Assessing and Evaluating Students' Abilities and Motivation for Lifelong Learning

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Criterion 3. Program Outcomes and Assessment

Engineering programs must demonstrate that their graduates have:

(i) a recognition of the need for, and an ability to engage in life-long learning
Workshop Overview

• What are abilities that support lifelong learning?
• Study Process Questionnaire (SPQ)
  – What is it?
  – What information might be gained from the SPQ?
• Learning and Study Skills Inventory (LASSI)
  – What is it?
  – What information might be gained from the LASSI?
• What are resources for improving abilities to support lifelong learning?
  – LASSI modules
  – Reflective journaling
  – Foundation Coalition module
What are abilities that support lifelong learning?
CRESST Model of Learning, Baker (1995)
Problem Solving

- Content Understanding
- Domain-Dependent Problem Solving Strategies
- Self-Regulation
  - Metacognition
    - Awareness
    - Planning
    - Monitoring
  - Motivation
    - Self-efficacy
    - Effort

Cognitive Strategies

http://www.cse.ucla.edu/CRESST/Files/downloads/CRESST/AASADAY1/9/ONeill.ppt
Self-Regulation

• Metacognition
  – Awareness
  – Planning
  – Monitoring
  – Cognitive Strategies

• Motivation
  – Self-efficacy
  – Effort
State Metacognitive Inventory

Metacognition

- **Planning**: One must have a goal (either assigned or self-directed) and a plan to achieve the goal.

- **Self-monitoring**: One needs a self-checking mechanism to monitor goal achievement.

- **Cognitive strategy**: One must have a cognitive or affective strategy to monitor either domain-independent or domain-dependent intellectual activity (for example, finding the main idea is a domain-dependent cognitive strategy).

- **Awareness**: The process is conscious to the individual.

O’Neill and Abedi, 1996
Planning

- **Goal setting and strategic planning** occur when students judge their analyze the learning task, set specific learning goals or refine the strategy to attain the goal:
  - Motivation
  - Task value
  - Critical thinking
  - Selection of appropriate learning strategies
  - Resource management
    - Time
    - Energy
    - Environment

The self-regulated learner: A student-centric view of learning, [http://orion.it.luc.edu/~jreymon/selfreg2.pdf](http://orion.it.luc.edu/~jreymon/selfreg2.pdf),
Also, Zimmerman, Bonner & Kovack
Self-monitoring

- **Self-evaluating and monitoring (How am I doing?)**
  - Occurs when students judge their personal effectiveness, often from formal or informal observations and recordings of prior performances and outcomes:
    - Self-efficacy, control of learning beliefs, effort control

- **Strategy-implementation monitoring (How is the strategy working?)**
  - Occurs when students try to execute a strategy in structured contexts and to monitor their accuracy in implementing it:
    - Critical thinking; effort regulation; affect, e.g., test anxiety; application of appropriate learning strategies; resource management; peer-learning; help seeking

- **Strategic Outcome Monitoring (Am I succeeding?)**
  - Occurs when students focus their attention on links between learning outcomes and strategic processes to determine effectiveness:
    - Critical thinking, control beliefs; self-efficacy; help seeking
Cognitive Strategies

• **Rehearsal**: reciting items over and over again until they are in memory. Rehearsal strategies encode and so supports higher learning strategy, but they do not lead to more advanced forms of learning. Rehearsal may be the choice when the task is the simple acquisition of new information.

• **Elaboration**: take information stored in memory and help students store it into long-term memory by building internal connections between items to be learned. Elaboration helps the learner integrate and connect new information with prior knowledge, and helps in recalling the new information.

• **Organization**: elaboration plus the learner selects appropriate information from a schema, rather than doing a brain dump. Organization strategies help the learner build internal connections between information. They require the learner to closely examine the schema and choose what is relevant to the task at hand.
Cognitive Strategies

• Rehearsal
  – Repeating over and over
  – Repetition with variation

• Elaboration
  – Paraphrasing
  – Summarizing
  – Creating analogies and metaphors
  – Generative note-taking

• Organization
  – Clustering
  – Outlining
  – Concept mapping
  – Selecting the main ideas from reading passages
Study Process Questionnaire (SPQ)

What is it?

What information might be gained from the SPQ?
SPQ: What is it?

- Original Study Process Questionnaire (SPQ)
  - Three-factor
    - Surface
    - Deep
    - Achieving
Learning Approaches

• **Surface Learning Approach**
  – Motivation: Extrinsic motives
  – Cognitive Strategies

• **Deep Learning Approach**
  – Motivation: Intrinsic motives
  – Cognitive Strategies

• **Achieving Learning Approach**
  – Motivation: Maximizing performance while optimizing efforts to achieve it
  – Cognitive Strategies
Surface Learning Approach

- **Motivation:** Motives are extrinsic such as fear of failing
- **Cognitive Strategies:** Surface strategies include reproductive or rote learning and "minimalistic" learning – learning that is just enough to meet the course demands.
- **Such an approach often leads to poor academic performance.**
Deep Learning Approach

• Motivation: Motives are intrinsic, such as seeking to understand and relate understanding to other subjects and to develop personal meaning for subject material.

• Cognitive Strategies: Deep strategies including relating previous knowledge to new knowledge, relating knowledge from different courses, relating theoretical ideas to everyday experience, relating and distinguishing evidence and argument, organizing content into coherent whole.

• A deep learner may sometimes wander off-track and not follow course syllabi and outlines. Academic performance, especially in a more structured system, may also be adversely affected.
Achieving Learning Approach

• **Motivation**: Maximizing performance while optimizing efforts to achieve it

• **Cognitive Strategies**: Use surface or deep approaches, whichever that can help them to get high marks.
SPQ: What is it?

