Democratic Consensus on Student Defined Assessment Criteria as a Catalyst for Learning in Technology Teacher Education

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Identifying the contemporary values and goals that underpin a new conception of technological education are important when contributing to the education of undergraduate initial technology teacher education students. Motivating students to explore and establish what is of value in their subject domain is a significant challenge facing academics and practitioners alike. Williams (2009) presents design based technology education as being embedded in the personal and social context of the student, where the value of what is being learned is as important as the content itself.

Design based tasks have the potential to encourage students to establish and make explicit their views and beliefs. Requiring students to establish their own assessment criteria introduces uncertainty, risk, and confusion into the process of learning. Establishing what is of value now becomes the primary concern for the learner in a quest to demonstrate their capability within a personal view of the subject domain.

This study implemented a constructivist approach to learning in a design based task focused on the development of design, craft and processing skills. The method employed a peer assessment strategy through the use of an Adaptive Comparative Judgement (ACJ) model of assessment that required students to democratically assess the work of their peers. Assessment criteria were not made explicit, as students were encouraged to present their own conception of capability developed throughout the learning activity.

The significance of the study was highlighted by the reaction of the students to their dual role as learner and assessor and how this affected their learning. The empirical evidence collected highlights the importance of empathy as a mediator when developing critical reflective practise. The study outlines the cultural impact of democratic peer assessment on initial teacher education students while establishing what to value within their subject domain.

Rationale for the study

With its origins in vocational and craft training, technology education is challenged to reinvent its value and objectives within a broader conception of schooling. Grappling with the epistemic

cultural complexities, the definition of technological education needs careful consideration. In response to a contemporary design activity, this study focuses on the capacity of Initial Technology Teacher Education students to present, identify and value what constitutes capability within the technology domain.

Complexities of Technology education

Williams (2009) describes how technology education is struggling for relevance and definition in the post modern era of globalization. Rasinen (2003) identifies two distinct forms, the *lehrplan type* which provides very specific details of the domain content and how it should be taught with the *Standards type* concentrating on the curriculum goals to be met within the subject domain. A shift toward the standards type approach to curriculum is identified with the onus being placed on personal development of students' capabilities and thinking skills (Rasinen, 2003). To achieve the contemporary goals of technology education Williams (2009) proposes that "a personal relevance type of curriculum design may be the most appropriate". This is based on humanistic educational theory with its emphasis being on personal growth, integrity, autonomy and uniqueness.

The challenge is to ensure that teachers are not only competent in their subject domain but also that their value system aligns with the new subject philosophy. This poses a challenge to Initial Teacher Education (ITE) providers to implement programmes of study that allow students to personally explore and define the role and value of technology education. Shifting from solely the provision of technical skills to a broader education agenda supports the global consensus that values personal development. Defining technology based education is made difficult by the contextual setting and needs of individual curricula. It is recognised that the post modern technology subject has the potential to develop and deliver outcomes of autonomy, creativity, problem solving, self-actualization, critical reflection/appraisal and communication skills (Kimbell and Perry 2001, Barlex 2007, Williams 2009). Learners' values are central to the appraisal of personal, social, economic and environmental implications of their actions (Kimbell and Perry 2001).

Objectives of Technology Teacher Education

Much debate is generated on what constitutes the modern day technology subject but where there is consensus, is that the hegemonic practices, methodologies and values grounded in the vocational approach still dominate the classroom learning environment (Dow 2006). Owen-Jackson (2000) and Banks and Barlex (2002) comment on how traditional pedagogic practices based on the transfer of knowledge are generally imposed on a new domain. These pedagogical practices are grounded on passive conformity rather than encouraging creativity and critique (McGarr, 2010). Breaking the hegemonic behaviourist cycle (Drakers, 2005) and implementing change is becoming increasingly important as Drakers argues that:

> *... learning in this narrow model is linear and instrumental and to all intents and purposes, not meaningful learning at all. It is more concerned with the assimilation of the young into an already established value system which has more to do with control than it has to do with liberation.* (p.113)

Dow (2006) identifies the areas of pedagogy and assessment as being fundamental to successfully implementing change. She comments on how the implicit beliefs held by the teacher can act as a barrier to implementing change and places emphasis on the important role ITE programmes play in the development of such implicit beliefs.

Assessment – the tail that wags the curriculum dog

The measure beyond the artefact or finished product is critical to ensuring the sustainable value of the post modern view of technological competencies. Measuring a complex iterative process requires a flexible model of assessment that can value evidence of learning in response to indi-

vidual heuristics while supporting diversity and measuring capability. Kimbell (2010) highlights the conflicting philosophical approaches to assessment in technology education and highlights how the empiricists, rationalists and Social culturalists presents logical emphasis and yet "do not comfortably acknowledge each other" (pg 20).

