

Capturing Graphical capability through Ipsative enquiry using Adaptive Comparative Judgement

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Abstract

This paper gives an overview of a student centered approach to assessment that serves two functions. Firstly, to facilitate an opportunity for each student to develop a personal construct of what it means to be graphically capable and secondly a capacity to track their level of competence based gain both normatively and ipsatively.

The study tracks the performance of a cohort of student teachers (N=119) in a core graphics module during a year three semester. Four consecutive design tasks, applying graphical principles, were designed to elicit core graphical skills and knowledge. An adaptive comparative judgment method (see Pollitt (2012) and Kimbell (2012)) was employed by the students to rank the responses to each task.

The paper highlights the potential of this approach in developing students epistemological understanding of graphical education, while tracking competence based gain through ipsative enquiry within the collective performance of their peers.

Introduction

The tacit nature of teacher education requires careful consideration when devising assessment methodologies. The approach to this study focuses on integrated assessment and learning processes, which facilitates each student exercising their personal construct of capability. Petty (2009, pg. 175) encourages the self-correcting classroom and supports the idea of students developing skills of self-appraisal and self-audit as a means of insuring effective learning. However, the difficulty with engaging students in meaningful assessment and appraisal arises when there is ambiguity surrounding the role and function of assessment. Broadfoot (1996) highlights the dominance of the social role and purpose of assessment as opposed to its educational function. This dual role focuses the discourse on formative and summative assessment and becomes problematic when considering Wiliam's (2000) suggestion that teachers are reluctant to operate parallel assessment systems.

Adaptive Comparative Judgement

This study considers an alternative approach to assessment that integrates assessment as learning and facilitates the student making judgement on their peers work as a means of developing a personal construct of capability. The method carefully considers marrying summative reliability with formative feedback.

Assessing the quality of students work has traditionally been approached using rubrics of assessment criteria and standards. Making a judgement about a piece of work based on abstract or generic criteria can be quite difficult on its own, but becomes much easier when compared to an exemplar. Comparison with

exemplars and comparison between students work will lead to the assessor generating a rank order of quality of students' performance. The subjective nature of this individual judgement is of concern and can be addressed by having multiple judges assessing pupils work and reaching consensus on the order of quality. This is the basis of the Adaptive Comparative Judgment (ACJ) method (Pioneered by Kimbell et.al (2009). The ACJ method provides students with the opportunity to assess their own conception of value in comparison to their peers and exposes them to a broad range of qualities and levels of attainment.

This approach integrates two key pedagogical characteristics highlighted by Torrance and Pryor (2001), firstly it provides the opportunity for shared construction and comprehension of assessment criteria and secondly, it provides direct feedback to the student during the judging session as a reflective catalyst.

Method

Simultaneous to the development of declarative and procedural knowledge within the descriptive geometries, students completed four consecutive graphical design tasks.

The governing importance statement for the four tasks (50% of the module grade) emphasised the development of graphical analytical skills, development of effective communicative skills and conceptual design. The students were tasked with analysing and deconstructing geometry, then synthesising the deconstructed geometry supported by specific descriptive principles to create a conceptual design solution. The students were then required to represent their solutions using what they determined to be appropriate graphical methods. Table I outlines a sample brief, linking the declarative knowledge with the design task.

Table 1: Outline of Design Brief for Assignment 2

Rationale: The focus of this Assignment is to explore and apply your knowledge of intersecting solids, both plane and curved surfaces and oblique solids.
Brief - You are commissioned to design a sports building to either house or support a particular sport. You must show evidence that you have considered the following:
1. The sport or sports – paying particular attention to scale, proportion, the user, spectator and particular needs analysis of that sport
2. The location of the building relevant to its surroundings and infrastructural support
3. The overall aesthetics of the building (focusing on intersection of solids and surfaces) clearly illustrating the key characteristics of the building, including focal points and projections from the spectator/user (utilising your knowledge of projection systems including orthogonal and auxiliary projection)
4. The function of the building in terms of user experience, accessibility and capacity

The research utilised a number of data collection tools to capture consensual measures of performance, student perception of their improvement and student insights into the role of graphical education.

Findings

The findings give a brief overview of the cohort's graphical competency, students' perception of their visuospatial development and some insight into an evolving personal construct of graphical capability.

Using the ACJ method students produced a rank order of each design task, recording a reliability score of above 0.94 for all four ranks. Graphed on the same absolute scale (for objective comparative purposes), the differences in the mean of each Assignment is indicative of a shift in student performance scores towards a higher grade percentile (Figure 1).

