

## UNDERSTANDING THE COGNITION PROCESS OF THE STUDENTS USING THE INTERNET AS A LEARNING RESOURCE

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### ABSTRACT

This study aims to investigate how students search and process the information found on the Internet to meet the needs of their academic tasks as well as how they view such information compared to printed materials. The study was conducted targeting the student teachers at Primary School Teacher Education (PGMI) Program and Kindergarten Teacher Education Program (PGRA) in State Islamic University Sunan Ampel Surabaya. Such information search and processing are then later viewed through the lens of Blooms' taxonomy. A qualitative method using the phenomenological approach is adopted in the study. Nine student participants of 1st, 2nd, 3rd-year classes were interviewed. The study indicates that the presence of the Internet as a source of learning has not shifted the role of the textbook as a primary source of information for the students while working on their academic assignments. It was revealed that the information search activities on the Internet have facilitated students to experience the four domains of the learning process in Bloom's Taxonomy.

Keywords: Bloom's Taxonomy, Online Sources, The Source of Learning.

### ABSTRAK

Penelitian ini bertujuan untuk menyajikan hasil penelitian tentang bagaimana mahasiswa mencari dan memproses informasi yang ditemukan di Internet untuk memenuhi kebutuhan tugas-tugas akademik mereka serta bagaimana mereka melihat informasi tersebut dibandingkan dengan bahan cetak. Penelitian dilakukan kepada mahasiswa PGMI dan PGRA di UIN Sunan Ampel Surabaya. Pencarian dan pengolahan informasi semacam itu kemudian dilihat dari kacamata taksonomi Bloom. Penelitian yang dilakukan menggunakan metode kualitatif dengan pendekatan fenomenologis. Sembilan mahasiswa dari tingkat 1, 2, dan tingkat 3 dipilih secara acak untuk dimawancarai. Hasil penelitian menunjukkan bahwa kehadiran Internet sebagai sumber belajar belum menggeser peran buku teks cetak sebagai sumber informasi utama bagi mahasiswa saat mengerjakan tugas-tugas akademik mereka. Namun kegiatan pencarian informasi di Internet memfasilitasi mahasiswa untuk mencapai empat domain dari proses belajar Taksonomi Bloom.

Kata Kunci: Taksonomi Bloom, Sumber Daring, Sumber Belajar.

### INTRODUCTION

Currently, the Internet is found almost in all aspects of life, more and more people are becoming dependent on the Internet. People use the Internet for various life needs such as learning, teaching, watching the news and doing business. In Indonesia until mid-2015, the number of the Internet users has reached about 82 million people. That number of users has made Indonesia a country with the eight highest number of the Internet users in the world. 80% of the users in the country aged 15-19 years who are students (Kemkominfo, 2014). Considering such high number of students who use the Internet in Indonesia, investigating further about the influence of the Internet on the students learning process is necessary. Nowadays, more and more students rely on information from the Internet as a source of information for working on their school tasks. This is understandable because in the Internet,

students are provided with tools to search for information quickly, easily, and inexpensively than through other sources (George et al., 2006). As a source of learning, the Internet provides students with access not only to journal articles, e-book, and useful websites but also to the authors, to their peers, teachers and/or to the experts in their relevant fields of knowledge. Students can then directly collaborate with them, discuss questions they may have, or even share knowledge and experiences with them. More study on the variations in the use of the Internet for learning can be found the work of many authors today such as Bowman & Akcaoglu (2014), Kharea, Thapa, & Sahoo (2007), Lin, Hou, Wang, & Chang (2013), Lin, Hou, Wu, & Chang (2014), Rovai, Wighting, Baker, & Grooms (2009), Yeni (2012).

