ASSESSING LIFE-LONG LEARNING THROUGH CO-OPERATIVE EDUCATION

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Abstract – This paper uses the data from Student Performance Evaluation forms submitted by coop employers to study the level and progression of life-long learning attribute among engineering undergrad students at University of Waterloo. The questions in the survey are mapped to the indicators defining the life-long learning. The measurements show excellent performance rating, progressing positively as students advancing in their program. We analyze the results and suggest future research to address the shortcomings observed in the survey.

Keywords: Life-long learning, Cooperative education, student performance review, Canadian Engineering Accreditation Board, Graduate Attributes

1. INTRODUCTION

One of the attributes that Canadian Engineering Accreditation Board (CEAB) expects engineering students to attain upon their graduation is lifelong learning (LLL). In this paper, we investigate on the impact of cooperative experience in enhancing this attribute among engineering undergraduate students. We look at different dimensions of LLL and assess students' progression with respect to these aspects.

2. LITERATURE REVIEW

Although there is no clear definition to define lifelong learning [1] several core components are prioritized which are common in most of the definitions [2]. These components are 1) love of learning 2) meta cognitive awareness during learning 3) resilience during learning challenges and 4) self directed learning strategies.

Since lifelong learners are naturally curious individuals, they are intrinsically driven to learn [3]. In order to evaluate their developmental growth, lifelong learners recognize their gap of learning and therefore

promote their self-awareness [4]. In addition, these individuals will not be disappointed by the obstacles they encounter during their learning process and set their own learning goals by actively searching for information.

CEAB defines LLL for students as “an ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge”[5]. Using this definition, the Engineering Faculty at our institute has defined three indicators to measure this attribute:

- 1- Identify gaps in their knowledge, skills and abilities.
- 2- Obtain and evaluate information or training from appropriate sources.
- 3- Reflect on the use of information or training obtained.

The above 3 indicators are very well aligned with the characteristics of the life-long learners. The first indicator represents the love of learning, the second one shows self-directed learning and resilience and the third one demonstrates the life-long learners meta cognitive abilities.

A vast body of literature defines LLL and propose methods for promoting it [6], [2], [7] and [8]. However, to our knowledge, there is no framework on how to effectively assess this attribute and its progression, when students are at university. Hence, we suggest using students work experience during coop to assess LLL.

3. COOPERATIVE EDUCATION

Students in our institute should participate in cooperative (coop) program. They start their coop experience, either after the first term or after the second term. The students should at least participate in 5 coop terms in order to be able to graduate. By the end of their

work experience, the students are evaluated by their supervisors using the Student Performance Evaluation (SPE) surveys [9]. This survey was redesigned a few years ago to be aligned with CEAB Graduates Attributes (GA), including LLL. Supervisors evaluate students based on different rating scales: developing performance: 1-2, good performance: 3-5 and superior performance: 6-7. Those students who are not assigned to tasks demonstrating the relevant attributes would be ranked zero or “not observed”.

4. METHODOLOGY

In this research we used the data obtained from SPE to evaluate the status of LLL attribute in different groups of students. Questions 1, 2 and 9 in this questionnaire [9] ask about students’ interest in work, their ability to learn and their reflection capabilities. These questions are mapped perfectly to indicators 1, 2 and 3, accordingly. Throughout this work we study the progression of students with respect to LLL and analyze students’ performance in different programs. The data set included is from 13 engineering programs (biomedical, chemical, civil, computer, electrical, environmental, geological, mechanical, mechatronics, management, nanotechnology, software, and systems design) and 4,917 employers. The data set follows 11,061 unique students across 15 terms (Winter 2013 - Fall 2017). Students in this dataset are Canadian citizens (81%), have permanent residency (7%), or are here on a Student Permit (12%). 22% of the students in the data set were female.

