutorial, Simintas UT, 2004). The Online Tutorial service is designed to help students learn the learning materials, in addition is also expected to train students accustomed to literature study, as it is purposed by the Online Tutorial service *i.e.* students learn the literature material given in *open education resources (OER)*. Through Online Tutorial service, students can interact with the tutor -in this case FKIP academic personnel at UT- in understanding the learning materials given.

The Open University offers several programs, one of them is a graduate program for Chemistry Education at the Faculty of Teacher Training and Education (FKIP). FKIP-UT students are those who work as educator (teacher) in Indonesia both residing in urban and rural regions. The use of internet in learning process supported by Online Tutorial, bridges the gap information between the tutor (academic staff in the Faculty of Teacher-UT) and students ; supports them opportunity to learn Main Topics Book (BMP) and any other literature related to the subject matter that followed. The book contains descriptions on the main topics, including the full three-dimensional images and tables that can help students understanding the subject matter, but some other topics have not described as well. It was expected that the provided literatures searched in *open educational resources (OER)* were able to enhance students' insight or understanding about the topic being studied.

This paper was intended to obtain information on the Online Tutorial activities during four registration periods and particularly was aimed to achieve information about:

- 1) Students' participation on Online Tutorial in some courses/subject matters of Chemistry Curricular Topic for Junior & Senior High School ; Inorganic Chemistry 2 ; and Environmental Chemistry, during four registration periods (2011.1, 2011.2, 2010.2, 2012.1 and 2012.2).
- 2) Student learning outcomes in reflecting the literacy obtained through literature studies on *open educational resources*.

The data was obtained through the documental study of the collected Online Tutorial activities during four registration periods in 2011.1, up to 2012.2. Randomly, it drawn 152 students' answer on one question item in Online Tutorial task about literary analysis referred

through OER on three subject matters. Indicators used for the literacy analysis were the ability of students in delivering reasons, situations or examples, and inferences. Data were analyzed by descriptive qualitative.

## II. RESULTS / FINDINGS

### A. Activities in Online Tutorial

In line with the development of information technology, the learning process can occur through the use of information sources that can be accessed over a network, known as connectivism approach. Kop and Hill (2008) explained: "In connectivism, the starting point for learning occurs when knowledge is actuated through the process of a learner connecting to and feeding information into a learning community".

In the distance learning, connectivism approach is relevant to be applied, in accordance with many educational material sources that can be accessed by students as a supplementary learning materials. The use of Internet technology would not be easy when it was not designed and well-prepared. Therefore the readiness to implement the use of these technologies was necessary in order to achieve effective learning. Both the system of distance learning and the Internet searching, require students' independent study behaviour, especially in doing Online Tutorial task given.

Student participation in Online Tutorials among other activities characterized by the involvement of students in reading the initiation, following discussions, and submitting assignments task/reply. Online Tutorial activities by Open University were held during the period /semester/term of eight test initiation, discussions on each week as well as the three other tasks. OER literature search through the activities on Online Tutorial described as follow :

#### 1. Initiation Topic Material Course

To arouse students' learning on the subject topic material texted on the Main Topic Book (BMP), the students was given initiation on Online Tutorial service. The initiation in the subject matter of Chemistry Curricular Topic for SMP and SMU ; Inorganic Chemistry 2, Environmental Chemistry, contains a short literacy, questions which invite to learn the modules given as well as pictures provided. The material was presented in a varied ; in the form of images, tables, literature or description and or power point. The initiation examples are given in Table 1a, 1b and 1c.

Table 1a. Footage example of Initiation Topic on Online Tutorial : Inorganic Chemistry 2

**Several footages from initiation 2 on Online Tutorial for the subject matter of Inorganik Chemistry 2  
METAL ALKALI AND SOIL ALKALI**

See you again in the second initiation electronic tutorial Inorganic Chemistry 2. At this initiation we will discuss about the source and extraction, the physics and chemistry nature of metal alkali and soil alkali. After this initiation, you are expected to explain about the source and extraction, the physics and chemistry nature of metal alkali and soil alkali. Meanwhile for the **mixture** and the usages of metal alkali and soil alkali you can learn them on module. Several natures of metal alkali are :

