Improving Student Visual Design Awareness Through Peer and Self Evaluation Using Adaptive Comparative Judgment

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Abstract

Adaptive Comparative Judgement (ACJ) is strongly suited for assessment of open-ended, project-based content. It has been shown to be valid and reliable in many applications internationally, but is only recently becoming known and utilized in the United States. This research is an attempt to apply ACJ as a tool to help students and instructors analyze and compare attributes of visual design in computer graphics through the use of a quasi-experimental mixed methods study. The authors anticipate further validation and use of this innovative assessment method and technology in diverse learning contexts.

Introduction

The creative and ill-structured nature of open-ended design problems has contributed to notoriously unreliable and difficult to implement methods of assessment (Bartholomew, 2017; Kimbell, 2012; Pollitt, 2004, 2012). In the context of teaching design, peer critiques help students become aware of the iterative nature of design, and the nature of the creative process (Garcia Bravo, Ashby & Exter, 2016). Traditionally, group critiques facilitate the qualitative assessment of design artifacts.

However, an innovative form of assessment called adaptive comparative judgment (ACJ) has recently been gaining exposure (Bartholomew, 2017; Seery & Canty, 2017). Rather than traditional forms of assessment such as rubrics, ACJ relies on a judge simply looking at two pieces of student work and picking the better of the two. Herein lies the strength of ACJ, as judgments between two items are significantly more reliable than rubric or purely qualitative judgments (Pollitt, 2004, 2012). In ACJ, the pairwise-comparison process is repeated, and, utilizing a devised algorithm, each piece of student work is compared with others until a rank-order is produced for all items. In addition to the ranking, judges can provide feedback pertaining to each decision in the judgment process. The resulting rank-order, and the associated judge comments, can be used in

both formative and summative learning and assessment. This approach has proven more reliable, and impactful than traditional forms of assessment (Bartholomew, Strimel, & Zhang, 2017; Kimbell, 2012; Pollitt, 2004; 2012). Despite increasingly widespread implementation abroad this method has only been limitedly employed in the United States, with an emphasis on K-12 education. The results of these applications have demonstrated high levels of validity, reliability, and feasibility (Bartholomew, 2016; Bartholomew, Strimel, & Yoshikawa, 2017; Bartholomew, Strimel, & Zhang, 2017).

This research calls for students and professors to join in the implementation, testing, evaluating, and propagating of an Adaptive Comparative Judgment tool titled *CompareAssess* in a university-course setting. This freshman-level course teaches the basics of raster and vector imaging for several applications. Technical and aesthetic components of computer graphic illustrations are investigated, including color theory, lighting, and rendering. The students in the experimental group will move through the normal course progression with the added responsibility of acting as judges and providing feedback on peer work—an opportunity that has shown promise in other contexts (Bartholomew, Strimel, & Yoshikawa, 2017). We expect this opportunity will assist these students as they shape their own ability to decipher what good design "looks like." Another cohort of CGT 11800 students, acting as the control group, will provide opportunities to explore the specific impacts of this ACJ tool on achievement as the final products from each group are compared and potential learning gains of the experimental group are studied. The resulting rankings, from control and experimental groups, will be used to explore the differences, if any, between the overall achievement of students receiving traditional forms of assessment and feedback, and those participating in the ACJ-based approach. Qualitative interviews will also be conducted with students and teachers from each cohort to clarify and explore the findings.

Research Design (Quasi-experimental, mixed-methods)

Course	CGT 11800 – Cohort 1	CGT 11800 – Cohort 2 & 3
Designation	**Control group**	**Experimental Group**
Population	N = 49	N = 98
Deliverables	Project 1 - 4 (Final)	Project 1 - 4 (Final)
Treatment	Traditional approaches	ACJ approach
Feedback Mechanism	Traditional paper-based peer-feedback in class at the conclusion of each assignment	ACJ ranking and feedback via *CompareAssess* at the conclusion of each assignment.
Other	5 semi-structured qualitative interviews with students at the conclusion of the course	

Research Questions & Design

		To what degree does a student's use of ACJ, as a learning tool through the evaluation of self and peer-design projects, impact their design performance?
RQ₁	**Working Hypothesis:**	As students use ACJ to provide *and* receive feedback to/from their peers after each project: • design abilities will improve, • students will recognize "good" design, and • students will solidify their own understanding of design principles
	Research Methodology:	End of each project: all student projects are uploaded (control & experimental) • **Control group** students print out a copy of their designs and complete the in-class peer-review session. • **Experimental group** students will complete the ACJ and give/receive feedback for the design projects from each class End of class: after the Project 4 **all** students (control and experimental groups) upload their designs for ACJ assessment by a panel of judges (2 faculty, 4 teaching assistants) *Quantitative*: • Spearman's Rho correlation (control vs experimental group) • Paired t-test *Qualitative*: • Semi-structured interviews with selected students
	Other:	Pre-test comparison of student work on Project 1 - establish comparability Post-study questionnaire related to how students viewed, used, and provided feedback

		What is the relationship, if any exists, between the final ACJ rank-order of student projects and the scores received through traditional scoring approaches (validity check)?
RQ₂	**Working Hypothesis:**	The rank-order, produced through ACJ, will correlate significantly with traditional assessment methods.
	Research Methodology:	Spearman's Rho correlational tests

Proposed Timeline: Fall 2017

June 2017	Research/Data management plan creation
July – Aug 2017	Research team finalizes details for ACJ implementation
August 2017 Week 4	Students (Experimental group) upload Project 1 to ACJ Students (Control group) turn in paper-based copies of their projects • Control group participates in paper-based peer assessment/critique • Experimental group participates in ACJ for designs from their class
Sept 2017 Week 1	Feedback is returned to students (all groups) Rank-order provided to the instructor (experimental group only) • *Student traditional grades (rubric-based from the instructors) received on Project 1 are collected from all students (control and experimental) to establish comparability across groups and a baseline for the research*
Week 2	Project 1 redesign due
Week 3	
Week 4	Students (Experimental group) upload Project 2 to ACJ Students (Control group) turn in paper-based copies of their projects • Control group participates in paper-based peer assessment/critique • Experimental group participates in ACJ for designs from their class

Oct 2017	Week 1	Feedback is returned to students (all groups) • Rank-order is provided to the instructor (experimental group only)
	Week 2	Project 2 redesign due
	Week 3	Students (Experimental group) upload Project 3 to ACJ Students (Control group) turn in paper-based copies of their projects • Control group participates in paper-based peer assessment/critique • Experimental group participates in ACJ for designs from their class
	Week 4	Feedback is returned to students (all groups) • Rank-order is provided to the instructor (experimental group only)
Nov 2017	Week 2	Project 3 redesign due Students upload Project 4 to ACJ • All students (control and experimental) • All work is assessed using ACJ by the panel of 6 judges (2 faculty, 4 TAs)
	Week 3	• Rank-order is provided to the instructor for all student work (project 4 control and experimental)
Dec 2017 – Feb 2018		Final write-up of results are prepared and submitted for journal publication Future work (grants, publications, etc.) are discussed and plans made

Conclusion

Assuming the results of this research provide more evidence of the validity of ACJ for use in higher education applications, the authors hope to further promote the use of this methodology in broader applications at Purdue University. Results from this study will be disseminated at graphics and educational conferences. The authors will also attempt to publish these data and results in relevant academic journals.

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