Achieving Lifelong Learning Outcomes in Professional Degree Programs

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Abstract

Learning to learn and lifelong learning are fundamental skills in Process Education, important for their roles in continuous growth and improved performance. Lifelong learning is one of the key outcomes for any educational program that deals with continuously and rapidly changing professional practices. In recognition of its importance, lifelong learning is considered one of the specified outcomes for accreditation of many professional programs.

Since learning outcomes are usually derivatives of the program educational objectives, both educational objectives and learning outcomes must be established. This paper examines the program educational objective for which lifelong learning is an outcome. Also discussed are the learning experiences and activities needed to achieve the desired objectives and outcomes. To conduct the study, the cognitive, affective, and psychomotor domains of Bloom's taxonomy are revisited. The progression in the developmental phases of these domains can help in identifying the areas to be targeted for continued growth, refined performance, and maturity.

An engineering case study is presented to demonstrate the role of different learning experiences in achieving the lifelong learning outcome. The holistic behaviors and observable actions of a practicing expert in the field of engineering are used to guide the development of the self-growing educational objective for the lifelong learning outcome. Finally, alumni survey data is used to assess the role of both classroom and co-op learning experiences in achieving improved lifelong learning ability.

Introduction

By definition Process Education is "a performance-based philosophy of education which integrates many different educational theories, processes, and tools in emphasizing the continuous development of learning skills through the use of assessment principles in order to produce learner self-development" (Burke, Lawrence, El-Sayed, & Apple, 2009). Therefore, lifelong learning is one of the fundamental skills in Process Education. In recognition of this essential skill, the issue of lifelong learning has become one of the significant aspects for certification and accreditation, especially in those professions for which rapid change in professional practices is common (European Commission, 2002). In the U. S., the Accreditation Board for Engineering and Technology (ABET), has required that "a recognition of the need for, and an ability to engage in life-long learning" should be one of the necessary educational outcomes for accreditation (ABET, 2005; Shuman, Besterfield-Sacre, & McGourty, 2005).

To achieve a program's outcomes, including lifelong learning, a set of clear educational objectives must be targeted. In addition, all learning experiences, courses, and activities must be aligned to deliver the outcomes and ultimately achieve the program objectives. The program outcomes are usually derivatives of the program educational objectives and not the reverse. Therefore, developing a meaningful and effective set of educational objectives will always be the foundation for success in higher education (El-Sayed, El-Sayed, & Beyerlein, 2010).

This article discusses the development of meaningful program educational objectives and outcomes for achieving lifelong learning. It also examines the roles of different learning experiences designed to achieve this objective. To demonstrate the impact of different learning experiences on the development of the lifelong learning abilities of graduates, an engineering case study is used as an example for professional degrees granting an educational program.

Educational Development

In Process Education, Bloom's taxonomy is utilized to help in establishing educational objectives, preparing better-designed courses, and achieving more student-centered implementation (Bobrowski, 2007). Bloom's taxonomy classifies educational development into the following three domains (Anderson & Krathwohl, 2001):

- Cognitive (thinking skills)
- Affective (valuing and emotions)
- Psychomotor (movement skills)

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The following are Bloom's developmental phases for the cognitive domain:

Cognitive (thinking skills)

1. Knowledge – Information gathering without necessarily understanding, using, or altering it
2. Comprehension – Understanding the gathered information without necessarily relating it to anything else
3. Application – Using general concepts gained through comprehension to solve a problem
4. Analysis – Disassembling something down into its fundamental elements
5. Synthesis – Creating something new by integrating different elements
6. Evaluation – Differentiating the subtle differences in objects or methods

The following are Bloom's developmental phases for the affective domain:

Affective (valuing and emotions)

1. Receiving – Awareness and willingness to receive
2. Responding – Willingness and active participation in responding (motivation)
3. Valuing – Attaching different worth or value to a particular object or action
4. Organizing – Setting priorities, comparing, relating, and synthesizing different values
5. Internalizing – Behaving based on an internalized value system

The following are Bloom's developmental phases for the psychomotor domain:

Psychomotor (movement skills)

1. Perception – Guiding motor activity using sensory cues
2. Set – Getting ready to act mentally, physically, and emotionally
3. Guided Response – Starting to learn complex skills through imitation and trial and error
4. Mechanism – Gaining confidence and proficiency in learning complex skills
5. Complex Overt Response – Performing complex movement skilfully
6. Adaptation – Modifying movement patterns to fit specific requirements
7. Origination – Creating new movement patterns

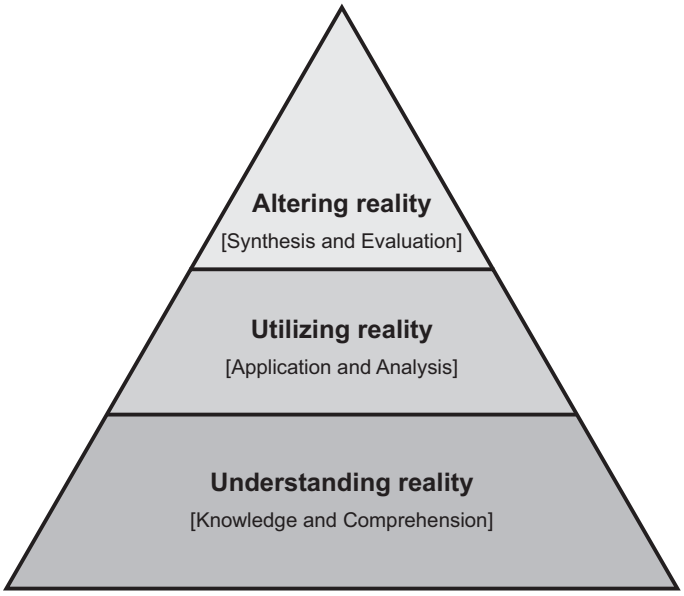
It is clear that Bloom's cognitive domain development phases represent the natural progression towards personal maturity in any field of study.

These phases are also well aligned with the natural progression towards higher levels of achievement or realization in the field. These levels of achievement can be categorized as the following (El-Sayed & El-Sayed, 2012):

- Understanding field reality (learning)
- Utilizing field reality (problem solving)
- Altering field reality (designing and researching)

By mapping Bloom's educational development phases in the cognitive domain into the three levels of achievement in the field, as shown in Figure 1 (El-Sayed et al., 2012), it is clear that:

Figure 1 Progression of Cognitive Domain Objectives



1. Knowledge and comprehension can be aligned with understanding field reality
2. Application and analysis can be aligned with utilizing field reality
3. Synthesis and evaluation can be aligned with altering field reality

Similarly, when dealing with reality each of the affective and psychomotor domain objectives can be mapped into three ascending levels, as shown in Figure 2 and Figure 3 respectively (El-Sayed et. al., 2012).