Metal	Radius (A <sup>o</sup> )		Specific Mass	Energy Ionitiation (KJ/mol)		Electro Negativity (Pauling)	Melting Point (°C)	Boiling Point (°C)	Cohesy Energy (KJ/mol)	Flame Color
	atom	ion		First	Seco nd					
Litium	1,52	0,76	0,54	520,1	7296	1,0	181	1347	161	Red
Natrium	1,86	1,02	0,97	495,7	4563	0,9	98	881	108	Yellow
Kalium	2,27	1,38	0,86	418,6	3069	0,8	63	766	90	Violet reddish
Rubidium	2,48	1,52	1,53	402,9	2650	0,8	39	688	82	Violet
Secium	2,65	1,67	1,90	375,6	2420	0,7	28,5	705	78	Blue

For further insight to the topic you are learning about, find information from any sources about metal alkali and soil alkali, for example searching via internet to visit the folowing addresses and many others.


- <http://jurnal.sttn-batan.ac.id/wp-content/uploads/2009/04/4-anis.pdf>
- <http://jurnal.sttn-batan.ac.id/wp-content/uploads/2008/12/51-Nooranis489-496.pdf>

Table 1b. Footage example of Initiation Topic on Online Tutorial : Environmental Chemistry

**Several footages of initiation on 5 Online Tutorial of Environmental Chemistry  
ENVIRONMENTAL CHEMISTRY**

Students, on the 5th Online Tutorial activities, you will learn environmental pollution. Please describe, what is meant by environmental pollution. Consider some important points/keywords, Were they caused by human activities? And How if they are seen from the usage.?

The existence of gases and particles above the needs oftentimes have negative impact for the dynamic balance in the air. What gases produced by human activities which tend to disturb the dynamic balance in the air? Observe the picture below which show the gases polute the air.



**Sumber:** [biomed.um.edu.my/.../kuliah/aircon/CoolTower.htm](http://biomed.um.edu.my/.../kuliah/aircon/CoolTower.htm)

Perhatikan pula macam-macam gas yang berpengaruh terhadap terjadinya pemanasan global dan efek rumah kaca. Dari mana sumber-sumber bahan pencemar tersebut?. Bila Anda ingin memperkaya pemahaman Anda tentang bermacam-macam senyawa yang berkontribusi dalam mencemari udara pelajari kembali materi yang ada dalam modul dan sumber bacaan lain yang mendukung.

Table 1c. Footage example of Initiation Topic on Online Tutorial: Chemistry Curricular Topics/Materials for SMP and SMU

**Several footages of initiation 6 Online Tutorial on Chemistry Curricular Materials for SMP and SMU subject matter**

THE CONCEPT OF DIFFICULT AND MISCONCEPTION ABOUT REACTION RATE AND CHEMICAL EQUILIBRIUM

Why is the reaction rate is defined as the concentration change rate of with time? Why not as the change of substance mole of time? Approximately what would happen if the reaction rate is defined as the substance moles change rate of time?

Based on the above questions, can you find the answer?

*When a chemical reaction lasts, the collision between atoms or molecules occurs. How collisions can occur if there is no media that holds the reactants, which allows the collision occurred? Most media used is liquid. So it needs corrections to the volume of liquid used. It means that the mathematical equations uses the concentration in molar. Comparing with liquids, solids volume is usually ignored. Why? In general, the addition of solid substances into liquids, will only add a very small volume compared to the initial volume of liquid used .... $dV \sim 0$ . <http://courses.chem.itb.ac.id/mod/forum/discuss>.*

.....

What factors are affecting the rate of reaction?  
Try to consider the effects of temperature, surface area of the touchpad, the substance concentration, the influence of the catalyst on the reaction rate.  
What if the temperature is raised?, pressure is magnified? and so on?  
Furthermore browse some literacy sources that you can use to strengthen your understanding of the topic you are learning about, as shown in:  
[http://id.wikipedia.org/wiki/Reaksi\\_SN1](http://id.wikipedia.org/wiki/Reaksi_SN1) Good Luck.

