EFFECTIVE USE OF ASSESSMENT FOR INSTRUCTIONAL ALIGNMENT

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Synopsis:

This paper will present a research study to design specialized Artificial Intelligence tools for engineering students. In the process of implementation, multiple assessments have been used to check the alignments of instruction to three aspects, 1) alignment to teaching objectives via a direct assessment of analyzing student learning outcomes in course activities; 2) alignment to meeting student expectations via an indirect assessment of student survey; and 3) alignment to nation-wide data in STEM.

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Abstract

This paper will present a research study to design specialized Artificial Intelligence tools for engineering students. In the process of implementation, multiple assessments have been used to check the alignments of instruction to three aspects, 1) alignment to teaching objectives via a direct assessment of analyzing student learning outcomes in course activities; 2) alignment to meeting student expectations via an indirect assessment of student survey; and 3) alignment to nation-wide data in STEM field via CURE survey analysis. The detailed data will be shared with audiences.

Keywords: Assessment, instructional alignment, undergraduate research, artificial intelligence, student learning engagement.

Background Introduction

This is a 3-year research project funded by the National Sciences Federation (NSF) to design artificial intelligence tools for engineering students at undergraduate level at the Texas Southern University. This project seeks to infuse innovative Electrical/Computer Engineering specialized Artificial Intelligence (AI) tools into traditional Civil Engineering problem-solving routines through problem-based learning approach (PBL). It also helps bridge current curricula gap in the Department of Engineering at the Texas Southern University (TSU). The objectives of the project are: 1) to develop an intelligent knowledge database to document, compare, and analyze cutting-edge AI applications in civil engineering field, which can be used as the platform and educational media for curricula development and implementation for PBL approaches in classroom; 2) to add one new interdisciplinary course to the Department's curricula "AI Tools for Engineering Problem Solving" for all senior engineering major students; 3) to enrich current curricula by integrating innovative AI application case studies into more than fourteen existing courses being offered in the Department, 4) to foster interdisciplinary academic setting by hosting server-based intelligent database in the College of Science, Engineering and Technology and to provide web- and classroom-based workshops and tutorials to all interested students and faculty; and 5) to support undergraduate students' early involvement in research.

The three-year implementation has witness the success of the research project based on the collected data and analysis. The carefully designed assessment activities not only help the improvement of instructional quality but more importantly help the instructor check the alignment of teaching. Instructional alignment is extremely crucial because it is "ensuring your learning objectives, the assessments of those learning objectives, and the instructional strategies are aligned." In this research project, a full-scaled alignment strategy has been deployed to guarantee an effective educational process that covers teaching, learning, and student future as a responsible citizen. This full-scaled alignment strategy includes following three aspects.

1. Alignment to Teaching Objectives

In this project, the instructor uses difference assessment activities to measure student learning outcomes. Those assessment activities are directly related to the project design objectives and student learning. Students were using the artificial intelligent tools to learn new concepts and knowledge, and they applied the knowledge in hands-on projects through problem-based learning. The direct assessment collected data from student learning performance, which helps instructor to find out if the artificial intelligent tools truly help student learning useful knowledge that prepares them for their future career and societal needs. The analyzed data results also help instructor adjust teaching methods and strategies to improve student overall learning performance.

2. Alignment to Student Expectations

The in process of education, students are equally important and responsible for learning achievements. They need to be actively engaged in the learning process instead of being spoon-fed by the instructor. The true involvement happens when students have the opportunity to provide feedback from their own learning experiences for instructional effectiveness and learning issues. In this project, an indirect assessment activity was conducted. An end-of-semester survey was created to collect students' perspectives on learning engagements, knowledge acquisition, artificial intelligence tools, their overall feedback on instruction quality, and their suggestions for project future improvement. This practice, in great deal, helped the instructor make sure to address student learning issues in future course design and project implementation.

3. Alignment to Nation-wide Data in STEM Field

Education in any school should never be isolated as a localized activity. It should be an instructor's concern to make sure student's academic achievements are comparable to those of other schools at equal level. This is a responsible practice for students. When they leave school, they should be as competitive as other students at equal level of schools in the society. This project uses the CURE national survey as a bench mark to compare TSU students with Nation-wide students in STEM field. This survey investigates various elements related to student learning, from the intention of taking the course, student pre-course experiences, post-course gains, course benefits, student attitudes towards sciences before and after students take the course, to student learning styles. The results of each category give the instructor an insight to find out the course teaching effectiveness, and more importantly to compare his or her students with national counterparts in academic performance. The survey results from TSU students are very competitive as compared to the Nation-wide students in STEM field, which indicates that the research project of using artificial intelligence tools in education is very successful.

In this presentation, detailed research experiences and data will be shared with audiences. Assessment is very important in the process of education since the data driven practice is the only way that can guarantee a successful education.