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Making Curriculum Visible Through a Multi-Dimensional, Interactive Curriculum Map, MyCourseMap
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Article abstract

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Abstract

Universities often find it challenging to provide students with an effective and holistic view of their program and its disciplinary outcomes. To provide a transparent visualisation of the curriculum, a multi-dimensional and interactive curriculum map tool, MyCourseMap, was developed. This study utilises mixed methods to explore how prepared Australian universities are in providing explicit information on the curriculum to staff and students. Staff and students reported a lack of awareness of course learning outcomes and graduate attributes adding to the issue of students not fully comprehending how their degree is aligned with employment expectations. MyCourseMap served to help resolve these coherence and visualisation issues.

Keywords

Curriculum literacy, visible graduate attributes, curriculum mapping, mobile technology, first year, qualitative and quantitative analysis, curriculum visualisation tool

Résumé

Il est souvent difficile pour les universités de fournir aux étudiants une vision efficace et holistique de leur programme et de ses résultats disciplinaires. Pour donner une visualisation

transparente du programme, un outil multidimensionnel et interactif de la cartographie du curriculum, MyCourseMap, a été développé. Cette étude utilise des méthodes mixtes pour explorer l'état de préparation des universités australiennes pour ce qui est de donner des informations implicites sur le programme au personnel et aux étudiants. Les étudiants et le personnel ont signalé une méconnaissance des résultats d'apprentissage des cours et des attributs des diplômés, ce qui augmente les difficultés des étudiants qui ne comprennent pas pleinement en quoi leur diplôme correspond aux attentes en matière d'emploi. L'outil MyCourseMap peut améliorer ces problèmes de cohérence et de visualisation.

Mots-clés

Introduction

While there appears to be no universally agreed definition of curriculum, it is widely accepted that in general, curriculum refers to the materials and methods of engagement that enables student interaction to achieve distinctive educational outcomes (Arafeh, 2016; Oliver & Jorre de St Jorre, 2018; Uchiyama & Radin, 2009). A well-designed, successful curriculum implementation with transparency will facilitate student engagement, and the positive impact of such a curriculum will be made explicit to university students, staff and educational providers (Harden, 2001). In Australia, the Tertiary Education Quality and Standards Agency (TEQSA) requires that all courses must be presented explicitly to students (2015 Higher Education Standards) in order to assure learning.

Curriculum development is the multi-step process of creating and improving a university course. This is usually undertaken by the academic course team, and involves those responsible for the courses and subjects—as well as the leadership group. The suite or course portfolio will be altered, with new courses added and redundant ones removed, according to their strategic importance and the business case put forward. While the exact process of curriculum development will vary from institution to institution, the broad framework includes stages of analysis, building, implementation, and evaluation. Disciplines will take different approaches, and some will be dependent on professional accreditation requirements and increasingly co-developed with employers, students and communities within partnership pedagogy (Barrie & Pizzica, 2019). Ideally, the curriculum development process should be one of continuous improvement rather than a linear or stagnant approach. Typically, in Australia curriculum is revised annually or in 5-year periodic major reviews, as per TEQSA standards.

Tee et al. (2015) argue that the way curriculum is presented to university students can be difficult to comprehend, imbued with academic language. It may be particularly unfamiliar to first-year university students and presented impersonally and in disparate ways (i.e., brochures, individual unit outlines, and highly detailed course handbooks) that limit the relevance of the information to individuals. Furthermore, there is also some disparity with regards to nomenclature within a degree of study in Australia. For example, a degree of study has been referred to as a "degree," "course" or "program"; while a subject within a degree has been referred to as a "subject," "unit," "program" or "course." For the purpose of this study, a degree or course of study is referred to as a "course" and the subjects taught in each course of study are referred to as "units"

in this paper. Anecdotal evidence from the Psychology Department at Utrecht University in the Netherlands, which is one of Europe's leading research universities and is recognised internationally for its high-quality, innovative approach to research and teaching, supports the idea that the curriculum is not visible to students (Wijngaards-de Meij & Merx, 2018). For example, teachers in the Psychology department noted that their students were unaware of how prior units had built skills and knowledge needed for later units (Wijngaards-de Meij & Merx, 2018). Creating a visible curriculum (Margolis, 2007; Stern & Wall, 2018) serves to benefit many stakeholders, including students, staff, and higher education providers. This transparency assists users in understanding the overarching goals of the degree, the anticipated educational outcomes and the relevance of units to one another, and makes it possible to track students' progress in the degree and ultimately enhance engagement through empowering a sense of autonomy towards their learning.