Through the example above, it can be explained that the initiation given contains a brief review on the topic material being learned, appealing unto learning the Main Topics Book (BMP), as well as browsing literature related to the topic being studied that can be accessed from the internet.

#### b. Tuton Task

The Online Tutorial assignments on three subjects, are given in the form of questions. Independently students should do three tasks for each subject in which each task contains 5 or 6 questions. The students can answer the questions not limited based on to Main Topic Book but also from variety of sources, but BMP's being one of OER that can be accessed through the UT Web site. In addition BMP gives an explanation of the expected competencies achieved after following the intended course. In the Online Tutorial activities the assignment are given based on the characteristic of subject matter/course. The examples of tasks are assigned as shown in Figure 2a, 2b and 2c. Furthermore one of the questions in each task is an appeal for reviewing a literacy that can be developed through OER. Students' response in delivering the answers shown in Figure 3a and 3b.

**Task 1. Subject matter : Inorganic Chemistry 2. Online Tutorial activities 2012.2**  
**Answer the questions briefly.**

1. Describe 5 methods used in metal extraction process.
2. Describe minimal 5 examples of alkali metal **compound/union** with the usages.
3. Mention minimal 5 examples of soil alkali metal **compound/union** with their characters.
4. Explain the usage of aluminum metal, tin, and timbale.
5. Describe how to extract aluminum metal from its ore.
6. Search article about how to extract metal (choose one of the various metal) from the sources could be downloaded from internet. Write the source and your view on the topic.

Figure 2a. The Example of Online Tutorial Task on The Subject of Inorganic Chemistry 2

**Task 1 : Chemistry Curricular Topic Material for SMP & SMU on Online Tutorial 2012.2**

1. Develop the mind-mapping of chemistry learning about :
  - a. Materials and their nature
  - b. Atom structures and the elements in the core, transition, and radioactive
  - c. Chemical bond
2. Describe (choose one) how to teach the main concepts in main topic of :
  - a. Materials and their nature
  - b. Atom structures and the elements in the core, transition, and radioactive
  - c. Chemical bond
3. Search articles about learning activities of the topic you have chosen. You may download from any sources and or from *open educational resources*. Choose the pdf files discussing about the research result . Support your reason and your REVIEW/point of views

Figure 2b. Examples of Online Tutorial Task on Chemistry Curricular Material for SMP and SMU Course

Students, to enhance your understanding on the topic of Global Warming, Greenhouse Effect and Acid Rain, do the following exercise

**TASK 1 :** Find out the answer of the following questions from the MainTopics Book about ENVIRONMENT CHEMISTRY and other literacy that can be downloaded from the internet / Open educational resources. Do not forget to include the source (..... <http://>) or what books ....

1. What is meant by the Greenhouse Effect (ERK) and its cause ?
  2. What is included in a group of Greenhouse Gases? Which countries has contributed to increasing Greenhouse Gas in the earth's surface?
  3. What is meant by Global Warming and Climate Change? And explain the influence of the earth's surface temperature increase to global climate change.
  4. Does the depletion of the ozone layer have a correlation to global warming and climate change?
  5. What is meant by acid rain? What causes it?
  6. Afterward, browse article about Green house Effect (ERK) or Global Warming and Climate Change from sources that can be downloaded from the internet. And do not forget to include the source and GIVE REVIEWS / YOUR OPINIONS about such topic
- Have a good work.

