Identifying quality with pre-service technology educators: a different perspective on assessment

David Ellis
Southern Cross University

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David Ellis

School of Education, Southern Cross University, NSW

The development of an ‘eye for good design’ - the ability to determine what looks good and is functionally appropriate - has always been a challenge for technology educators when dealing with students designing their own projects.

In a design and technological context, each new cohort presents a yearly challenge for educators in terms of transferring the ‘know-how’ to enable students to problem-solve, anticipate, and assess functionality problems, as well as develop an aesthetically pleasing project. Not all students find problem-solving easy and the cognitive skills required to successfully problem-solve necessitate in-depth engagement in defining the problem in order to develop an appropriate solution. (Lee, 1996)

From a skilled technology educator’s perspective, what may seem a relatively quick glance at a student idea or project, is in fact a demonstration of higher – order thinking skills being exercised, an ability acquired through the development of a cognitive infrastructure laid down through years of observation and experience, knowledge of industry standards and processes, technological foresight -including a mechanical aptitude- and honing skills across multiple technologies to name a few.

Whilst this infrastructure enables these teachers to easily evaluate designs and problem solve, it is much more difficult for their inexperienced students, because of their lack of cognitive infrastructure.

The Revised Bloom’s Taxonomy (Anderson et al, 2001) reinforces the concept of a foundation or infrastructure that is required to support the development of higher-order thinking skills.
Two examples where students are required to assess the quality of their practical projects can be found in both the NSW Stage 4 Technology Mandatory syllabus and the NSW Stage 6 Design and Technology syllabus. The expectation of these students is to “evaluate prior to, during and at completion of each design solution” (NSW Board of Studies, 2003 p.25). But given the challenges faced by some of these inexperienced students, their under-developed ‘eye for good design’, and misunderstandings of the true intentions and requirements of the syllabus could lead to embellished views on the quality of their final product.

**A student’s view on the quality of their project may be different to yours?**

“Sir- My table functions perfectly... it doesn’t wobble, look!” (photo courtesy of Trevor Watson)

Rightly or wrongly, students can get the wrong idea when deciphering the purpose of a final evaluation. Anecdotally, junior technology students can embellish their final evaluation for fear of being penalised for producing a project with faults and secondly for pointing these faults out to their teacher (no one is questioning their intelligence there). But this example reinforces their inexperience in understanding the value of honesty in evaluation, and the true purpose of it.

Any teacher who takes the opportunity to participate in itinerant HSC marking of major Design and Technology projects, would be all too familiar with the benefits of honest evaluation, as well as the creativity displayed when students try to convince the marker via their portfolios that the pig’s ear is in fact a silk purse!
When dealing with pre-service teachers, the challenges are no different to that of school students. Due to the diversity of backgrounds, age, confidence and experience, some university students attend practical workshops unfamiliar with the material or the workshop environment, not aware of industry acceptable standards, and lacking in practical skills and experience. Yet these students are expected to produce practical projects to standards that they may or may not be overly familiar with.

Southern Cross University students enrolled in the Bachelor of Technology Education program attend intensive skills development workshops as part of the requirements of the degree. During these workshops, the pre-service teachers are required to construct practical projects from a variety of technology areas.

In the past, these projects were assessed and graded according to their performance against quality summative criteria such as: accuracy of length; squareness of joins and quality of finish; to name a few. In addition to the assessment of their practical projects, the students were also required to reflect on the acquisition of practical skills. The problem acknowledged with this summative assessment is that the students were being educated in the production of practical solely within the constraints of their own projects, unaware of the sliding scale between high quality and poor practical examples of work.

Pre-service technology teacher education is similar to that experienced by high school students where they “are encouraged to reflect on and modify their thinking through their involvement with some form of technological design-type process.”(Walmsley 2003) Without the luxury of time to develop numerous practical projects to develop supportive cognitive infrastructures, such as applying practical skills, analysing their own performance, evaluating their methods and modifying them to re-create a better quality project - whether they be pre-service teachers or school students - their assessment concludes with the realisation of the project and its evaluation. To question the educational value of the assessment, if the student is unaware of practical project standards, is this where a potential problem may reside?

