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Best Practices for Designing an Undergraduate Engineering Curriculum

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BEST PRACTICES FOR DESIGNING AN UNDERGRADUATE ENGINEERING CURRICULUM

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Abstract

This article offers examples of best practices for planning instructional learning within the naturalistic setting and based on real learning experiences. The inquiry, based on practices and strategies proven successful in an undergraduate engineering class is the focus of this best practices article. This article is also a useful guide for administrators, practitioners, and undergraduate educators who make decisions on instructional delivery and scholarship. The instructional activities offer core instruction and curriculum modules on best practices for effective college instruction.

Steps for Instructional Delivery

Inceptive Screening and Lecturing

It is essential to understand prior experience of students to generate a sense of their existing knowledge before the learning path starts. Show bonds and personal association with students.

Offer Curriculum Planning

University professors should clarify course goals, projects, student learning outcomes, and expectations to avoid misinterpretations. This practice frame and communicate learning goals, content topics, concepts in each topic, and topical contents in lectures. Offer information on course agendas, assessment criteria, deadlines, and multiple set of activities, on-field assignments. Each subject overview document should include a list of references, bibliographies, outside reading assignments, and value-added resources. These exercises allow students to plan and schedule activities grounded on future needs and required standards.

Gripe Session

Practice the act of conveying learners to be thoughtful of difficulty levels and instruct how to tackle those difficulties. When students take part in goal related practices, this increases their independence; enhancing their reading experiences before lectures. This not just promotes their self-directed learning, better prepare them for class instruction, giving students more time to concentrate on the important course learning objectives. Professors should discuss topics for gallery walks, recitations, debates, and workshops and ease interventions according to individual students' needs and accomplishments. Pick out the most meaningful topics for anchoring instruction and abstraction studies.

Graded In-class pursuit

This practice centered on collaborative discoveries, adventures, and active learning approaches, a routine where both instructors and learners build and gain knowledge.

i) Conducting Gallery Walks

Classes divided into teams with a group leader. Each group assigned an eclectic topic by the instructor. Each group prepares 5 to 6 posters, arranging them in order and post-on the wall. Beginning the first stage, other team members make observations and write interpretations, on the gallery sites. During the second stage, group exchange sheets, reads existing interpretations and create changes (additions/corrections). The squad leader of each group summarizes and reports to the class. This teaching and learning method generates a written record of students' judgmental thinking skills.

ii) Anchored instruction

Anchored instruction develops the ability to break content and topics into parts. This method calls for structural understanding of facts and inferences. In squads of 4-6 members, this practice includes working out difficult problems or subjects, and involves dealing with current developments, possible problems and future demands, how to solve particular problems. Offer explicit instructions along with citations and resources on particular core topics. Students research, compose and present data as a report. The reports documented as a reference guide.

Debates/ Re-enact Debates

This contemporary pattern builds upon the ideas and applications over time and revisit concepts or topics in a proper way.

Conceptual sketches/ Visual maps

A constructive learning practice includes interpretations, and illustrations. The students organize their knowledge and this method is quick to appraise.

i) Assignments

This practice based on connectivism, action, and self-directed learning to raise intellect, drawing new connections and overcoming difficult levels using problem-based, project based, or task based activities. It facilitates the learners' ability to apply and analyze concepts. The exercise keeps track of what students are learning / or have taken. Below are examples of assignments:

ii) Storyboards:

Here students organize and display graphic, illustrations or images in sequence. It provides opportunity to judge management ability.

iii) Lectures and lab work, recitations:

Assignment centered on an active learning approach, involves explaining, understanding, or interpretation. Students work together in teams of four, thereafter-delivering recitation assignments as seminars, incorporating new models/applications, from choice, the latest development, such as reports or journals. The intervention makes students responsible for constructing knowledge with teachers. The approach fosters learning and allows scholars to get their intellectual potential. It too helps to test the ability of a learner to comprehend coursework implications.

iv) Professional Presentation:

This pattern allows students the chance to find out how to apply and present technical contents as professional along with technological assessment. Students develop the ability to put parts together, carry out imagination or original ideas, formulation of new patterns, and synthesize knowledge to propose plans. It helps to find students' strengths and enhance their ability to express in a rational way.