Figure 2c. Examples of Online Tutorial Task on Environmental Chemistry Course

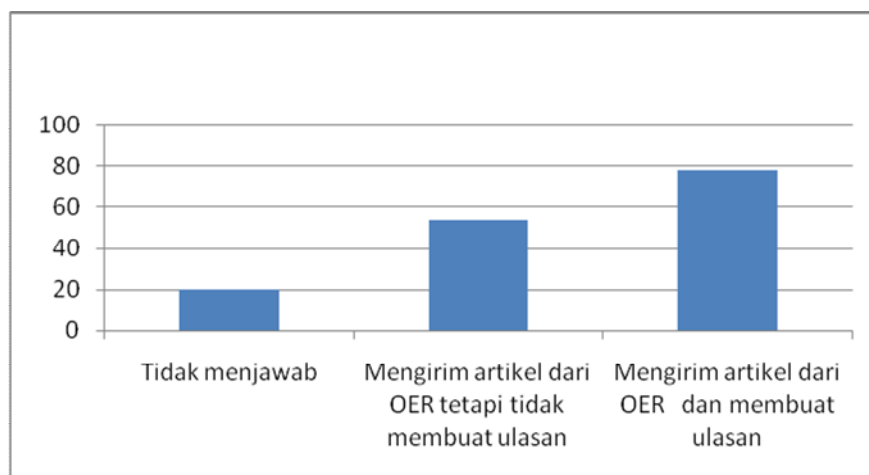


Figure 3a. Students' response to the Literacy Browsing Analysis

Figure 3a showed 13.33% students did not answer the relevant questions that asked them to deliver a review or literacy analysis. While 36% students were able to surf the literacy through OER and 50.66% students were properly able to answer the questions and make a review based on their reflection on the literacy they developed.

Further result indicated, the three subject matters showed the same trend i.e. students were generally able to make a review of the literature that has been referenced. This indicates that the students has attempted to answer the question though they have some obstacles to access Online Tutorial due to the poor network existence in their home region.

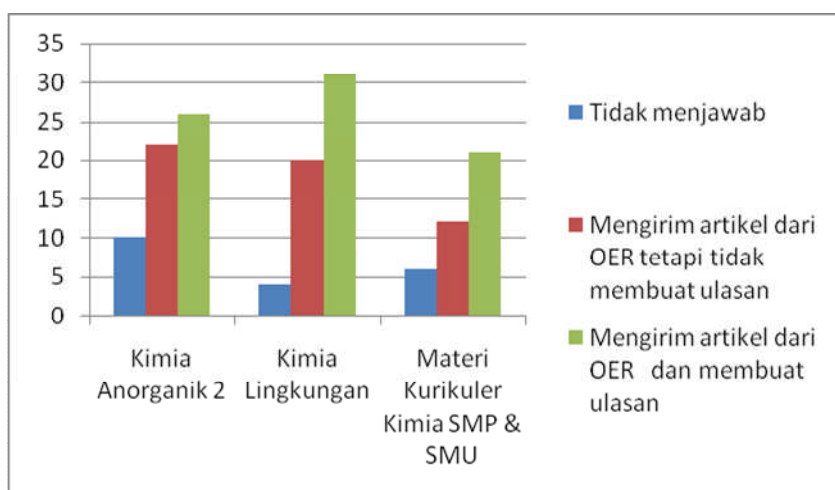


Figure 3b. Student response to the Literacy Browsing Analysis on 3 Courses

The students selected the accessed literacy through OER referred to the question that was asked in the task, and the answers were various. Some chose a research article, some others chose general literacy on the discussed topics as covered in Table 3.

Table 3. The Sample Articles of Students' Choice

STUDENT NAME	ARTICLE / LITERACY DOWNLOADED
Saiin	<p><b>STUDI KOMPARASI PENGGUNAAN METODE STAD (<i>Student Team Achievement Divisions</i>) DILENGKAPI MODUL DENGAN LKS TERHADAP PRESTASI BELAJAR SISWA SUB POKOK BAHASAN KONSEP MOL SEMESTER I SMA NEGERI 1 MANYARAN</b></p> <p>Author : <b>WIJI HASTUTI, FAKULTAS KEGURUAN DAN ILMU PENDIDIKAN UNIVERSITAS SEBELAS MARET SURAKARTA 2009</b></p> <p>website address : <a href="http://eprints.uns.ac.id/188/1/167260309201011431.pdf">http://eprints.uns.ac.id/188/1/167260309201011431.pdf</a></p>
Asmiyati Wahyuningsih	<p><a href="http://www.chem-is-try.org/materi_kimia/kimia_anorganik1/ekstraksi_logam/penetapan-kadar-logam-dengan-ekstraksi-menggunakan-metode-air-acetylene-flame/">http://www.chem-is-try.org/materi_kimia/kimia_anorganik1/ekstraksi_logam/penetapan-kadar-logam-dengan-ekstraksi-menggunakan-metode-air-acetylene-flame/</a></p> <p>download date. 6 October 2011</p>
Irlin Afriani	<p>Source : <a href="http://techno.okezone.com/read/2011/10/03/56/510224/pemanasan-global-buat-hewan-menyusut">http://techno.okezone.com/read/2011/10/03/56/510224/pemanasan-global-buat-hewan-menyusut</a>            Accessed : Tuesday, 4 October 2011 08:34 wib</p>