5. RESULTS

5.1 Distribution of performance rates

The results of this study show that overall a great number of students receive high evaluation, and as the number of completed academic terms increases, more students receive “outstanding performance,” the highest possible rating, for their overall performance rating, while fewer students received “good” or “very good” ratings. This is true for all the departments, although some show faster progression over others. Figures 1, 2 and 3 demonstrate the distribution of the rates for questions 1, 2 and 9 for all programs across all terms.

5.2 Progression of attributes

The following figures show the progression of students LLL attribute with respect to questions 1,2 and 9 for different programs. Due to confidentiality of information we are not presenting the names of the

programs. The dotted black line is the average across all programs.

Figure 1: Distribution of data- Interest in work

Figure 2: Distribution of data- Ability to learn

Figure 3: Distribution of data- Reflection

As shown in figures 4 to 6 the data shows improvement across all the programs for questions which are mapped to LLL. Although some programs depict faster improvement than others, the overall progression trend is positive.

Figure 4: Progression of interest in work

Figure 5: Progression of ability to learn

Figure 6: Progression of Reflection

6. CONCLUSIONS AND FUTURE WORK

The overall evaluations that we obtained from employers show a significantly high performance rating of our students. Their performance is maintained high and improves as they gain more work experience in the future terms. This might be due to lack of informing employers about a referent to which students should be benchmarked. This referent could be a senior-level student or students at the same level. In future, we may

need to study the impact of such referent in employers' evaluation.

Another area that needs further investigation is studying the differences among the programs and analysing the reasons contributing to such differences. The distinguishing factors might be overall students' GPA, type of employers or type of the coop job.

Also, we plan to combine this evaluation with other direct and indirect assessments to verify the accuracy of the results of the survey. If the gap between our assessments is significant then there should be extra caution considered in deriving robust conclusions from these results.

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References

- [1] J. R. Kirby *et al.*, "Development of a scale to measure lifelong learning," *Int. J. Lifelong Educ.*, vol. 29, no. 3, pp. 291–302, 2010.
- [2] D. Drewery, C. Nevison, T. J. Pretti, A. Pennaforte, D. Drewery, and C. Nevison, "Lifelong learning characteristics, adjustment and extra-role performance in cooperative education," *J. Educ. Work*, vol. 9080, no. May 2016, pp. 1–15, 2017.
- [3] R. D. Crick, P. Broadfoot, G. Claxton, R. D. Crick, P. Broadfoot, and G. Claxton, "Developing an Effective Lifelong Learning Inventory: the ELLI Project," *Assess. Educ. Princ., Policy amp; Pract.*, vol. 11, no. 3, pp. 247–272, 2010.
- [4] R. D. Crick *et al.*, "Developing Resilient Agency in Learning: The Internal Structure of Learning Power," *Br. J. Educ. Stud.*, vol. 63, no. 2, pp. 121–160, 2015.
- [5] A. Criteria, "Canadian Engineering Accreditation Board Bureau canadien d'agrément des programmes de génie," 2017.
- [6] A. Tomer, K. College, G. Hagel, J. Mottok, M. I. Barak, and T. Israel, "CAPELLA: A Conceptual Framework for Adaptive Life-Long Learning," in *IEEE Global Engineering Education Conference*, 2017, no. April, pp. 1463–1472.
- [7] A. Gonzalez, "Embedded Academic Librarians Instilling Life-Long Learning Skills: A Proposed Methodology for Assessing Self-Perceived Information-Seeking Behaviors of Undergraduate Students," *Qual. Quant. Methods Libr.*, vol. 2, pp. 245–249, 2013.
- [8] D. Boud and N. Falchikov, "Aligning assessment

with long - term learning Aligning assessment with long-term learning,” *Assess. Eval. High. Educ.*, vol. 2938, no. 2006, pp. 399–413, 2007.

- [9] University of Waterloo - Cooperative education, “Student Performance Evaluation.” [Online]. Available: <https://uwaterloo.ca/co-operative-education/student-performance-evaluation>.