Gaps when mapping technical skills in courses and assessments: Can we explain the gaps?

Susan J. Shannon and John Paul Swift

The University of Adelaide and Prismatic Architectural Research, Adelaide, Australia

ABSTRACT: In order to map the graduate attributes of courses (or subjects, papers or units) Prismatic Architectural Research developed the APMap prototype tool which mapped the graduate attributes of courses which aggregate into a degree Program (or Course). In a further development, the research was extended to encompass mapping of assessments of any type against courses. Gaps were revealed between the extent to which Course Coordinators believed they were assessing any given attribute in their evaluation of the constituent parts of the course, when considering the course at course level, and at assessment level. This paper explores that assessment vs coursework difference in the dimension of technical skills acquisition and demonstration. Shannon (2010) has shown that employers of M Arch (formerly B Arch) graduates highly value the demonstration of technical skills at graduation. APMap may assist in stakeholders (employers) understanding where students acquire and demonstrate the acquisition of these skills, and as an aid to reflection for academic staff and University management.

Keywords: graduate attribute mapping, Course and Program mapping, graduate attributes, assessment

INTRODUCTION

The University of Adelaide Faculty of the Professions (as the funder) and Prismatic Architectural Research (as the developer) and the School of Architecture, Landscape Architecture and Urban Design, The University of Adelaide, Adelaide, Australia (SALAUD) collaborated in developing APMap - a prototype software tool - which was designed by Prismatic to graphically display (“map”) the graduate attributes of courses (or subjects, papers or units) which accrete to form a sequence of courses in a named degree (Program). That research, the motivation for it, the methods adopted and the results, is reported elsewhere in this conference (Swift and Shannon, 2010a). In an extension to that research, Prismatic and some academic staff of the School of Architecture, Landscape Architecture and Urban Design (SALAUD) collaborated to explore a further dimension of course mapping – namely mapping the graduate attributes of assessment tasks within the already mapped courses. Thus some courses were mapped at course level, and also at assessment level. This new data was very rich in displaying any potential gap between the Course Coordinators’ intentions at course level, and their practices at assessment level. This paper explores those gaps and through educational theory proposes an explanation. This paper displays the mapping data for two (six unit) core courses which aim to increase students’ technical, design and communication proficiency: Construction and Design: Theories and Practice and Technology in Design.

The focus on understanding more about the teaching and assessment of courses which have a rich technical dimension is warranted. Shannon (2010) showed that employers of M Arch (formerly B Arch) graduates, are interested in graduates’ technical skills, and rate them very highly. In particular she showed that employers overall rank the demonstration of technical skills at graduate level employment as marginally more important than demonstration of design skills; the mean rating was Likert scale 4 “important” on a 5 point scale (Table 1).

Table 1: Overall outcomes: How highly do you prioritise key discipline area skills in recruitment?

<table>
<thead>
<tr>
<th>Graduate attributes – Discipline Area Skills</th>
<th>Mean 5 point Likert scale where 1= not important at all and 5= critically important</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Representation - CAD Skills</td>
<td>4.4</td>
</tr>
<tr>
<td>2. Technical</td>
<td>4</td>
</tr>
<tr>
<td>3. Design</td>
<td>3.9</td>
</tr>
</tbody>
</table>

This further investigation by some staff in SALAUD is nested within a more extensive pilot project which sought to map core (compulsory) undergraduate courses (or units, or subjects) within the B Design Studies onto the B Design Studies Program (or Course or Degree) Graduate Attributes. This Program mapping was designed to discover and display how and where the Graduate (or Program) Attributes were acquired and how they related to each other. This
project commenced with distilling the Graduate Attributes of the accreditation bodies for professional architects, landscape architects and planners, and developing a template of (in part industry-derived) Graduate Attributes. Course coordinators were asked to “vote” in an online Survey with 30 tokens against these attributes for the extent to which those attributes were present in their course. The results were mapped onto a database developed to display the course’s attributes in a variety of graphically legible formats (for example as in Fig 1 Construction and Design, and Fig 2 Technology in Design).

Figure 1  Software Application Tool Graphic Output Sheet – Indicative Screen Shot for Construction and Design

In a pilot extension to that project, some course coordinators in the B Design Studies Program were asked to consider their courses at a finer grain – specifically the assessment tasks within the courses - assessment tasks of whatever form - from exams to essays, written or graphic assignments, production of designs, and documentation including individual and group work. Course coordinators then mapped the assessment tasks against the same template of Graduate Attributes they had previously mapped their courses against.