Figure 2 Progression of Affective Domain Objectives

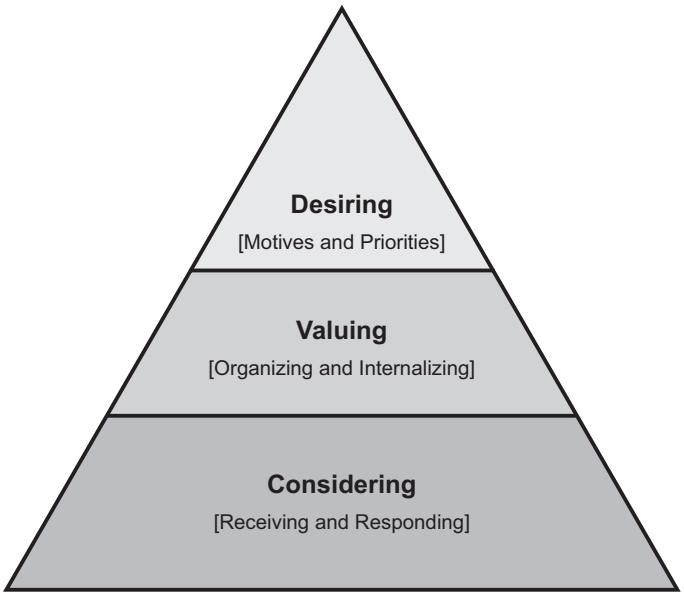
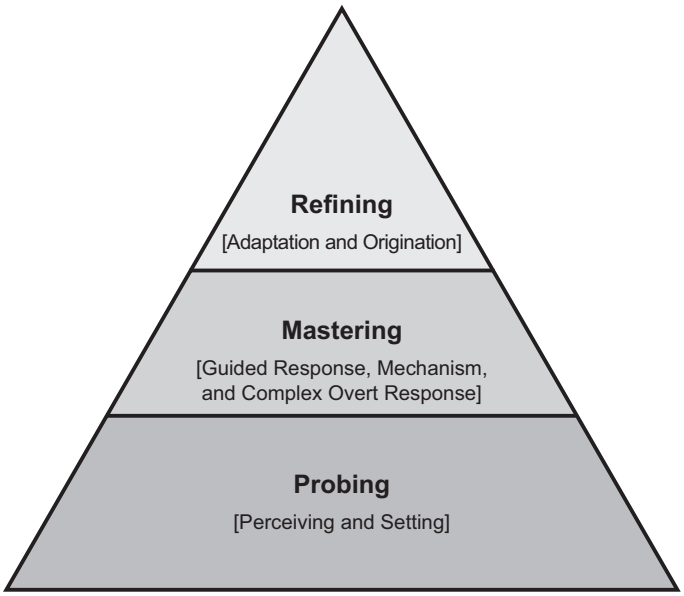


Figure 3 Progression of Psychomotor Objectives



For refined performance in any field of professional practice, it is clear that affective and psychomotor maturities are as essential as cognitive maturity. With continuously and rapidly changing professional practices, maturation requires commitment to lifelong development to reach higher phases of all three domains. Considering that learning is only the first phase of cognitive development, as shown in Figure 3, lifelong learning is clearly one of the developmental aspects for sustained professional maturity.

Educational Objectives and Outcomes for Lifelong Development

Educational objectives are the aspirations for the development, assessment, and continuous improvement of any program. To develop educational objectives, the focus should be on the required performance attributes of the practicing graduate three to five years after graduation. In engineering, for example, the Transferable Integrated Design Engineering Education (TIDEE) consortium of colleges in the Pacific Northwest developed an engineer profile by compiling accreditation criteria, codes of ethics, attributes valued by employers, and core competencies valued by professional societies. Synthesis of these traits produced a set of ten holistic behaviors of an engineer (Davis, Beyerlein, & Davis, 2005). These ten roles include those of analyst, problem solver, designer, researcher, communicator, collaborator, leader, self-grower, achiever, and practitioner. The broader spectrum of skills provided by the profile of an engineer outlines the characteristics that, once mastered, would make an engineer deemed an "expert" in his or her profession (Davis, Beyerlein, & Davis, 2006).

The TIDEE ten holistic behaviors are grouped into three categories: technical roles, interpersonal roles, and professional roles. Along with the holistic behaviors associated with each role, the five top observable actions are identified. One of the ten holistic behaviors of the professional roles is self-grower, defined as:

Self-Grower: Motivated for lifelong success, the engineer plans, self-assesses, and achieves necessary personal growth in knowledge, skills, and attitudes. The following are the set of behaviors or observable actions demonstrated by a self-grower:

a. Takes ownership for one's own personal and professional status and growth
b. Defines personal professional goals that support lifelong productivity and satisfaction
c. Regularly self-assesses personal growth and challenges to achieving personal goals
d. Achieves development planned to reach personal goals
e. Seeks out mentors to support future growth and development

It is clear that the TIDEE self-grower holistic behavior is broader and farther reaching in the graduate career than in the ABET lifelong learning outcome. This behavior defines an attribute for a practicing engineer a few years (3–5 years) after graduation. Therefore, the self-grower behavior can be directly used as a program educational objective.