The existence of more advance and powerful search engines such as <http://www.google.com>, <http://www.bing.com>, and <http://www.yahoo.com> has greatly helped human being to research nowadays. By entering only specific keywords into the search engines, an abundance of related knowledge is presented before the search engine users almost instantly. To have more accurate search results, an adequate search skill is needed. The skill includes the ability to understand the key concepts and to locate and determine the correct keywords to research (Becker, 2003). Also, ones should also be able to identify and formulate which questions to ask so the search engines can present the results as relevant and expected as possible. Also, knowledge on the use of search operators (such as Google search operators) is advantageous when researching on the Internet.

Entering or typing a keyword in the Internet search engines is a form of framing or localizing knowledge based on the Internet users' needs. For students, when the search engines have displayed their search results, it is critical for them to decide which information is most suitable to their needs. Their ability to analyze the content and the source information may also determine their success in obtaining useful information and thus eventually their success in learning. Pan et al., (2007) conducted a survey of Google search engine users. Ironically, they found that students tend to trust search results displayed at the top of the screen of the search engines. This may imply their laziness in exploring the rest of the search results deeply.

The process of finding information via the Internet is also a learning activity (Jansen, Smith, & Booth, 2007). A learning activity can be seen from how students gather information from the Internet and process them into a coherent knowledge for themselves. The processing of this information can affect how much someone's cognitive achievement could be (Athanassiou & Mcnett, 2003). Someone's cognitive achievement and performance can then be observed against the cognitive taxonomy to understand his/her level of achievement during the learning process.

To date, no known study has investigated the process of students' acquiring information from the Internet and its contribution to their cognitive achievement. This fact becomes the entrance to the study. In this study, therefore, the researcher investigated the students' online information search experience and how they process the search results as a new knowledge and as part of their learning process. The data collected in this study was analyzed against a cognitive taxonomy. To guide the study, the following research questions were adhered to: What are the students' experiences in retrieving information from the Internet to fulfill their academic tasks? How the student's process information from the Internet to fulfill their academic tasks? Which learning domains do students experience while searching in and processing information from the Internet?

## **METHOD**

The study was qualitative in nature using a phenomenological approach. The phenomenology design guided researchers in finding research data and how researchers

interpret the data that has been recorded. The research data were collected through synchronous interviews and discussion via WhatsApp chat room, students' mid-term test papers, and in-depth interview with nine purposively selected participants to follow up preliminary finding on the previous data collection mode (i.e. online discussion and test paper reviews). The participants represented each of students' academic level.

Analysis part and data processing will be carried out according to the procedure initiated by Stevick-Colaizziki Keen (Creswell, 2007) as follows.

1. Researcher wrote his own experiences related to the phenomenon under study with the aim that researchers could rule out subjectivity in analyzing the data.
2. Developing a list of important statements. Researchers tried to find answers of how the participants experience the phenomena being studied, make a list of important statements (horizontalization) which consisting of no overlapping or repetitive statements and treated each statement with equal worth. At this stage, researchers must postpone judgment in taking the important points.
3. Taking important statements and group them into meaning units or theme.
4. Based on the results of the grouping, detailed description of what the participants have experienced with the phenomena being studied was developed, and verbatim examples were included as well. This was then called textural description.
5. Developing the structural description, in which how the participants' experiences happened, was described.
6. The description on points four and five was then combined. This description called the composite description was the core descriptive summary of what the participants experienced with the phenomena being studied and how they experience it.

## RESULTS AND DISCUSSION

### Selection of Participants

The study was conducted targeting the student teachers at Primary School Teacher Education (PGMI) Program and Kindergarten Teacher Education Program (PGRA) in State Islamic University Sunan Ampel Surabaya. The selection of students is done purposively by looking at the students' answers during the execution of the tasks assigned by the researchers' during teaching subjects in the programs. Of the fifteen students selected, only nine students gave their consents to be willing to participate in the study, and they are all women. Table 1 summarizes the participants' characteristics.

Table 1. Participants Characteristics.