This paper reports on the analysis yielded from courses evaluated at the overall and assessment level providing an insight into how the course coordinators perceive Graduate Attributes and how they are represented at both the abstracted course level (as an overview of the course) and a more reflective and detailed picture which emerges from the assessment level investigation. Hence a comparison of these very different conceptual understandings gives an immediate graphical indication of where the anomalies and consistencies exist across the levels of approximation within the studied courses. Fig 3 – topographical array - shows that technical studies are focussed upon Construction and Design (in first year, Sem 2), Tech and Design (second year, Sem 2) and Architecture Design Studio (third year, Sem 2). Two of these courses form examples considered in this paper and graphically displayed herein.

1. LITERATURE REVIEW AND BACKGROUND

Before embarking on the development of yet another Graduate Mapping tool, bearing in mind the development, use and subsequent demise of two preceding tools at the University of Adelaide due to software platform support changes (Radford, Coldicutt, Bennetts, 1992; Roberts, Shannon, and Radford, 2003; Shannon, Roberts, and Radford, 2003) tools from other universities were evaluated to discover whether there was already a suitable tool on the market could be used for Course Mapping. Whilst there were many available, they tended to be paper based, which presented limitations for distribution and accessibility. A web based tool, developed by Murdoch University...
Prismatic, in responding to the Faculty’s brief for durability, ease of operation, robustness, and extendability thus developed the APMap tool and, in a Case Study to test its efficacy, mapped the B Design Studies undergraduate Program of the SALAUD (Swift and Shannon 2010a). The APMap tool data collection was web-based, and the web-based graphical display was based on the knowledge that the end users would appreciate images which reflected the extent to which any particular Graduate Attribute was covered in the Course and hence Program. An ambitious topographical graphical display of the undulations of an ‘actual’ compared with ‘desired’ course landscape was created. It was envisaged as a starting point for discussions about gaps and overlappings in Courses accumulating to Programs, as well as being universally understandable (Fig 3).

As an extension to the Faculty commissioned research which led to the development of APMap, the researchers believed that mapping course attributes could be brought into sharper relief if the constituent parts of the course were also mapped, and compared with the Course overall mapping. There were various ways to do that constituent mapping, for example mapping the content of all learning sessions, but it was felt that this process too closely resembled mapping the course – or what the course coordinator would perceive as “the course”, in that each course coordinator was thinking of exactly those constituent parts, or formal teaching activities of the course, when describing the course for mapping.

The teacher has major control over formal teaching activities: lectures, tutorials, laboratories, field excursions, etc. The teacher can also set up formal cooperative activities involving peers, such as discussion groups, brainstorming, or learning partnerships (Biggs, 1996:354).

Therefore assessment tasks were selected as the mapping domain to tease out the relationships between overall course mapping and what students perceived as important in the course; as Boud describes getting assessment right as critical to the learning and teaching nexus.

We need to examine assessment practices to see if they are compatible with our academic ideals and, more specifically, objectives for higher education. I suspect that we might find that we have been guilty of “don’t do what I do, do what I say” on quite a large scale. The reasons for these discrepancies are many and varied, but in all cases there is an obligation to ensure that our assessment practices do not contradict our educational values. (Boud, 1990:102)

2. THE GAP BETWEEN COURSE MAPPING AND ASSESSMENT LEVEL MAPPING

The APMap tool, which has a particular focus on usability, versatility and longevity, and updates both data gathering and dissemination to the digital (web) realm, was completed in December 2009. Then the researchers turned their attention to questioning whether courses mapped at a constituent level would yield different data from the same course mapped at assessment level. A modest trial of 6 courses across 1st and 2nd year, history and theories to design and construction, and technical knowhow was proposed. The aim was to discern whether there was an overlap, or a gap in the Graduate Attributes between the same courses being mapped at a finer grain related to assessment compared with being mapped at the course level. The results for 2 courses are given – Construction and Design: Theories and Practice (first year) and Technology in Design (second year). In all of the six courses evaluated in the extension study, there was a gap; the gap in the case study (technically oriented) courses is displayed in Figs 4 and 5.

