

Adaptive Comparative Judgment for Polytechnic Transformation: Assessment across the Curriculum

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Abstract

The authors are investigating potential applications of adaptive comparative judgment (ACJ) across numerous environments and learning scenarios within the Purdue Polytechnic Institute as part of Purdue's efforts to transform the undergraduate learning experience. Six courses or program areas were selected for the study, involving a wide variation in subjects, subject matter, and assessment artifacts. The authors anticipate that positive results from these pilot studies will encourage broader and deeper applications of ACJ in the Purdue Polytechnic, across Purdue University, and in other academic institutions. Results from these scenarios will be disseminated in future conferences and scholarly journals.

Introduction

Adaptive Comparative Judgment (ACJ) is rapidly becoming an assessment tool for educational evaluation and learning (Bartholomew, 2017; Bartholomew, Strimel, Yoshikawa, 2017; Hartell, 2015; Seery & Canty, 2017). In the Purdue Polytechnic College we see potential for broad, robust, and potentially-transformative applications of this assessment and learning technique. Previous research has demonstrated that open-ended assessment in STEM-related fields are uniquely situated for the application of ACJ (Kimbell, 2007, 2012a, 2012b).

The Purdue Polytechnic Institute houses six schools/departments consisting of more than 35 program areas. Five program areas or specific courses (shown below) will be piloting the use of ACJ for open-ended assessment and student formative feedback in a college-wide study. The use of ACJ for formative student feedback and assessment and summative project-based evaluation will specifically address the potential for transforming the assessment and learning culture in the Purdue Polytechnic.

Project Overview

The following paragraphs describe each program area or course and the accompanying study methods, design, assessment artifacts, stakeholders, and target outcomes.

Engineering/Technology Teacher Education

The Engineering/Technology Teacher Education department at Purdue University is primarily focused on training future secondary technology and engineering educators in integrated STEM content, pedagogical approaches, and learning theories. Students work in problem-based learning classrooms to develop their content knowledge while applying their learning to classroom applications for secondary students. ACJ will be used for open-ended problem assessment and learning in the core content areas of

the Engineering/Technology Teacher Education program. Students will use ACJ to formatively assess their own, and peer, projects both providing and receiving feedback throughout. This exposure to fellow-student work and the opportunity to differentiate between quality in open-ended design scenarios has already shown promising in terms of student achievement (Bartholomew, Strimel, & Yoshikawa, 2017).

Computer Graphics Technology 11800 - Fundamentals of Imaging Technology

This freshman course provides a foundation for the development and use of raster and vector images for a variety of industries. Full-color images and illustrations are produced using computer technologies, with a focus on both technical and aesthetic aspects. Topics include color theory and perception, surface and lighting analysis, rendering techniques, and technical characteristics.

There will be approximately 50 students in this course using ACJ as part of this study. Four projects will be assessed throughout the semester (approximately 200 artifacts in total) consisting of several file types including PDF, PNG and JPG. The ACJ judges will be the students, instructors, and course teaching assistants. In addition to using ACJ for formative and summative feedback, the resulting rank orders from the students, teaching assistants, and instructors will be compared to identify potential areas of misalignment and necessary emphasis.

Game Development and Design

The Game Development and Design program is designed to produce career-ready graduates who know how to prototype games and game systems and who can evaluate their impact on society. Research areas include the use of games for sustainable energy, therapy and medicine, entertainment, and information visualization. Students take classes in video game design and development, animation, visualization, rendering and programming. As part of this study, students in the Game Development and Design capstone course will be utilizing ACJ for project portfolio assessment in both formative and summative scenarios. Approximately forty students, as well as faculty and industry sponsors, will be acting as ACJ judges for this course. The resulting rank orders will be used to inform both teaching and learning practices.

Transdisciplinary Studies in Technology

The Transdisciplinary Studies in Technology (TST) program is a unique open-ended and competency-based program that enables students to personalize their plans of study by blending areas such as technology, business, and humanities. The emphasis is on hands-on, team-based projects focusing on real world problems. The environment combines individualized learning combined with close mentoring by faculty experts, with resultant artifacts such as an electronic portfolio which documents student ability and mastery of subjects. Approximately 25 students will be using ACJ in formative and final assessment of their portfolios in multi-level (freshman to senior) studio and portfolio

courses. Judges will be the students, their faculty mentors, and invited outside faculty and industry stakeholders. The resulting rank orders will be used to inform competency-based credentialing for the course and student progression.

Theater 35300 - Theater Audio Techniques I

This course (taught in the College of Liberal Arts by a Purdue Polytechnic faculty member) emphasizes a theoretical and practical study of the technical aspects of audio as they relate to theatre. Topics include audio specifications, layout and installation techniques, operation, and maintenance of theatre sound systems. For this study, approximately 18 students (juniors, seniors, and graduate students) will use ACJ for analyzing team projects related to intelligibility under different reverberation times, loudspeaker system design, and CAD drawing layout of physical audio plans.

Design Thinking (Freshman Experience)

Students enrolled in the Design Thinking Freshman Experience course work in teams to solve real-world grand challenges. These open-ended problems, which require creativity, innovation, and teamwork to solve, are framed around design thinking and students work to produce portfolios which demonstrate their mastery of the design process. Students enrolled in these courses will use ACJ as a brainstorming and formative assessment tool throughout the course; as students embark on challenges they will also act as judges in an ACJ session comprised of hundreds of past student projects. This exposure, and opportunity to act as a judge between quality of work, will assist and shape student design thinking and abilities throughout the course.

Conclusion

The goal of this cross-curriculum research study is to test the efficacy and practicality of adaptive comparative judgment (ACJ) as an assessment tool for open ended problem sets across numerous scenarios in technology related environments. The wide variety of variables that are involved include subject matter differences, multiple stakeholders (students, faculty, industry partners), multiple grade levels (freshman to graduate level), artifact types/scope (assignments, projects, portfolios), ACJ purpose (formative learning tool, summative evaluation tool, etc.), individual or team projects, and number of ACJ applications per subset group.

It is expected that the study will yield results that validate the use of ACJ across many environments and scenarios in higher education as both a learning and assessment methodology. Future plans include broader applications of ACJ university-wide at the authors' home institution, and additional collaborative studies at partner institutions. In parallel with this study, the authors are involved in other related research at both the national and international level, highlighting the growing interest in ACJ as a powerful educational resource. Results of this study will be disseminated at multiple conferences and in journals in the technology and education areas.

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