### c. Answer Analysis on Online Tutorial Tasks

Various literature sources chosen by the students allowed diverse answers. Question on Online Tutorial task includes not only some matters with the low-level thinking, but also a form of high-level thinking, such as doing analysis, application, and evaluation. The questions on the matter of the three courses have been prepared in accordance with the difficulty level of the sums thus some questions seemed easy to answer and other requires a high level of analytical thinking to be solved. The matter in the form of high-level thinking indicate questions that appeal students to discover a literacy through the OER and make a reflection on it. Through reflection activities the students were able to use his mind in making the analysis, and assessing the accuracy of an idea / idea of a literacy and argue from the results of the analysis and the assessment.

Considering many possible students' answers, it impacted on the tutors' readiness in providing assessment guidelines. Therefore it was necessary to develop assessment indicators, such as indicators to measure the high-level thinking skills, among others, as revealed by Ennis (2006), namely: *reason, inference, situation, clarity and overview*. The analysis results of the three subjects based on indicators of students' ability to deliver reason



and the ability to arouse other situations or examples, as well as how to make a conclusion on literature browsing through OER is presented in Figure 3a, and 3b. Approximately 45.56% of the entire students' answers were analyzed, and they were able to give an explanation or article review in high thinking level. The number in this figure is below

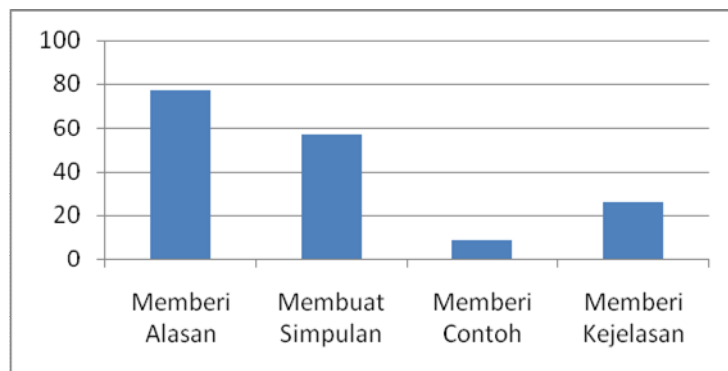


Figure 7. Students' Review to the Literacy

Through Figure 7 can be explained that most students are able to deliver/ give reason or explanation for his chosen literacy. While not many students able to explain the situation or another example of the topic being studied. However, quite a lot of students were able to make inferences from the analyzed literacy. The example of the students' review to the literacy obtained through OER, listed in Table 4

Table 4. The Example Downloaded Literacy done by Students

No	SUBJECT MATTER	QUESTIONS	STUDENTS' ANSWER	SOURCES
1	CHEMISTRY CURRICULAR TOPIC MATERIAL FOR SMP & SMU	Search articles about learning activities of the topic you have chosen. You may download from any sources and or from <i>open educational resources</i> . Choose the pdf files discussing about the research result Support your reason and your REVIEW/ point of views	This article discusses the comparison of the mole concept learning using STAD method equipped with students' worksheet than that equipped with module. The process of learning is done through 3 stages: 1. Stage Presentation Lessons, include; a. Introduction. Emphasizing to the the mole concept learning to motivate students to learn the concepts that have been taught. b. Stages of development, include: setting goals, emphasizing students' understanding, explanation to the answer of practice questions. c. Control practices, including: provision questions and tasks to the students, and instruction to do the work in front of the class. 2. Group activities. Teacher delivers material and assigns tasks /questions to the students to be done independently. Then the students divided into groups to discuss the given problem collectively. 3. Quiz. Quizzes are given individually to determine individual understanding. Repair individual score held through pretest	<a href="http://eprints.uns.ac.id/188/1/167260309201011431.pdf">http://eprints.uns.ac.id/188/1/167260309201011431.pdf</a>