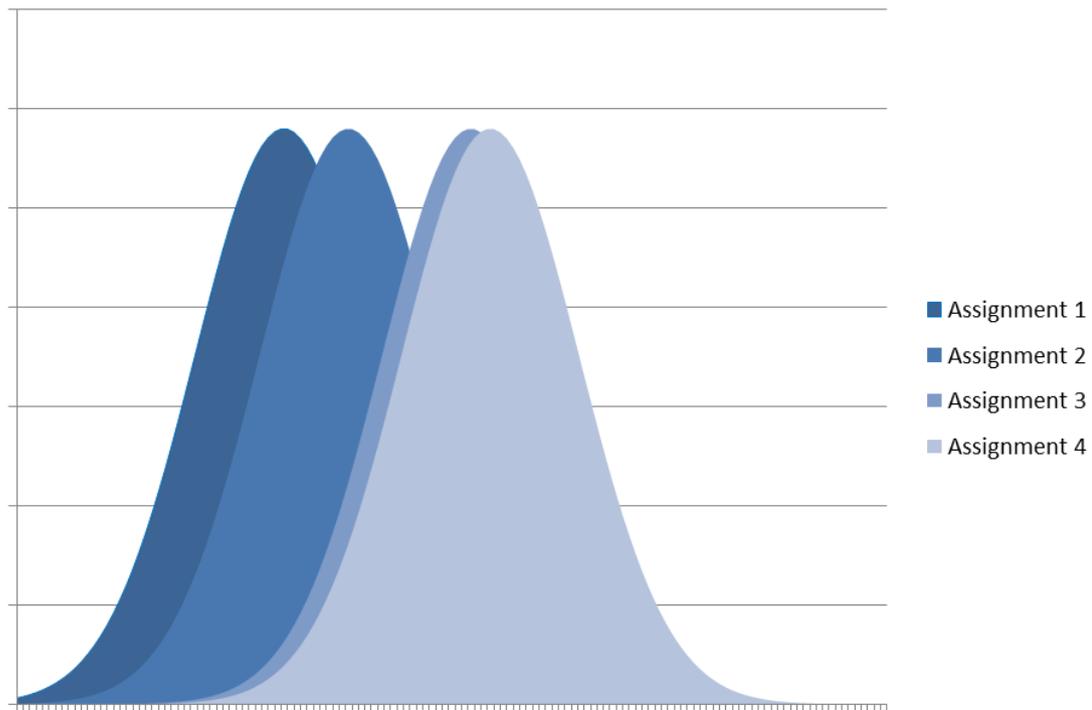


Figure 1 – Initial Teacher Education Students Distribution of Performance

To qualify the overall effect, it was necessary to examine the performance variance between the first and last task. The first Assignment recorded a skewness value of 0.54 indicating a clustering of grades towards a lower quartile. Assignment 4, by comparison, had a skewness value of -0.13 which indicates a significant shift of grades towards a higher quartile. A Wilcoxon Signed Rank test was used to test for statistically significant differences between variables and returned a significance value of $p < 0.005$, indicating a significant difference between performance scores in Assignment 1 and Assignment 4.

The ipsative enquiry achieved through peer assessment using the ACJ method also increased the students self-rated scores. Pre and post data was captured to measure the perceived change in students' capacity to build and manipulate mental images. Students were asked to complete a self-report measure of their development in the area of visuospatial cognition. Students were asked to rate their ability on a scale of 1-10 pre and post the module in relation to the following cognitive competencies:

- The ability to build visual mental images
- The ability to manipulate visual mental images

There was a 74% response rate from the student population. The data are summarised in the following table.

Table 2 – Summary of self-rated cognitive competencies

	<i>Ability to build visual mental images</i>		<i>Ability to manipulate visual mental images</i>	
	Pre	Post	Pre	Post
Mean	3.5	7.5	4.5	7.5
Std. Dev	1.8	1.0	1.8	1.2

The statistical analysis of the data using a paired samples t-tests on both reported cognitive measures returned a significant difference between pre and post scores in the category “Ability to build visual mental images” ($p < 0.001$). A significant difference was also found in the difference between pre and post scores in the category “Ability to manipulate visual mental images” ($p < 0.001$).

In addition, the student’s perception of graphical education was captured. Responding to an end of semester anonymous survey (74% response rate), 94% of student said the module changed their perception of graphical education. A sample of comments below qualifies this change.

“I think that my perception has changed because I now see that the subject Design and Communication Graphics in L. Cert can be helpful for many jobs down the road. Take for example our last assignment on designing the surgical plate for the broken jawbone, I never thought a background in graphical education could help you in that” (David - PN4305 2012)

“My outlook has broadened it isn’t just about drawing lines and working from textbooks to gain knowledge just to pass exams. It is about solving real life problems through graphics, using graphics as a language to explore and demonstrate ideas. Graphical education is very important for everyone to be able to communicate in some shape or form” (Padraig - PN4305 2012)

Discussion/Conclusion

This study utilises binary decision making to produces a rank order of student work. The collective decision making of the student body aligned on four consecutive assessments with considerably high levels of reliability. Exposure to a broad range of student responses forced the learner to develop appraisal skills beyond their own interpretation of the task. Consecutive tasks facilitated the student in building a more comprehensive understanding of what it means to be graphically capable through ipsative enquiry.

This study suggests an approach that can not only develop the core graphical skills required but also develop a personal construct of what it means to be graphical capability.

References

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