A set of learning outcomes can be derived by defining an acceptable level of performance upon graduation in areas such as ability, knowledge, or recognition. The following

example illustrates the development of the program educational objective and the learning outcomes for the self-growing holistic behavior.

Example: A program educational objective for an interpersonal role could be stated as follows:

This program prepares the graduate to be a self-grower.

The learning outcomes for this objective would be:

a. Ability to take ownership of one's own personal and professional growth
b. Ability to define personal professional goals that support lifelong learning, productivity, and satisfaction
c. Ability to self-assess personal growth and challenges to achieving personal goals
d. Ability to develop plans to reach personal goals
e. A recognition for the need to seek out mentors to support future growth and development

From this example, it is clear that lifelong learning as an outcome is one of the criteria for the self-growing attribute.

Learning Experience for Professional Development

Learning experiences enable the achievement of educational program objectives and outcomes. For professional degree programs, integrating classrooms with other experiential learning experiences provides a successful model for achieving the educational objectives and learning outcomes (El-Sayed, El-Sayed, & Beyerlein, 2010). The selected experiential learning experiences should complement the set of designed program courses and classroom activities. The following describes the role of achieving program objectives and learning outcomes for both classroom and experiential learning experiences:

A. Classroom Learning Experience:

In addition to providing the fundamental knowledge and skills needed for professional practice, classroom learning objectives and activities attempt to emulate the field practices. While classrooms are the proper settings to gain knowledge, understand the theories behind the application, practice problem solving and design, and conduct some research, the emulation of field practice represents only a shadow of the complexity and ambiguity that exists in an actual workplace. Therefore, to fully realize the importance of self-growing in professional practices, students need additional forms of experiential education to complement classroom activities.

B. Co-op Learning Experience:

Before formal organizations of higher education existed, apprenticeship was the common way a young person would learn a profession. An apprentice would shadow the master craftsman to learn through observation and interaction. Slowly the apprentice would pick up the craft, first by doing elementary tasks under the full supervision of the master and as the apprentice developed, he or she would graduate to performing more advanced tasks with more independence and self-direction. The master would model all characteristics of an expert in his field, including personal development and self-growing.

To gain the advantages of both classroom and experiential learning experiences a well-designed learning experience should integrate the classroom with experiential field practices (Bowers, Sonnet, & Bardone, 1999; Grosjean, 2003). In engineering the cooperative education (co-op) represents the modern day version of apprenticeship. In a co-op program, students alternate between classroom instruction and working in an industrial setting. Through co-op, a student is exposed to exactly the type of complex environment that he or she will face during practice. If the experience is designed properly, students will fully comprehend the need for self-growth to deal with the multitude of constantly changing tools, processes, and practices. Through these experiences students can recognize and build frameworks about what it takes to be successful professionals.

Case Study for Assessment of Lifelong Learning Criteria

Because the classroom usually provides the fundamental learning and co-op provides much more experiential learning, it is important to examine the roles that classroom and co-op experiences play in achieving program educational objectives and outcomes for involving self-growth. To assess the role of both classroom and co-op learning experiences in achieving self-growing educational objectives, an engineering case study using university alumni survey data is used.

Students enroll in the engineering program following an integrated learning experience that alternates between classroom and co-op. Students begin their co-op rotation normally in their freshman year and must successfully complete multiple co-op terms as a graduation requirement (El-Sayed et. al., 2004). For continuous improvement purposes, university alumni are periodically surveyed about the program learning experiences of their classroom and co-op worksite.

The university alumni surveys are conducted by the Office of Institutional Effectiveness and adhere to the standard practice in higher education. Alumni are first surveyed three years after graduation. The surveys are mailed to each member of the targeted class with an addressed, stamped envelope. The typical number of graduates surveyed is approximately 400 per class with a return rate of approximately 16%. The first alumni survey used for assessment was conducted in 2005 and was highly based upon the ABET educational outcomes (El-Sayed, 2008). The questions asked the respondents to individually rate how co-op and classroom environments contributed to the development of different criteria.