		PGMI (No. of Students)	PGRA (No. of Students)
Semester	1	1	2
	2	4	
	3	2	
Age	16-20 years old	5	2
	21-25 years old	2	
Internet access tools	PCs	7	2
	Mobile Devices	7	2

In Table 1, it can be seen that all students use both PCs and Mobile devices for accessing the Internet. To further find out about their experiences in using the Internet for finding information to assist them in working on their academic task, in-depth interviews were conducted.

## Themes Analysis

The results of the interviews with participants were then analyzed through the procedure mentioned above, and themes emerged from the interviews were identified and listed below.

### Level 1

The themes categorized as the level one here are determined through a modified technique of phenomenology analysis as mentioned by Moustakas (1994) as horizontalization (cited in Creswell, 2007, p. 159). Table 2 list all the possible themes identified during the horizontalization process.

Table 2. Themes Categorized as Level 1 Emerged from the Interviews with Students.

No.	Possible Themes
1	Easiness.
2	Speed.
3	Low cost.
4	Book is more trusted than Internet resources.
5	Keywords in Google.
6	Open the site resources.
7	Retrieving information from the top of the search engine.
8	Pay attention to the information resources.
9	Seeing the suitability of the theme without notice resources.
10	Information sources are complete as needed.
11	Scientific articles.
12	Wikipedia.
13	Blog that is noting a clear resource.
14	Practicing search results in the classroom.
15	Compare the information with other information on the Internet.
16	Information associated with daily activities.
17	Information compared with explanation friends or lecturers.
18	Copy-paste.
19	Taking an important point according to the theme sought and neatly arranged.
20	Writing with his/her own words.
21	The existence of the internet makes students lazy to seek information from other sources.
22	Criticized by comparing information from various sources.
23	Criticized based on personal understanding.
24	From not knowing to knowing through information on the Internet.
25	Getting new information from reading information on the Internet.
26	Applying the theory to the modification procedures of the Internet.

From the theme listed as level 1, the theme which has similar characteristics are categorized into themes level 2 as shown in Table 3.

Table 3. Level 2 Themes List.

No.	Themes
1	Positive views in relying on the Internet as a source of information to learn.
2	Negative views in relying on the Internet as a source of information to learn.
3	The initial step of finding information on the Internet.
4	Considerations in retrieving information from the Internet.
5	Type of Internet resources chosen.
6	How to compile information from Internet sources into academic tasks.
7	The process of evaluating information from the Internet.
8	Information from the Internet is practiced in life.
9	The process of understanding the information from the Internet.
10	The Process to know the information from Internet.

From the theme list level 2, the theme becomes more narrowly categorized to obtain three cluster theme as can be seen in Table 4.

Table 4. Cluster Themes List.

No.	Themes
1	Perspective of students seeing the existence of the Internet as a learning resource.
2	Processing information from the Internet sources to fulfill academic tasks.
3	Students' cognitive taxonomy in using information from the Internet.

For the process of associating each themes into cluster themes see Figure 1 below. In those figures, the process of obtaining cluster themes as listed in Table 4 are diagrammatically presented to see how each theme in the lower level is interrelated.

**Cluster Themes**

The following is the result of the grouping of themes to form several clusters of themes.

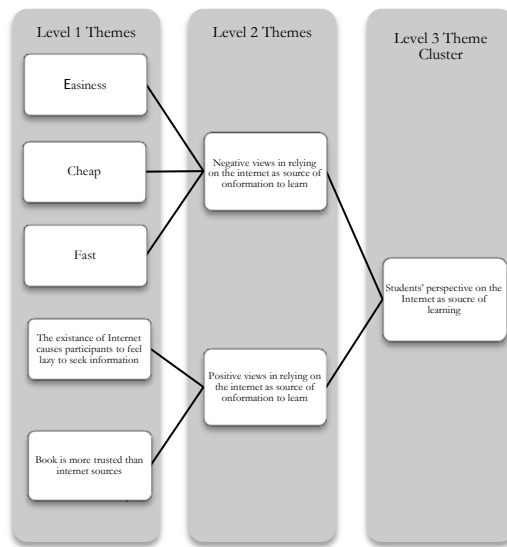


Figure 1. The Interrelation of Themes Clustered Under students' Perspective In Viewing The Existence of The Internet as a Learning Source.