v) Workshop (Participative Learning Assignment):

This practice allows learners to explore research articles (journals), and report advancements in the field, presents evolving status. A group of five students indulged in the workshop amid them, each group explores a research article from a journal of high impact factors and highlighting the approaches. Drafts of each group are later compiled as a pragmatic report. The task helps to judge the ability of the student to organize and collaborate.

vi) Brainstorming:

This procedure requires a higher level of understanding than comprehension. Each group brainstorms and submits a pragmatic report to highlight the gaps, inconsistencies, and limitations. The report gives future research directions. This practice judge student' leadership abilities.

vii) Out Class Action Learning Assignment:

This learning practice pulls students out of the class and the textbook into practical field related learning experience. The practice incorporates individual fieldwork task conferring with relevant industry or cluster. The student explores small and medium scale manufacturing units. They record observations, analyze, make interpretations, and prepare reports. This practice judges students' ability to evaluate technical competencies.

viii) Jig Saw Technique:

Consulting with businesses and industries' on their needs by forming teams of at least four students who visit the local business industries making observations and collecting data on existing processes, constraints, problem areas to name bottlenecks. Thereafter workout potential alternative solutions and/or optimize processes. The team makes a brief report. This exercise helps to judge the students' coordination capacity.

Assessment and Review Progress

Counseling is incompatible without assessment since discernment is required to decide proper guidance. Assessment judges the learning consistency and sufficiency of the core content learned, from a mix of formative and summative assessment instruments. The review procedure diagnosis learning, record and reflect on every activity and rank the assignments in learner's portfolio. Float open-ended questions and create space for remarks on issues instead of closed-ended questions or 'yes/no' answers. Assess and judge learners' strengths and areas for development with formative statements of progress. Periodic refinement, variation and experimentation with different approaches are essential. Formative assessment leads to feedback that is developmental and summative assessment defines the standard of competence.

There are abundant instances that counseling is incompatible without assessment since discernment is required to decide proper guidance. On that account, review and assessment procedures meant for diagnosis and reflections. Foregoing instances have shown formative assessment leads to developmental feedback; in contrast summative defines the standard of competence. Assessment judges the learning consistency and sufficiency of the core content learned, from a mix of formative and summative assessment instruments. Hence, record every pursuit and rank the assignments in learner's portfolio. Assess and judge learners' strengths and areas for development with formative statements of progress. An opinion now become established, open ended questions create space for remarks on issues instead of closed-ended questions or 'yes/no' answers. After this, it remains solitary to say, periodic refinement, variation, and experimentation with different approaches are essential.

Conclusion

To prove academic benchmarks and to create 'future ready' professionals', academicians need to organize and deliver the curriculum, weaving together the vital components of instruction, scholarship, and manifestations, and embed instructional activities with philosophies and ideologies. On that account, learning strategies should set new performance measures, offer reliability expectancy, and make sure compliance with an established standard. As always, instructors should exercise responsibilities to foster excellence in learning and skills development, and ease learning in context of distinctive intellectual behaviors. The overall duty of an educator is to prepare and offer versatile, resourceful, and result-oriented best practices.

References

- Magliaro, S. G., & Shambaugh, N. (2006). Student models of instructional design. *Educational Technology Research and Development*, 54 (1), 83–106.
- Mayer, R. (2003). The promise of multimedia learning: Using the same instructional design methods across different media. *Learning and Instruction*. 13, 125-139.
- Orlich, D. C., Harder, R. J., Callahan, R. C., Trevisan, M. S., & Brown, A. H. (2012). Teaching Strategies: A Guide to Effective Instruction. *Houghton Mifflin*.
- Paul, R., & Elder, L. (2004). Critical and creative thinking. Dillon Beach, CA: The Foundation for Critical Thinking.
- Powell, K. C. & Kalina, C. J. (2009). Cognitive and social constructivism: Developing tools for an effective classroom. *Education*, 130 (2), 241-250.
- Tuning Project II. (2008). Approaches to teaching, learning and assessment in competences based degree programmes. Retrieved from <http://www.unideusto.org/tuningeu/teaching-learning-a-assessment.html>.