A general principle of assessment is that it rewards students for the quality of their effort. Identifying this quality and assigning it value are the key challenges for the assessor. Kimbell (2007) outlines the difficult nature of judging student work against abstract criteria, but when compared with an exemplar of capability the task becomes much more meaningful. Project e-scape (Kimbell et al. 2005, 2007, 2009 and 2012) outlined a new and innovative approach to the assessment of performance portfolios. The approach, based on the comparison of students work, relies on a holistic judgement where overarching criteria are used to guide the assessor to make a professional judgement. This requires the judge to have an understanding of what is better or worse in terms of the required capability while eliminating the varying standards that may exist across a group of assessors. This approach has particular significance when introducing a group of student teachers to the field of assessment as they can focus on evidence of capability without the worry of levels of attainment. This study evaluates the impact of students personally establishing their own criteria for assessment. The value of engaging students in this type of peer assessment has the potential to increase thinking, learning and confidence, helping the student to establish the role and purpose of assessment (McDowell and Sambell, 1999).

Method/Approach

This paper focuses on the findings from the initial phase of a three year longitudinal study. The aim of the study was to facilitate ITE students' in the development of a personal construct of capability in technology education. The learning activity centred on a thematic design brief, where students were required to produce decorative artefacts (Flower and Scene – the rationale for the design of the task is beyond the scope of this paper and details can be found in Seery et al 2012) that demonstrated a synergy of design solution. The openness of the brief facilitates diversity of interpretation which is housed in the context of a post modernist view of technology education and ultimately enables the personalisation of approach. For the purposes of assessment students constructed an electronic portfolio to present their definition and evidence of capability.

Coupled with this approach to learning the study employed an assessment strategy that exercised the students' personal construct of capability, by assigning value to the design task outcomes. This was achieved through the use of an Adaptive Comparative Judgement model of assessment (Kimbell 2009) where the students democratically ranked the quality of their peers work. The objective of the study was not to provide students with explicit assessment criteria but rather to facilitate them in establishing their own criteria for assessment based on what they valued. This necessitated an approach to assessment that provides over-arching criteria or goals for learning and assessment that students consult with when developing a personal construct of domain capability. The over-arching criteria used in this study are based on the findings of Kimbell (2004) that identified indicators of innovative and creative solutions to design tasks as Having, Growing and Proving of ideas.

Findings

This study focused on the implementation of ACJ as an assessment tool to evaluate student performance in the design task. The ACJ session ran for 16 estimation rounds generating a rank order of student portfolios based on the democratic consensus of the judging group. A Cronbach Alpha reliability coefficient of 0.955 was recorded for the judging session which is considered as very highly reliable (Cohen et al. 2007 p. 506). The graph in Figure 1 shows a high level of consensus on the portfolios across the rank after 16 estimation rounds of judging.

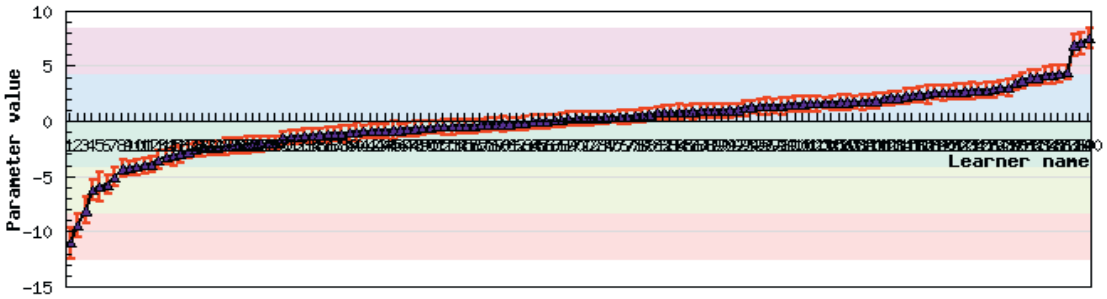

Figure 1 - Rank Parameter Value Error Plot (Round 16)

One of the strengths of the ACJ assessment process is the statistical data that is gathered on both the students' portfolios and the judges as the process evolves. Portfolio statistics were analysed and 7 portfolios were observed to be outside the fit criterion for the rank orders (Seery et al. 2012). Kimbell (2009) presents a similar level of misfit observed with a group of professional teachers assessing portfolios in a design and technology based activity. By comparison this low level of misfit is impressive for the group of novice assessors. The significance for this study is that this high level of consensus was achieved using individually constructed criteria based on the students' individual construct of capability within the domain.