The second alumni survey was conducted in 2008 (El-Sayed & Stodola, 2009). Because the surveys were based upon the ABET criteria, only the criterion of lifelong learning was surveyed for the self-growing program objective. The normalized results of these surveys and the combined averages are shown in Table 1 and charted in Figure 4.

From the data included in the 2005 and 2008 surveys, both experiences contributed somewhat similarly to the increase in the lifelong learning abilities of the respondents. The combined average percentage shows that, of the two surveys, slightly more than half of the respondents had the highest increase in their lifelong learning from the co-op experience.

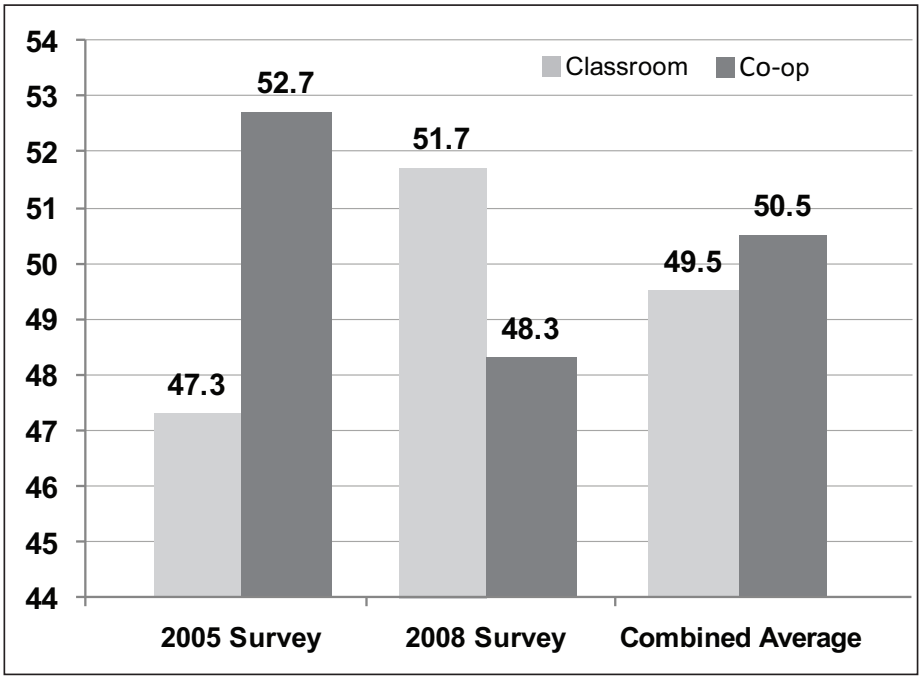
Conclusions

Refining performance, a core value in Process Education, requires continuous development of the affective and psychomotor domains in addition to the cognitive domain. Since learning is the first phase of cognitive development, lifelong learning is one of the essential skills for sustained professional development. Therefore, in the development and assessment of any educational program, especially a professional degree program, lifelong learning should be considered one of the program learning outcomes and assessment criteria for the self-growing attribute or program objective.

Table 1 Normalized percentage of respondents (responded as very high or high)

Increase in Lifelong Learning Ability	Classroom	Co-op
2005 Survey	47.3	52.7
2008 Survey	51.7	48.3
Combined Average	49.5	50.5

Figure 4 Normalized Percentage of Respondents with High Increase in Lifelong Learning Ability



For professional degree programs, using self-growing as an educational objective can serve as the foundation for lifelong development in many dimensions. In addition to lifelong learning, these dimensions include productivity, seeking mentorship, career planning, achieving professional goals, personal growth, and satisfaction.

Learning experiences are the enablers for achieving program educational objectives and outcomes. Based on the alumni surveys presented, the assessment of classroom and co-op learning experiences showed close contributions to the increase in lifelong learning abilities of the respondents. Classroom experience provided higher increases in the lifelong learning abilities of less than half of all respondents. Therefore, without the co-op experience, slightly more than half of all respondents would have had less development in their lifelong learning abilities.

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