• Revised Study Process Questionnaire (R-SPQ-2F) (Biggs, Kember & Leung, 2001).
  – Two-factor
    • Deep
    • Surface

• SPQ and R-SPQ-2F have been previously utilized in Australia, Hong Kong and Great Britain (Biggs, et al, 2001; Kember and Leung, 1998).
Learning and Study Skills Inventory (LASSI)

What is it?

What information might be gained from the LASSI?
LASSI: What is it?

• The LASSI grew out of an effort to assess and promote *strategic learning*. Strategic learning, as defined by Weinstein, has three components:
  – Skill
  – Will
  – Self-regulation.
## LASSI Scales

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Skill Component

- **Information Processing** - assesses how well students' can use imagery, verbal elaboration, organization strategies, and reasoning skills as learning strategies to help build bridges between what they already know and what they are trying to learn and remember, i.e., knowledge acquisition, retention and future application (sample item: I translate what I am studying into my own words). Students who score low on this scale may have difficulty making information meaningful and storing it in memory in a way that will help them recall it in the future.

- **Selecting Main Ideas** - assesses students' skill at identifying important information for further study from among less important information and supporting details (sample item: Often when studying I seem to get lost in details and can't see the forest for the trees). Students who score low on this scale may need to develop their skill at separating out critical information on which to focus their attention. Tasks such as reading a textbook can be overwhelming if students focus on every detail presented.

- **Test Strategies** - assesses students' use of test preparation and test taking strategies (sample item: In taking tests, writing themes, etc., I find I have misunderstood what is wanted and lose points because of it). Low scoring students may need to learn more effective techniques for preparing for and taking tests so that they are able to effectively demonstrate their knowledge of the subject matter.
Will Component

- **Attitude** - assesses students' attitudes and interest in college and academic success. It examines how facilitative or debilitative their approach to college and academics is for helping them get their work done and succeeding in college (sample item: I feel confused and undecided as to what my educational goals should be). Students who score low on this scale may not believe college is relevant or important to them and may need to develop a better understanding of how college and their academic performance relates to their future life goals.

- **Motivation** - assesses students' diligence, self-discipline, and willingness to exert the effort necessary to successfully complete academic requirements (sample item: When work is difficult I either give up or study only the easy parts). Students who score low on this scale need to accept more responsibility for their academic outcomes and learn how to set and use goals to help accomplish specific tasks.

- **Anxiety** - assesses the degree to which students worry about school and their academic performance. Students who score low on this scale are experiencing high levels of anxiety associated with school (note that this scale is reverse scored). High levels of anxiety can help direct attention away from completing academic tasks (sample item: Worrying about doing poorly interferes with my concentration on tests). Students who score low on this scale may need to develop techniques for coping with anxiety and reducing worry so that attention can be focused on the task at hand.
Self-regulation Component

• Concentration - assesses students' ability to direct and maintain attention on academic tasks (sample item: I find that during lectures I think of other things and don't really listen to what is being said). Low scoring students may need to learn to monitor their level of concentration and develop techniques to redirect attention and eliminate interfering thoughts or feelings so that they can be more effective and efficient learners.

• Time Management - assesses students' application of time management principles to academic situations (sample item: I only study when there is the pressure of a test). Students who score low on this scale may need to develop effective scheduling and monitoring techniques in order to assure timely completion of academic tasks and to avoid procrastination while realistically including non-academic activities in their schedule.

• Study Aids - assesses students' use of supports or resources to help them learn or retain information (sample item: I use special helps, such as italics and headings, that are in my textbooks). Students with low scores may need to develop a better understanding of the resources available to them and how to use of these resources to help them be more effective and efficient learners.

• Self-Testing - assesses students' use of reviewing and comprehension monitoring techniques to determine their level of understanding of the information to be learned (sample item: I stop periodically while reading and mentally go over or review what was said). Low scoring students may need to develop an appreciation for the importance of self-testing, and learn effective techniques for reviewing information and monitoring their level of understanding or ability to apply what they are learning.
What are resources for improving abilities to support lifelong learning?

LASSI modules
Reflective journaling
Foundation Coalition module
LASSI Modules

• The authors of the LASSI have associated constructed a set of ten modules associated with the ten scales in the LASSI. Each module contains a set of activities designed to help students improve their abilities related to the particular scale.

• Access to the modules can be purchased along with access to the instrument.
Reflective Journaling

• A research study conducted by Burrows, McNeill, Hubele, and Bellamy (2001) confirms through statistical evidence that reflective journal writing can improve the learning of content in a freshman engineering course. Burrows, et al outline five key areas, which they believe define reflective writing:
  – A summary, in the student’s own words, of the important elements of the reading assignment;
  – Questions that the student had about the content of the reading assignment;
  – A personal description of potential applications of the material to the student’s own life (written in the first person);
  – A description of the student’s own experience relevant to the material in the reading (written in first person);
  – Comparison and contrast of the reading material to other material in this or other courses.
Foundation Coalition Module

• The Lifelong Learning Module is a short module that might be incorporated into a standard engineering course. This module will provide students with some instruction and experience in developing an appreciation of the need for lifelong learning, finding sources of continuing education opportunities, and demonstrating their ability to learn new material.

• Student Activities
  – Develop a process for learning new material
  – Find sources of technical and non-technical information
  – For a given problem/project, determine what additional information is needed
  – Find sources of continuing education opportunities
References

- Deep and Surface Learning Approaches, http://www.dmu.ac.uk/%7Ejamesa/learning/deepsurf.htm