A slight shift in focus

In 2012 at Southern Cross University, as first year pre-service teachers prepared for their intensive practical skills workshops, they faced an alternate task in the assessment of their practical projects. A re-think on the assessment of pre-service teachers’ practical work, changed the focus of assessing the final product to a focus requiring their own assessment of the final products, after they had consulted current Technology Education high school teachers. The aim of this shift in focus had been to develop pre-service teachers’ recognition and understanding of what the industry standard is in terms of ‘quality’ as well as developing the students’ literacy of assessment (National Council on Teacher Quality 2012).

The result of this new approach to the assessment task was a much more critical assessment of their practical work. It negated any potential validity issue with students embellishing the ‘brilliance’ of their projects, because a better grade would be awarded to the pre-service teacher who could
demonstrate higher-order thinking skills of evaluation by identifying both imperfections and examples of good quality work, as evidenced by supporting photographs.

Following the construction of their practical projects, the revised assessment asked students to:

- Identify any criteria you could use to assess each of the 5 projects
- Evaluate your project against these criteria (include photos to support your answer)
- Consider what you could have done to improve the quality of the project

In contrast to a traditional approach of the lecturer (in this case) assessing the finished project, a comprehensive example of the approach that one student (Jessica Saye) took to a hand drawn and rendered calculator is shown below:

<table>
<thead>
<tr>
<th>Photograph</th>
<th>Justification of where each practical project may have lost/ or gained marks in its assessment</th>
<th>How it could be improved</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="calculator.png" alt="Realistic visual effect" /></td>
<td>Realistic visual effect</td>
<td>Shadow from the calculator on surface would help improve realistic visual effect and clearly show where light source is coming from.</td>
</tr>
<tr>
<td><img src="presentation.png" alt="Presentation: colour test marks, sticky tape and raw torn edges would have been better if removed or cut off" /></td>
<td>Presentation: colour test marks, sticky tape and raw torn edges would have been better if removed or cut off</td>
<td>Mounting the picture onto another piece of paper or framing to eliminate these marks</td>
</tr>
<tr>
<td>Image</td>
<td>Firm line missing</td>
<td>Attention to detail, focusing on firm lines and their angles</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
</tr>
</tbody>
</table>

- **Firm line missing:**
  - Great application of rendering to create a glossy effect on screen
- **Attention to detail, focusing on firm lines and their angles:**
  - Even leaving a completely white area will also help to bring the glare out
- **Successful angles of numerals created. Great use of shading:**
  - Small letter numerals on top row could be more accurate especially the +/- button. Lines are not on the required angles
- **Digits on buttons seemed to blend into the button itself:**
  - Perhaps change shade of button or produce a clearer outline on top left sides of each numeral
<table>
<thead>
<tr>
<th>Area where colour and shading protruded outside of line.</th>
<th>Attention to detail being more careful not to go outside lines or by adding shadow to cover mistake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful rendering of shadows created by buttons</td>
<td>Shadows could be slightly better calculated or even.</td>
</tr>
<tr>
<td>Vertical lines not straight or matching up</td>
<td>Sticking to guidelines when drawing in final firm lines</td>
</tr>
<tr>
<td>Angles of the double zeros are slightly misaligned</td>
<td>Use construction lines to create a frame to draw the zeros within</td>
</tr>
</tbody>
</table>
Jessica displayed an obvious talent for drawing and rendering, however what was important in this case was that she identified aspects of the project that could be improved on, or areas that were done particularly well. Possessing this ability to define ‘quality’ can influence her work in the future by providing standards for her to work towards, as well as redefining the use of the evaluation as a valuable tool for future quality control, rather than an summative add-on.

**Conclusion**

A common practice in the education industry is to assess the effectiveness of their pedagogy once a lesson is delivered and determine whether a change is required. In this article a small change to an existing task was required and the results appear to be promising.

With the aim of encouraging greater interaction between the students, the pre-service teachers, and the Technology Education community, Southern Cross university students were asked to improve their ‘assessment literacy’ (National Council on Teacher Quality 2012) by researching what constitutes a quality project, and part of this task was to source the information from practicing technology education teachers using a primary research methodology called interviewing. The opportunity to network with and consult current teachers was an additional benefit of the task, and the detail provided in their critical assessment of their projects indicates that they can now visually identify examples of good quality practical work, and work that may be sub-standard.

Referring back to the acquisition of higher-order thinking skills as evidenced by the technological know-how, practical skills and the development of that ‘eye for good design’, this approach may take a step towards establishing the essential foundational skills irrespective of whether the students are in high school or the university.
Acknowledgements

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References