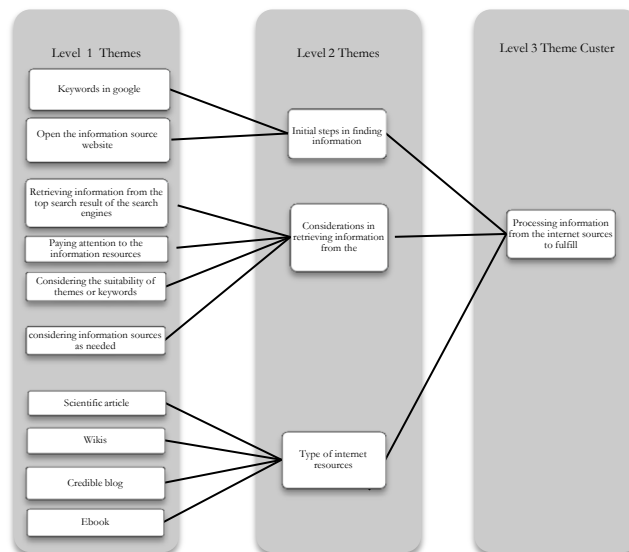


Figure 2. The Interrelation of Themes Clustered Under Processing Information From Internet Sources To Fulfill Academic Tasks (Part 1).

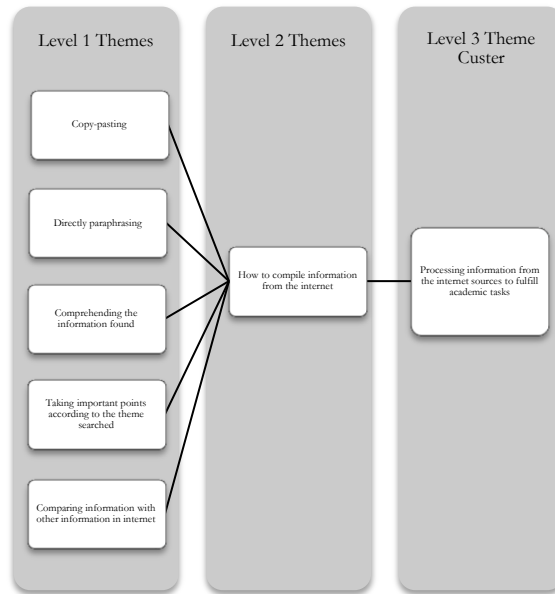


Figure 3. The Interrelation of Themes Clustered Under “Processing Information From Internet Sources To Fulfill Academic Tasks” (Part 2).