			<p>and posttest.</p> <p>Results of the study</p> <p>Teaching using STAD cooperative learning methods equipped with modules can further improve students' achievement than delivering lectures with STAD cooperative learning methods equipped with students' worksheets.</p> <p>My Review:</p> <p>Of the articles above , they just wrote the learning method which related to affective and cognitive aspects, and not applied to the psychomotor aspects.</p> <p>Its application in schools must be different, I think it is the best to combine the 2 methods ; STAD method with media modules and worksheets and also equipped with stoichiometric lab procedures so that the inquiry and problem solving approach can be done for real.</p>	
2	KIMIA LINGKUNGAN	<p>Afterward, browse article about Green house Effect (ERK) or Global Warming and Climate Change from sources that can be downloaded from the internet. And do not forget to include the source and GIVE REVIEWS / YOUR OPINIONS about such topic</p>	<p>review:</p> <p>The above article is one example of the impact of the current global warming that is happening and is not just a bustling global environmental issue debatable but it is a reality that can threaten the survival of living beings. Related to the above problems, the accumulation of some cold-blooded species to temperature changes that are now taking place due to the rising temperature of the earth's surface. Surely human being's activities also contribute enough for this, such as the increasing use of fossil fuels, the increasing number of operationing factories, the use of household appliances that contain chemicals chloro fluoro carbon (CFC) gases that causes CO2 levels rising, therefore, more and more infrared light reflected by objects in the sky to the earth's surface is absorbed by greenhouse gases and trapped in the troposphere layer so that the surface of the earth was hotter, and consequently temperature increases.</p>	<p><a href="http://techno.okezon.com/read/2011/10/03/56/510224/pem-anasan-global-buat-hewan-menyusut">http://techno.okezon.com/read/2011/10/03/56/510224/pem-anasan-global-buat-hewan-menyusut</a>          Accessed :          Tuesday, 4          October 2011 at          08:34 wib</p>
3	KIMIA ANORGANIK 2	<p>Search article about how to extact metal (choose one of the various metal) from the sources could be downloaded from internet. Write the source and your view on the topic</p>	<p>Review About Compounds Zeolite.</p> <p>Zeolite (Zeinlithos) or boiling rock also means, as mentioned above. Hydrated aluminosilicate zeolite compound is a compound that has a skeleton structure of three-dimensional (3D), microporous, and crystalline solid with the main content of silicon, aluminum, and oxygen and binds a specific number water molecul in the pore. The nature property of water molecules in physics and chemistry of the zeolites is unique, so in this decade, zeolites by researchers is served as a versatile mineral. The unique properties include dehydration, adsorbents and molecular sieves, catalysts and ion exchangers. Zeolite compounds used in the petroleum industry, detergent industry, and industrial water purification, industry and also widely used in agriculture, animal husbandry, fisheries, and energy fields.</p>	<p>Source:  <a href="http://www.chem-is-tryorg/artikel_kimia/kimia_material/zeolit_sebagai_mineral_serba_guna/">http://www.chem-is-tryorg/artikel_kimia/kimia_material/zeolit_sebagai_mineral_serba_guna/</a></p>

Although not all students could answer questions related to OER searches but when viewed by the results of the final value Online Tutorial service showed a fairly high rate. Figure 4a, 4b and 4c show the student's participation in the task sends the answer on Online Tutorial activities which are accumulated as the students' final mark of Online Tutorial.

