

EVALUATING THE HIGH ORDER THINKING SKILLS OF ONLINE LEARNING STUDENTS AT HANOI OPEN UNIVERSITY

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Date received the article: 03/04/2022

Date received the review results: 03/10/2022

Date published the article: 28/10/2022

Abstract: *Evaluating the learning outcome of an education program is always a problem for any education institution. By admitting that the assessment of overall knowledge is based on the GPA is somewhat obsolete, we really need other measured evaluations for the learning outcome. In general, the learning outcomes of an education program should be measured in terms of knowledge, skills and attitudes which are not reachable by the program design. Even a well-designed tool such as PISA can only evaluate just the mathematic, science and reading knowledge and skills of 15-year-old students. This paper aims to evaluate the high order thinking skills of students from several chosen online programs by analyzing the received survey questionnaire. This research also helps to diagnose the potential weaknesses and suggests some changes to increase the quality of online education programs.*

Keywords: *learning outcomes, high order thinking skills, Bloom's taxonomy, online education.*

I. Introduction

A comprehensive evaluation tool for learning outcomes is a dream of every educational institution. Regardless of the efforts from education community, there is no such tool developed so far. The tools such as PISA (Program for International Student Assessment) [1] or ALL (Adult Literacy and Life Skill Survey) [2] focus on certain group of learners and test only certain subjects' knowledge and skill. Besides, the standardized tests for admission into U.S and Western universities such as SAT, GMAT, GRE,

IELTS, TOEFL, etc., are reliable tests to assess students' knowledge through their achieved scores, but there is no test to verify the knowledge and skill for the graduated students. All we have is the GPA in transcript results calculated by the average grades obtained by a specific student during a course. The GPA is mainly used for screening evaluation by recruiters. Applicants still have to attend several in-depth interview rounds for their skills and attitude. Because the feedback mechanism between recruiters and educational institutions is not working

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efficiently in a regular and continuous manner, the curriculums do not reflect the needed updates. Hence, there is a big gap between the knowledge and skill acquired from university and what the labour market needs.

From the above analysis, the educational institutions are really in need of an independent method to survey and evaluate student learning outcomes. Assessment of knowledge, skill and attitude is not carried out in a comprehensive and systematic approach in higher education.

Currently, the OECD also provides a framework for transforming competencies for learners towards 2030 [3] including:

- Creating new values
- Reconciling tensions and dilemmas
- Taking responsibility

Under the impact of the COVID-19 pandemic, each country, educational institution and even each individual had to change to pursue the learning process. Online learning, if previously considered a supplementary activity to formal training, is now considered an appropriate training method that can even completely replace formal training in some contexts or particular conditions. This new form of learning also needs a framework to assess learners' capacity to suit the situation. Due to the learning environment on the Internet and the self-study nature of online learning, Hanoi Open University has determined the required competencies of learners such as:

1. Ability to use tools in the digital environment

2. Ability to self-study and communicate in the digital environment

3. Capability to pursue lifelong learning

Thus, for the ability to use tools effectively in the digital environment, here are tools such as office software, OTT software, email/calendar, and cloud tools. In addition, learners need to have the ability to search, analyze, process, store and present data from different sources through online/ installed tools.

For self-study ability, learners must be able to design a learning path most appropriate to their work and personal life. Furthermore, learners should be able to master social networking platforms and communicate effectively to share knowledge, collaborate, and coordinate in completing the learning program.

Lifelong learning is a must-have capacity in the knowledge era. Nowadays, knowledge in each specific field, interdisciplinary and multidisciplinary knowledge is regularly updated. Individuals working in a particular field also need to update their knowledge continuously and regularly to be able to continue working.

In order to evaluate students' competencies, the classification of competencies must meet the following criteria:

- Evaluate specific professional knowledge such as basic/specialized/ interdisciplinary knowledge.
- Assess the ability to use foreign languages/informatics

- Assess the ability to solve a problem, the ability to work in groups and the ability to work independently.

University curricula are designed with a huge knowledge base of general, basic, specialized and supplementary. The assessment of knowledge, as a whole, is an assessment of knowledge that students have accumulated during the training process. Often, training programs use Grade Point Average (GPA) to assess students' performance. However, the curricula had been designed years before the launching of the courses such that the acquired knowledge may become obsolete at graduation. Consequently, almost all graduated students need to participate in internship/apprenticeship programs before joining labour market.