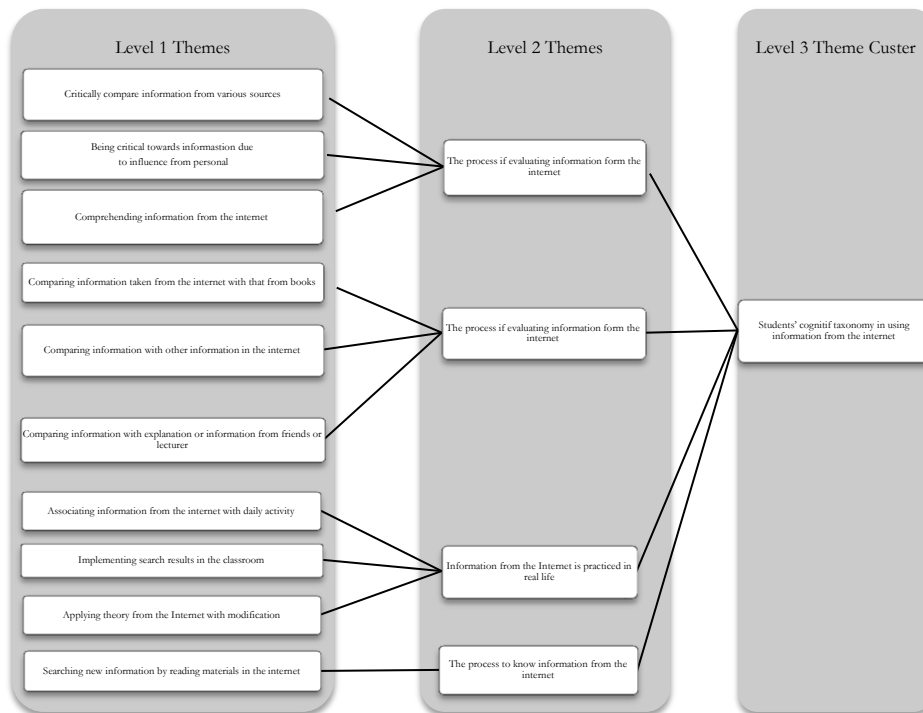


Figure 4. Matrix Cluster Theme of Students' Cognitive Taxonomy in Using Information on The Internet.

### Perspective of Students Seeing Existence The Internet as A Learning Resource

There are two views of students in addressing the existence of the Internet as a learning resource: positive and negative. Students positive views see that the Internet provides convenience, speed, and resources that are cheap and complete. On the other hand, their negative views see that the Internet can not provide reliable information than printed books. Although there is a negative attitude in regard the Internet as a learning resource, this does not make the students rule out the existence of the Internet as a learning resource. From the

interview, they still rely on the Internet as a learning resource. In meeting the needs of academic assignments, printed resources is the most popular ones used by academics and graduate students (Melgoza et al., 2002; Rosenwald, 2015). Similarly, Stefl-Mabry, (2003) found that there is a tendency from experts to give advice orally to students to rely on printed information in the first place then followed by the Internet information. This is in line with the study findings indicating that some students were suggested by lecturers to rely on printed resources such as books before find information on the Internet. The following excerpt shows the suggestion of lecturers to students in determining the source of information for academic needs:

- I4 : .. depending on the lecturer sist.. if we were permitted to search information on the internet, we will mix it with the information from the book too.”*
- Researcher : are your lecturers make rules about resources?*
- I4 : engage (yes) sir.*
- Researcher : of all lecturers on campus, What is the percentage of those who make those kind of regulation?*
- I4 : it's about 40%...”*

It shows how the lecturers' suggestions influence the thinking of students regarding the choice of information resources. It may also imply that the Internet is not more credible than printed content.

From the interviews, it has also been observed that students shows positive attitude towards finding information on the Internet. However, finding information in the Internet which offers ease, speed, and economics, the information found there was still not regarded as a credible source of information that can be trusted by their lecturers. This surely affects the students thought that the best source of information for working with academic tasks is the printed book, not the Internet. This is in contrast with the students' growing reliance on the use of Internet for information seeking as also reported by Wilson cited in Rieh & Hilligoss (2007).

Interestingly, the lecturers' limitation on the preference of which information to use does not necessarily change the attitude of students regarding their preferences when searching for information. This is due to the ease of finding information through the Internet has become part of their lives with smartphones, and Internet access is increasingly easy nowadays.

### **Processing Information from The Internet Sources to Fulfill Academic Tasks**

The following are the findings of students' information processing from internet sources when they are doing academic tasks.