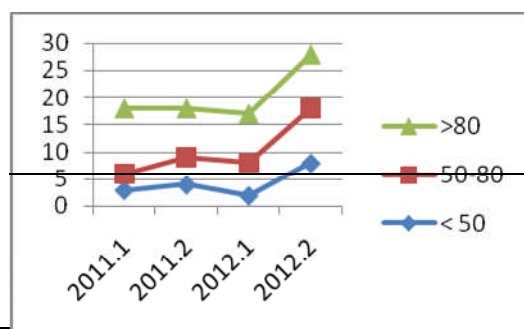


Fig. 4a. Online Tutorial mark on Inorganic Chemistry2 Course

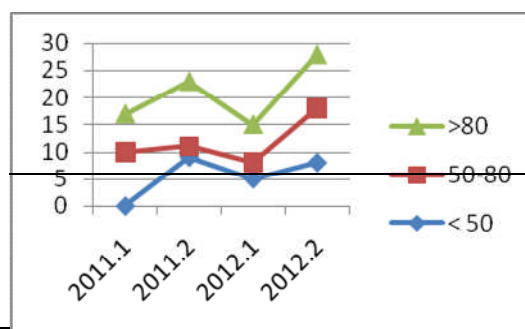
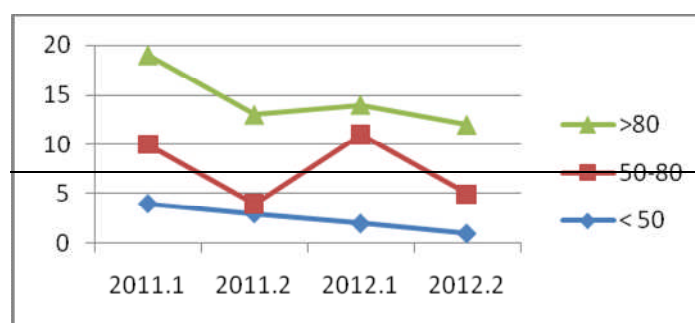


Fig. 4b. Online Tutorial mark on Environmental Chemistry Course



Gb. 4c. Online Tutorial mark on Chemistry Topic Materials Curricular For Junior & Senior High School

Based on the data in Figure 1a, 1b and 1c it can be explained that during the four test/examination periods the three subjects showed the same tendency that students could answer the given task in the Online Tutorial. There are quite a lot of college students, earn points / end value of more than 80 compared with students who scored below it. This shows that students who attended Tuton could understand the initiation material and completed it with the answer of given task. This figure shows that generally students were able to correctly answer the task given on Online Tutorial.

#### d. Students Impression in Completing Online Tutorial Tasks related Using OER

Students stated various responses to the Online Tutorial in accordance with the use of OER, some said that by having literacy fro the OER they could enhance their insights, facilitated them to gain knowledge needed, as they revealed :

By downloading the zeolite compounds I got lots of advantages. My knowledge about minerals increase more. (Apong Nuirta Inorganic Chemistry course participants Tuton 2)

Impression in the downloading articles from the Internet is very useful to broaden and increase our knowledge. There will be a lot of new things we can find to improve our competence as educators. (Fauzul Muna Tuton course participants Curricular Materials Chemistry SMP & SMU)

Downloading articles from the Internet is certainly useful, as it can increase knowledge particularly in relation to the material / tasks assigned by Dewi Hanzani (course participants Online Tutorial for Environmental Chemistry course)

Although the students felt their usefulness in downloading articles via OER, not all students get the ease with network utilization, as revealed by the following students.

By downloading articles from the internet we can enhance broader insights, discussions/information and recent research that are not available on module / teaching materials we can get on the internet via download. However, the use of the Internet is limited to specific areas, the ones that are not covered by mobile phone signals are difficult to reach search for browsing besides, it takes special times in to learn articles through the internet (Saiin Tuton course participants Curricular Materials Chemistry SMP & SMU).

There are also students who are not proficient in conducting literature searches through OER by using computers and networks, but the students were eager to learn operate it further because he learned this method can be applied to learning in their school.

My constraints is I still have much to learn. Other technical constraints in the use of internet, particularly weak signal, far away from the cafe. My impression of the internet to download: Discovering techniques, media and new teaching methods, can be applied directly to students in Teaching Learning Activity (Eka Mai Atmaja Online Tutorial course participants Curricular Materials Chemistry SMP & SMU)

### III. DISCUSSION

86, 66%, Students who were able to use OER in answering Online Tutorial tasks. Comparing with 13.33% students who were not able to use OER, it showed that students tended to have been able to practise independent learning. The Open University (UT) as a higher education provider has designed distance learning guide activities through Online Tutorials since 2004. The activities utilize a internet network that can be reached by students in various regions in Indonesia even other countries. In line with the development of science and the development of distance learning paradigm, the Online Tutorial service proves that UT has been able to provide learning guide which can meet the students's expectations today. The Online Tutorials service by using OER gives students the opportunity to learn extensively and allows students to be able to process their learning abilities. The development of information technology allows one to get and build his knowledge and learning process. The learning process can occur through the analysing information obtained through a variety of learning resources especially through the utilization of the network, in order to build

communication and the use of learning resources that can be accessed publicly (Siemens, 2005a, 2005b, 2007, and Stephen Downes, 2007, in Belawati 2011).