The Need for a More Visible Curriculum and Graduate Attributes for Students

To date, there is no universal definition of "visible curriculum." There is, however, a need to provide students with explicit and transparent information about the entire degree structure when they start studying for a degree. In accordance with the principles of MyCourseMap, a visible curriculum should be presented in a manner that provides visualisation of the entire degree structure in one screen, with immediate links to detailed subject information such, as descriptions of syllabuses, learning outcomes, tuition pattern and assessment. (Tee, 2019; Tee et al., 2015)

This information could allow students to understand that there is a continuum of learning throughout the course, and may assist them in making informed course and career decisions, while these recommendations by the curriculum management team in higher education institutions could be the grounds for a visible curriculum definition.

First-year university students report difficulty with course selection specifically because the curriculum is unclear. Australian surveys in 2004, 2009 and 2014 indicated that students felt inadequately prepared to choose a degree program of study directly from high school (Krause et al., 2005). Poor course selection leads to negative outcomes for both students and universities in the form of financial burden (Krause & Coates, 2008), including employment dissatisfaction and loss of future earnings, and lower student engagement and retention rates (Thomas, 2012). The need for clear communication to university students at the commencement of a degree program of study about course structure and better-quality course advice is being increasingly articulated (Baik et al., 2015; James et al., 2010; O'Neill et al., 2014).

A visible curriculum made available in a manner that provides clarity and context around scaffolding and integration between units, may assist other academic-related activities including initiatives that involve curriculum mapping (Arafeh, 2016; Hamilton & Weiner, 2000; Sumsion & Goodfellow, 2004; Uchiyama & Radin, 2009). The purpose of engaging in curriculum mapping is often related to quality assurance and enhancing student learning (Dyjur & Lock, 2016). Curriculum mapping allows staff and accreditation boards to identify learning gaps in the course. Academic staff may be highly focused on their unit of teaching and may neglect to consider vertical and horizontal integration within the course (Dyjur & Lock, 2016). Consequently, students may learn a certain skill/attribute multiple times, while others are scarcely addressed (Wijngaards-de Meij & Merx, 2018). While curriculum development is usually undertaken by the academic course team, not all academic members may be familiar with the process. Initiatives such as curriculum mapping as part of a quality assurance process may also be used as a form of professional development for staff (Dyjur & Lock, 2016; Holmes et al., 2017).

A previous study alludes to a potential for visible curricula to enhance student engagement and graduate outcomes (Tee et al., 2018). Our article provides a strong rationale for the need to create a visible curriculum for students by noting the benefits to students, staff, universities and industries (i.e., better course selection, increased retention, enhanced student engagement and enhanced graduate success), and identifying the lack of research conducted in this endeavour, despite calls to do so from other researchers (Barnett & Coate, 2004).

Higher education must provide graduates with the appropriate skills for employability in response to the rapid technological developments and the changing nature of work (Tee et al., 2018; Treleaven & Voola, 2008). Graduate skills, also known as 'soft' or 'transferable' skills, are regarded as skills or personal attributes that, irrespective of discipline, all university graduates should possess (Treleaven & Voola, 2008). Although all Australian universities make claims in policy and curriculum documentation about developing graduate attributes and achieving course learning outcomes, during institution review by TEQSA (Tertiary Education Quality Standard Agency) and course accreditation agencies the process has been somewhat intangible and 'invisible' to students, with the result that students do not fully engage with course expectations (Oliver et al., 2010), thereby impacting on students' learning experience and outcomes. Oliver and Jorre de St Jorre (2018), recommend that all providers, both universities and non-university entities, make graduate attributes more visible to students for the purposes of enhanced learning.

The Conceptualisation of MyCourseMap to Increase Curriculum Visibility

> MyCourseMap is an interactive visual curriculum map that supports students in understanding the structure and integration of units in their chosen or prospective degree and is intended to assist them in appreciating the relevance of individual units of study to the profession or discipline. (Tee et al., 2015, p. 285)

The MyCourseMap tool was developed to present user-friendly 'one-stop portal' degree information for students and staff showing the entire program with alignment to graduate attributes and course learning outcomes using mobile touch technology. The development of the MyCourseMap tool began in 2014, building from the work on curriculum mapping (Oliver et al., 2010), graduate capabilities (Oliver et al., 2010), learning outcomes (Lawson et al., 2013; Owen et al., 2011), technology-enhanced learning (Laurillard et al., 2009) and graduate employability (Bennett, 2018). MyCourseMap was first developed as an iPad App (Tee et al., 2015), and the new version is now accessible on all digital formats and platforms based on IOs, Windows, Linux and Android. In this study, the MyCourseMap tool is used as an example of how higher education can engage students in understanding their program, thus contributing to their learning, specifically to enhance curriculum visibility and increase awareness of graduate attributes and course learning outcomes. The guiding principles from which the MyCourseMap tool was developed were to:

– provide immediate relevance for degree content and its organization,

– provide an implicit view of the horizontal and vertical integration across the curriculum,

– increase visibility and awareness of graduate capabilities, with links to the degree content,

– increase visibility and awareness of learning outcomes, with links of unit/courses outcomes to assessment tasks, and

– promote the relevance of learning and graduate employability through peer, graduate and employer stories (Tee et al., 2015).