On analysis of the judgement history of the misfit portfolios it was noted that technical problems with the portfolio were cited as reasons why some portfolios lost to a portfolio of a lower parameter value. Judging comments:

"portfolio B would have won only for the text being in computer language"

"could not load portfolio A??????"

The level of disagreement between judges overall was very low with the portfolio statistics indicating that where there was disagreement it tended to be concentrated on a number of individual portfolios.

Capacity of Students to make professional judgements

The judging statistics present the high level of consensus within the group with only 3.89% of the judgements being outside of the judging fit criterion. This indicates that the student judges had a high level of agreement on what they perceived to be of quality in the work that they assessed. An analysis the judging data identifies two judges from the student judging group that were outside of the judge fit criteria for the rank. It should be noted that one of the misfit judges only made one judgement while all other judges averaged 20 judgements each. The second judge was outside the misfit parameter by only 0.01. This judge's average judgement time was 2 minutes 27 seconds, approximately half that of the group average, which may indicate that this judge may not have analysed the portfolios for capability to the same level as others within the judging group.

Overall the low level of misfit for the novice assessors indicates that their individual interpretation of capability converged on qualities that were observed and valued by the group through the democratic ACJ assessment process. The significance of the high level of consensus lies in the fact that the judges were not given explicit assessment criteria to identify these qualities or make their judgements. The consensus was reached on the basis of the epistemological understanding developed by each individual student as a result of their engagement in the design task. The consensus was achieved despite students producing their own '*unique*' and diverse interpretations of the task.

Discussion

Having confidence that your effort will be rewarded is a central issue for any student engaged in an activity where innovation and creativity are key outcomes. Jeffrey and Woods (1997) outline the need for trust in a creative classroom where the student needs a climate that offers personal confidence and security.

The ACJ model of assessment was presented and demonstrated to the student body as the means by which they would be assessed. Students were informed that they had to personally construct their own criteria for assessment and that they would generate the rank order of capability using the ACJ approach. The reaction of the students was positive. An average of 70% of the students agreed that they were confident that the model of assessment would value what they presented as capability. The consensus of the group was that generating their own assessment criteria through their engagement in the task had a positive effect on their learning. They also agreed that this had a positive impact on them determining what was of value in the subject domain. The removal of explicit criteria and the introduction of democratic peer assessment were the catalysts for the natural propagation of a social-constructivist approach to learning. The evolution of collegiality among the class group was in contrast to the prescribed traditionally focused approach used in previous years to this study. One hypothesis for the students' supportiveness is that no student felt as if they were trying to compete on predefined criteria, as their interpretation and engagement in the task was uniquely personal. What was observed was that students engaged in dialogue with peers and teaching staff in an effort to establish the value of their actions among their community. This sharing of ideas and experiences give confidence to students who were trying to navigate their way through the development of a personal construct of capability and ultimately the definition of criteria for assessment. Over 60% of the students reflected that being peer assessed encouraged them to interact more with their peers during the learning activity. The consensus amongst the group was that the purpose of these discussions related to more conceptual issues of clarifying their thinking or problem solving than with sourcing information and getting help with procedural aspects of manufacture. An average of 52% of students agreed and 36% strongly agreeing that discussions with peers were mutually beneficial. This indicated that students found benefit in discussing other students work and that their learning did not always happen in the context of their own project. A further indication of the level of peer support that developed in the classroom is indicated by 88% of the students' initiated communication to help peers with their work. The peer to peer collaboration was clearly a means for the students to externalise and validate their thoughts and ideas in relation to the task. This is a critical feature of the constructivist approach. Therefore, finding out what your peer was doing was not the only focus; finding out why they were doing it was now becoming important, as making meaning within the subject domain and establishing a common frame of reference for capability was essential for learning.

Overall the latent integration of the assessment into the learning activity had a positive impact on the students' experience. The removal of explicit criteria did not stifle students' progression but rather promoted dialogue and interaction that was valued more than the normative comparison that would ultimately decide on quality.

Conclusion

Although, this paper did not consider the validity of the rank that the student's produced, it was addressed in the parent study. The research presented in this paper highlights the capacity of the students to democratically reach consensus on what was of value in response to a thematic design brief.

When considering Initial Technology Teacher Education the capacity of future educators to define domain specific qualities and competencies as they evolve is a powerful paradigm for change. This research highlights the value of moving from a deterministic approach to assessment and allowing learners develop the meaning that underpins capability.

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