(Lowe and Marshall, 2004), which best fitted our development criteria had two limitations for our use – first that it was configured for a binary condition, in that any aspect was either covered 0% or 100%. Thus in the visual display of Murdoch’s courses, most appear to totally fulfil all course attributes always. We had already decided that the extent to which a course fulfilled any Graduate Attribute would be important. The second limitation related to end users – as an end user of Murdoch’s tool had to be both well informed about the definitions for their display, which possibly ensured that their end user was a University administrator – using the tool for Course and Graduate Mapping in an auditing sense, whereas the Faculty of the Professions ideal user could be a prospective student, logging on from a remote site, contemplating enrolment in a School within the Faculty and wanting to be more informed about what they will learn, when and how, or a prospective employer of a Professions’ graduate wanting to know whether, and to what extent, key criteria for employment within their firm were covered in the Program. Thus a web-based display was mandated for a broad spectrum of users – students and prospective students, University staff and administrators at every level, accreditation authorities, and the professions – in recruitment - employers who need this type of assurance about graduate outcomes. Ideally completed course maps would reside on various Schools’ websites, whereas Murdoch’s are presently displayed on the Teaching and Learning Centre Website – suggesting an academic development role for these maps:

a web based graduate attribute mapping tool has been used with a number of staff development strategies to push the boundaries of curriculum development and question the comfort zones of individual academics (Lowe and Marshall, 2004:548)
3. METHOD

Whereas the data for the Course Mapping was gathered with an online survey (Swift and Shannon 2010a), the small scale of the subsequent study meant that data was easily gathered on a paper matrix which listed on the X axis all the Graduate Attributes, whilst the staff member listed all the Course assessments on the Y Axis. The staff member completed the process by assigning 30 tokens for the extent to which each of the Course Assessments fulfilled the Graduate Attribute criteria. Prismatic authored a series of Visual Basic Application (VBA) scripts to collect and compile the data, and to generate the images which were used to populate the web tools – as html and jpeg images. Figs 4 and 5 display the data in bar graphs – the blue bars show the Course mapped against Graduate Attribute at assessment level, whilst the red bars show the Course level mapping. Figs 6 and 7 display the data in other ways – Weighted attribute vs Assignment (Fig 6) which is a clear visual display of the relative prevalence of each Attribute in each Assignment, weighted for the attribute; and Fig 7 Summary of Attribute vs Assignment which shows for each Assignment what Attributes are covered, in proportion to each other.

The same Course Coordinators completed both course and assessment mapping for their courses. There was a time gap of about 3 months in between the completion of course mapping, and the assessment level mapping. All Course Coordinators were interviewed in a semi-structured interview to ascertain why they thought this discrepancy existed, and the interviews transcribed, themed and research inferences drawn within the limitations of a case study mode.

4. RESULTS

As the results for all 6 courses revealed discrepancies between the course level mapping and the assessment level mapping, we looked to the assessment literature for any insights into the gap we exposed. We theorised that there could be several reasons for this gap or discrepancy. The first was that the course coordinators, when completing the assessment level mapping, after having completed the course level mapping some months previously, did not look back to the course level mapping and make an attempt to replicate the course level mapping when conducting assessment level mapping. Through interviews we found that this was the case, and that staff did not look back, or otherwise try to remind themselves of their previous answers with the voting tokens, assuming that their responses would be consistent, and believing that this was the utility of the exercise for them. When viewing the inconsistency, one staff member said that the time elapsed between mapping course and assessment had contributed to different responses, as had his/her unfamiliarity with the Attribute Criteria (recalling that on both occasions s/he had needed to look up what the criteria meant (which was as simple as rolling the mouse over the Attributes in the Web survey, or referring to a printed list in the paper base survey)). S/he thought had the time lapse been less, or his/her familiarity with the Graduate Attributes been greater, his/her responses may have been more consistent.
Figure 4 Technology in Design: Graduate Attributes evaluated at Course Level and Assessment Level

Our second speculation was that Course Coordinators did not see assessment as capturing everything that the course sought to offer in the realms of skills, knowledge and understandings. We were correct in this assumption, with Course Coordinators saying that there were aspects of their courses which were not intended to be assessed at first or second year level, but the curriculum was there to build a knowledge base for the future (eg knowledge of Codes and Standards) or were so called employability skills (team work, ethics, self and time management) which were important but not assessable.