The use of OER materials referred in the initiation topic material was intended to increase students' knowledge of the topic being studied. In OER students could acquire images, the results of research and review relating to deeper topics. Through searching literature from OER, students could undertake their own learning activity that was done by structuring the information, and organizing perceptions. All of these activities occurred in the students' internal learning process. This was in line with cognitive theories presented by Ausubel in (<http://www.instructionaldesign.org/theories/subsumption-theory.html>, accessed on 10 July 2013) said that learning occurs when a person is able to assimilate the knowledge that has been previously owned with newly learned knowledge. Through the process of assimilation, one uses cognitive structures to adapt and coordinate their environment to form new schemata. Assimilation is the process of absorption of new information in mind, meanwhile accommodation is the process of constructing the structure repopulating mind with new information (Ruseffendi (2006). Thus, through initiation and literature study, students can explore his/herself to understand the topic material being learned while building his/her own understanding. This is in line with most of the principles learned connectivism by Siemens (2005) which describes learning is a process of connecting specialized nodes or information sources; nurturing and maintaining connections is needed to facilitate continual learning.

Results of the study also revealed that there were 50.66% of the students could answer well in making the review based on their reflection of the literacy they traced, while 36% students do not make reviews but able to surf the literacy and only 13.33% students did not answer. These results indicated that many students have achieved the ability to think critically. In the literature search activity through OER students trained to use his knowledge to choose the right literacy and analyzing selected articles. Selecting and analyzing activities guided students to practice higher level thinking. This high-level thinking can be categorized as critical thinking, since students are asked to use their thinking process in order to make an argument against the analysed literacy. This is in line with Ennis that said critical thinking is a thought process that is intended to make a sensible decision about what they believe or do (Ennis, 2006). The existence of searching activity through OER literature, students are trained to use their thought ability in giving/supporting reasons, making conclusions, giving/delivering an example / situation, as well as providing an review thorough explanation. The results shown, in general, students had been able to choose the literacy and

do the analysis but had not gained maximum results since not all Online Tutorial participants made analysis thought. However tutor has sought to give a huge role in students individually to construct knowledge and make it meaningful connection between ideas. It is also in line with the views Gage and Berliner (1991) which explains the virtue of learning that occurs in the following.

1. promote positive self-direction and independence (development of the regulatory system);
2. develop the ability to take responsibility for what is learned (regulatory and affective systems);
3. develop creativity (divergent thinking aspect of cognition);
4. curiosity (exploratory behavior, a function of imbalance or dissonance in any of the systems), and
5. an interest in the arts (primarily to develop the affective / emotional system).

#### IV. SUMMARY / CONCLUSION

In the system of distance learning and learning via the Internet, it is required independently students' readiness to study. The existence of technology uses the Internet is not be easy to run whenever it is not designed and well-prepared. Required experience and readiness to implement the technology so that the use of the technology run effectively. Online Tutorials activities during five registration periods i.e. 2009.2, 2011.2 held by Chemistry Educational programs of Faculty of Teacher-UT showed students' participation in Online Tutorial activities of some courses offered and also the task of using OER in students' learning activity. It showed that 86, 66%, students used OER in answering tasks online tutorials, and only 13.33% were not able to use OER. From 86,88%, students 50.66% students could make good answer in their reviews based on the reflection of the literacy they traced, while 36% students had not made reviews but able to surf the literacy. Those who did not do Online Tutrial task in literature study through OER was suspected having some constraints due to weak network so that they met difficulty in accessing the requested answers on the Online Tutorial task.

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