Within this study, the authors do not conduct a comprehensive assessment of knowledge, skills and attitudes, but develop a narrow set of competency assessment criteria focusing on Higher Order Thinking (HOT) skills. These HOT skills are in the upper categories in Bloom's Taxonomy [4]. These categories include applying, analyzing, evaluating and creating instead of understanding and remembering.

The chosen set of skills is Learning and Innovation Skills announced by P21, the Framework for 21st Century Learning

includes Critical Thinking, Communication, Collaboration and Creativity [5],[6].

- Critical Thinking: To teach learners how to question and solve problems through developing, evaluating, and using their options.
- Communication: To guide learners in developing communication skills and conveying ideas effectively
- Collaboration: To emphasize teamwork and assign appropriate work among members to achieve solutions.
- Creativity: To encourage learners to think and solve problems in their own way.

II. Research Methodology

The competency assessment framework for online learning students is designed in the form of a diagnostic assessment, that is, using interview questions to detect what skills are provided and to what extent these skills are integrated. The results, after being collected and analyzed, will give an overall picture of which specific skill needs to be revised. The demographic factors are also analyzed to bring insight into the similar/different points of view from different categorized groups. Some basic statistics techniques are used to analyse the data.

The designed survey questionnaire follows the below guidelines:

	Requirement	Specification	Guidelines
Subject	Online learning students	The chosen students should finish at least one semester	The respondents come from different majors
Sample size	The sample size is large enough	The sample size > 400	Demographic factors such as age, and living area are not included in this study

	Requirement	Specification	Guidelines
Question format	Covering all 4 skills: Critical Thinking, Creativity, Communication, Collaboration	Each of the 20 Likert scale questions has the following levels: Strongly disagree, disagree, neutral, agree, strongly agree	All the questions are compulsory.
Delivery method	User input	Google form	Data is collected and analysed using statistics

Table 1. The designed guideline for the survey questionnaire

III. Results and discussion

The number of responses are 521 records, of which only 407 responses are complete and usable. Among the respondents were 186 males and 221 females. Table 2 and Table 3 illustrate the detail of these respondents.

Education level before joining the online program	Male	Female	Total
High school graduation	49	40	89
Intermediate professional in the same major	7	11	18
Intermediate professional in the different major	30	32	62
College degree in the same major	10	24	34
College degree in the different major	22	25	47
Bachelor degree	68	89	157
Total	186	221	407

Table 2. Education level before joining the online program

No	Number of participants	Training program
1	76	Accounting
2	46	Bussiness Administration
3	57	Information Technology
4	18	Financial and Banking
5	28	International Law
6	52	Law
7	8	Tourism Management: Hotel and Travel
8	122	English
Total	407	

Table 3. Participants by major

All 20 questions are in form of 5 Likert scale comprising: Strongly disagree, disagree, neutral, agree and strongly agree. A respective value from 1 to 5 is assigned to each option in the same order ranging from strongly disagree to strongly agree.

The percentage of total strongly agree/agree takes up the major part of

the whole dataset (minimum at 54.79% - Question 16 in Creativity skill and maximum at 80.84% - Question 3, 4 in Critical Thinking skill).

Among questions about 4 skills, Critical Thinking and Creativity are just the general questions while Communication and Collaboration

are designed in association with the curricula.

Analyzing the overall data (no gender classification) gives out the

peak results of total strongly disagree/ disagree at 14.99% and 11.79% for Question 6 and Question 9 respectively (Communication Skill).