Notwithstanding this acknowledgment about those aspects not directly assessed, Course Coordinators did think there should be more consistency in the course and assessment level mapping, one saying that ‘while the course – what’s happening in the assessment - at least in the courses I teach – does marry very strongly with what is happening in the lectures, and how that is being played out in the studios and with the other things that are going on. So I really would expect that the two marry quite strongly. So while there are subtle differences, as there are things we do in the course which are not directly assessable, I would still expect it [consistency between course and assessment level mapping].’ Achieving this consistency is termed constructive alignment.

John Biggs says that constructive alignment is difficult to achieve even for committed educators because to do it there needs to be a moving away from the more prevalent forms of teaching (lectures) and assessments (exams and multiple choice questions) which are required for larger classes, and "managerialism" which mandates forms of teaching and assessment (Biggs, 1996:361). Earlier Boud (1990:102) stated that

There is often a gap between what we encourage students to focus upon and what is needed for meaningful learning to occur. There is too often a discrepancy between the high level course objectives and assessment tasks … We need to examine assessment practices to see if they are compatible with our academic ideals and, more generally, our goals for higher education.

Boud (2000:153) continued to be concerned about the seemingly static role of assessment in learning:

In recent times, the role of higher education in lifelong learning has been recognised through a number of developments. These include a focus on learning outcomes (Hussey & Smith, 2003), the use of graduate attributes (Hager & Holland, in press), the promotion of key skills and the adoption of an agenda of employability (Dearing, 1997) and the development of capability (Stephenson & Yorke, 1998). In all of these the role of assessment has generally been taken for granted. The range of matters to be assessed has been extended to encompass the issues mentioned and this has prompted
the development of new assessment methods. However, a reappraisal of the role of assessment has not occurred.

The discrepancies which exist in the account of the graduate attributes of assessment tasks, when mapped, compared with the graduate attributes of courses, when mapped, indicate the difficulties of alignment, between a course, where the Course Graduate Attributes are frequently proscribed, and the assessment tasks, where the teacher is scaffolding learning, through a number of assessments, to attain those attributes, (however imprecisely).

![Comparison of Attributes Determined at Course Level vs Assessment Level](image)

**Figure 5 Construction and Design: Graduate Attributes evaluated at Course Level and Assessment Level**
Furthermore, Boud and Falkichov (2006:410) state that “[T]he limited number of assessment tasks in any given course could not be expected to demonstrate a large number of desirable features” for taking a learner from the scope of assessment tasks, embedded within courses, to the skills, knowledge and understandings to be an autonomous life long learner in employment. They argue that assessment tasks should not be considered within courses, but rather within Programs. This longer term view is not captured in the current APMap depictions, which use courses as the basic units, not Programs.
Notwithstanding the perceived difficulties of aligning course objectives (which aggregate to the desired Program Graduate Attributes) and assessment level tasks, and the recognition that aggregating Graduate Attributes at Program, rather than course or assessment level is ideal, Biggs (1996:361-362) concludes optimistically:

That a working version of constructivism can be integrated with instructional design at three crucial points: the curriculum or unit objectives are clearly stated in terms of content specific levels of understanding that imply appropriate performances, the teaching methods require students to be placed in contexts that will likely elicit those performances, and the assessment tasks address those same performances. On the basis of at least the example given, and of the inferential evidence from the research literature, the model provides a powerful teaching/learning context.

CONCLUSION

For our case study, we found that committed educators desired an alignment between Graduate Attributes mapped at the course and assessment level. They strove to do this in their Course design. Their outcomes were imperfect, and gaps were revealed between graduate attributes mapped at both levels. This was not as a result of staff carelessness, but the explanation for these gaps lies in three things: 1. time lag between course and assessment mapping completion 2. assessment was not designed to capture everything that courses contained and 3. the difficulty experienced (even amongst committed educators) in aligning assessment with course graduate attributes. Part of this difficulty arises from inflexible modes of delivery and assessment (possibly mandated by class size, University space availability mandating some types of teaching practices and budgets). But without APMap educators and administrators may not have even known that these gaps existed. The Course Coordinators interviewed believed that APMap Course vs Assessment mapping was most useful as a tool for reflection. Reflection is aided by data. Without the development of APMap and the extension into Course vs Assessment mapping this tool for reflection would not exist in the visually powerful way that it does, mapping domains for further assessor and Course Coordinator reflection.

REFERENCES


44th Annual Conference of the Architectural Science Association, ANZAScA 2010, Unitec Institute of Technology