1. The initial step in Finding Information on the Internet.  
To find information on the Internet, search engines are the most favorite place on the Internet that are firstly visited by students. Though there are many search engines available on the Internet offering various features, yet Google has been their most favorite search engines. No one has mentioned the use of other search engines while attempting to find information about their academic tasks. The existence of Google, which is nowadays accessible through smartphones or other Internet-connected mobile devices, has made students consider it as the major search tool to search for information to fulfill their academic tasks.
2. Taking consideration of the information from the Internet.  
There are three considerations for students in selecting the information to be used for academic tasks, i.e. the information is suitable with the theme, it has complete

information, and there is a clear source. A clear source here is the credibility of the web where information obtained, the credibility of the author, and the existence of an accompanying bibliography or reference though the writer and web information credibility can not be guaranteed. Another major emphasis in consideration of information retrieval is to offer information that can be understood easily.

Shenton and Dixon (2004) found that young people prefer to use easily and quickly accessible information that does not require much effort to obtain. They also emphasized the most important pattern in the information seeking behavior of young people is to shorten the search process. This is in line with the desire of students in the study to get complete information on a single web page, easy to understand, and by the theme.

Almost all participants interviewed emphasizes the importance of resources. This is similar to a survey conducted by Rich and Hillis indicating that students are aware of the importance of the credibility of information sources (Rieh & Hilligoss, 2007). For example in this study, students rechecks information obtained against reference sources, compare it with books, or ask their lecturers.

3. Type of Internet resources chosen.

Preferred types of resources that the participants choose are scientific journals, Wikipedia, blogs with obvious sources, and e-books. The fourth sources of information is the most widely mentioned is the blogs with clear sources. The existence of a blog on the one hand makes it easy for users to get information and providing a forum for anyone to express what he/she know. However, no one can confirm that the credibility of information provided in the blog is guaranteed.

To make sure the credibility of the blog sources, the participants try to evaluate the credibility of the blog contents from the existence of bibliography there. The existence of bibliography gives them access to compare the contents of the blog with its resources. In addition to comparing the contents of the blog with listed sources, the students also question the truth of the contents by asking lecturers or colleagues as previously mentioned.

It is interesting that many students believe that they believe in the credibility of Wikipedia. Wikipedia is an encyclopedia of information sources such as where people can write and edit the contents of papers have been written by someone else. There are pros and cons to see Wikipedia as a source of information. On the one hand, Wikipedia provides an opportunity to educate students, on the other hand, wikipedia doubt in terms of accuracy and scope (Selwyn & Gorard, 2016). There are things that do not realize that wikipedia is the same format with a blog that the truth needs to be evaluated.

4. How to compile information from internet sources into academic tasks?

Students process the information obtained from the Internet in few different ways such as direct copying and pasting, directly paraphrasing, comprehending the information found, taking important points relevant to the theme searched, comparing information found on the internet and combine information from the Internet with information from books.

A high number of participants (six out of nine) who tend to use direct copying and pasting information seem to indicate that their paraphrasing skills still needs honing. More training on how to paraphrase is necessary for them. However, there is also the possibility that it is students language literacy that needs improving. Another possible cause is their laziness which seems to cause them to just copying and pasting



information from the internet. No clear confirmation from participants when further interviewed regarding such issue. They seemed to be speechless when such phenomenon is questioned to them. Probably, as Robert H Schrimsher, Lori A Northrup, (2011), suspects that there is changing views among them towards the information available on the Internet. There is a possibility that they consider information on the Internet is public knowledge, and thus no intellectual property rights attach to it. Thus no proper reference is needed.

### Students' Cognitive Taxonomy in Using Information from The Internet

Nicholas Athanassiou & Mcnett (2003) using the cognitive taxonomy such as Bloom's to develop a metacognitive framework to facilitate a more student-centered and critical-thinking promoting learning activities. Abrami, P.C., Apollonia, S., & Rosenfield, (1997), also been adapted the Blooms' taxonomy to analyze the aspects of effective teaching. In addition, Allen, D., & Young, (1997) used the Bloom's taxonomy as a framework to discuss effective design and implementation of a learning process. In this study, Bloom's taxonomy is used as a framework to discuss the students' learning process while doing online information search.