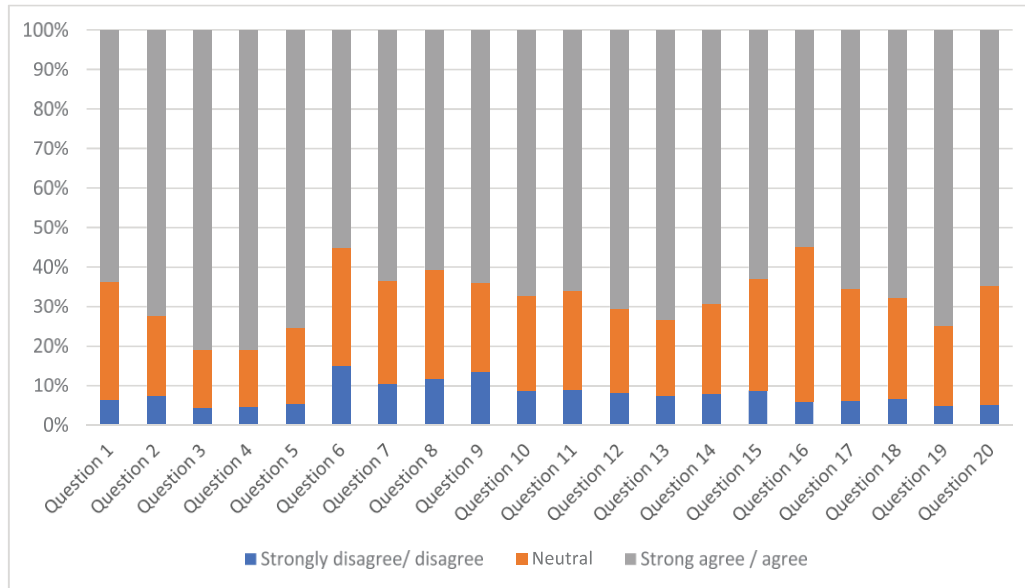


Figure 1. Response percentage by a 3 Likert scale dataset

Question No	Skill Type	Content
3	Critical Thinking	Do you collect information from many different sources before solving a problem?
4	Critical Thinking	Do you define a list of options before solving a problem?
6	Communication	Question 6: Does this online program offer you a chance to communicate with teachers and other students?
9	Communication	Question 9: Do you receive prompt feedback as expected?
16	Creativity	Do you have a lot of useful ideas?

Table 4. Some sample questions

While Critical Thinking has the highest percentage of agree and strongly agree responses at 74.55% followed by Collaboration, Creativity and Communication at 68.26%, 65.41% and 61.97% respectively. The Communication Skill has more disagree and strongly disagree responses while at the same time has fewer agree and strongly agree responses. This skill

needs to be revised and changed in future curriculum design.

The Critical Thinking and Collaboration skills have higher percentages of agree and strongly responses than Collaboration and Communication but we can not deduce that the result has reflected the well-embedded skills in curriculum design because students can acquire these skills before joining online learning programs.

To have a more detailed result on determining different points of view, the Likert scale data is collapsed into 3 levels in which strongly agree and agree responses / strongly disagree and disagree responses are combined respectively while neutral responses are kept untouched.

Using ANOVA analysis for the gender of the new dataset with disagree, neutral, agree columns with gender category, we have:

H₀: The null hypothesis states that there is no difference between females and males.

H_a: The alternative states that there are differences between females and males.

Previous degree	Disagree	Neutral	Agree
p-value	4.6E-10	5.51E-17	5.1E-33

Table 5. ANOVA analysis for 3 Likert scale dataset

H₀: The null hypothesis states that there is no difference between bachelor degree, associate degree, intermediate professional diploma and high school diploma

H_a: The alternative states that there are differences between bachelor degree, associate degree, intermediate professional diploma, high school diploma.

The p-values are less than 0.05, the null hypothesis is rejected. There are differences among the degrees or academic achievement attained by all respondents.

IV. Conclusion

Among all the 4 skills, the Communication skill ranked lowest, thus there is a need for this skill to be revised and changed in the future curriculum design. Communication and Collaboration skills

For disagree the p-value equal to $0.312119 > 0.05$, the null hypothesis is accepted. This case, there is no difference between females and males in disagree responses.

However, for neutral and agree responses, p-values equal to 0.000215 and $0.002497 < 0.05$ respectively, the null hypothesis is rejected, thus there are differences between females and males in neutral and agree responses

Using ANOVA analysis for the new dataset with disagree, neutral, agree columns with previous degree categories, we have:

are designed in the context of the learning process while Critical Thinking and Creativity skills are just general questions. Consequently, it is not possible to deduce that these two later skills are acquired by students throughout the online learning program. Also, the results indicated that there is no difference between the gender; whilst there are differences according to the earlier degrees of respondents.

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