At first seen as a cognitive taxonomy of educational objectives are designed to facilitate the designing process of learning and evaluation. However, there is an idea to make one of the cognitive taxonomy as metacognition framework. Nicholas Athanassiou & Mcnett, (2003) create Bloom's taxonomy of cognitive as metacognition framework in classroom management activities with student-centered learning. Metacognition framework is used to look at the natural learning process of students in learning so that students can learn how they can improve their critical thinking skills.

In Bloom's taxonomy the level of cognitive development is grouped into six levels namely knowledge being the lowest, comprehension, application, analysis, synthesis, and evaluation as the highest level of cognitive development (Athanassiou & Mcnett, 2003). From interviews with participants, the themes that are listed above at least can be fitted into Bloom's taxonomy levels based on indicators compiled by (Athanassiou & Mcnett, 2003). See below for the elaboration.

#### 1. Knowledge

The level of knowledge on Bloom's taxonomy achieved if students reviews the information they obtain and paraphrase it. The interviews indicate that some students do paraphrase in writing academic assignments after they read the information thoroughly and understand it.

#### 2. Understanding

The level of understanding in bloom taxonomy achieved when students compare the information obtained with the information that has been obtained previously, the daily activities or actual events. From the interview, the informant showed some indications in utilizing information from the Internet. For example, the following statement:

*"I will match the information from the internet with a reference book and then compile them according to my understanding" (I9).*

Another interesting phenomenon was that some students could easily understand the information even before using it for writing their academic assignments. However, there are students who admit that they can understand the information obtain when they try to use it and paraphrase it for use in their academic assignments.

3. Application

Students practice information obtain from the Internet for the fulfillment of their daily academic life. An example of this is when they search for tutorials of a specific software required in an academic task. They learn the software operational tutorial from the internet through articles, wikis, and videos then directly practice it while they work with the software for the completion of their academic tasks.

4. Evaluation

The evaluation takes place especially when students select and sort the information obtained from the Internet for use in the writing of their academic tasks. In addition, the information from the Internet is also used to critically evaluate other information from other sources such as from books and the lecture in the class. The evaluation process conducted by the student begins with checking the accuracy of information on the Internet with other information, then proceed with asking their friends or professors.

To sum up, there are four of six cognitive levels in Bloom's taxonomy which are experienced by students in utilizing the Internet as a learning resource. This study confirms what Chrisman et al. in Athanassiou & Mcnett (2003) found that cognitive levels in bloom taxonomy do not work with a strict hierarchy. Three levels of the Bloom's taxonomy namely knowledge, understanding, and application are continuously experienced by the students, while the evaluation level is occasionally experienced by students. No evidence were found whether students experienced the synthesis and analysis levels or not. Thus, taxonomy Bloom levels in this information search process do not happen in stages.

## CONCLUSION

The experience which is mostly initiated by typing keywords in the search engine, students then determine the usability the information by checking against criteria such as: 1) the relevance of the information found to theme of tasks, 2) the ease of comprehensibility 3) the completeness of the information contents, and 4) the availability of a clear reference source. Interestingly, the information at the top of the search engines' search results usually provides the required information.

Students' experience and behavior in information searching and processing on the internet have also revealed the domains of their learning activities which according to the lens of Bloom's taxonomy. They are at the four levels of the learning domains as suggested by Bloom. The four levels are knowledge, comprehension, application, and evaluation.

How the students take and organize information from the Internet into academic tasks need to be well observed by the lecturers. Students who do not pay attention to ethics in scientific writing would have trouble adapting when they write a thesis. Their habit of copying and pasting information found on the internet risk them with plagiarism issues. Thus, there is an urgent need for assistance from lecturers or their seniors in guiding them to write academic assignments intelligibly and responsibly as well as upholding academic values. It is then suggested that further studies understand the meaning of the search pattern and processing of information from a variety of learning resources and relevance to the learning process for students needs to be done. It aims to understand how the behavior of students in processing information from the Internet as well as to understand the student's learning process based on the search behavior.

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