As seen in Figure 1, an entire curriculum can be viewed transparently at a single glance. Within this view, users can navigate through their map at the touch of a button. Users may filter the map via several categories shown on the right-hand panel (which shows types of units, the year, graduate attributes, course learning outcomes, accreditation standards and the unit focus). This allows staff and students to better understand how units are related to each other in the course, and when certain skills may be re-engaged.
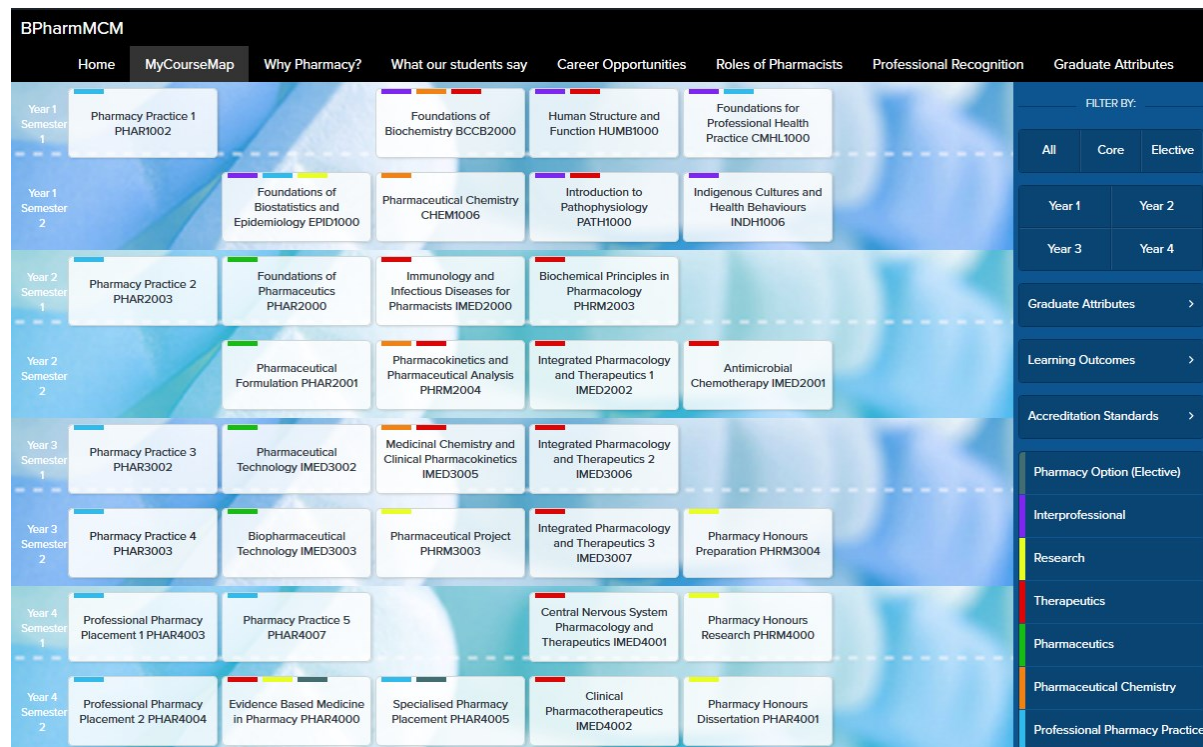

Figure 1
A visual overview of MyCourseMap for the Pharmacy discipline

To increase the visibility of graduate attributes, the MyCourseMap tool was built with features to incorporate the description of graduate attributes in order to increase awareness of graduate attributes. For example, as illustrated in Figure 2, the graduate attribute of 'communication' has been filtered to reveal all units that were designed to foster the development of this skill.

Research on the visibility of curriculum and visible graduate attributes is still in its infancy phase. Our article addresses this gap by reporting results from surveys and focus group discussions that utilised the MyCourseMap concept as a tool to initiate a strategic academic conversation on the importance of presenting visible curriculum and graduate attributes to students. The MyCourseMap tool was provided to institutions as an example of how curriculum may be presented to students using a curriculum map built on modern technology. A teaching team would normally undertake a process of curriculum mapping that involves indexing (textual) or diagramming (pictorial) a curriculum to identify and address academic gaps, redundancies, and misalignments for purposes of improving the overall coherence of a course of study and, by extension, its effectiveness. The resulting curriculum map presents the alignment of learning standards with teaching strategies, including how well, and to what extent a team has matched the content that students are actually taught with the academic expectations described in learning standards. MyCourseMap takes this one step further by articulating the actual or potential learning journey to the student – by presenting it in a dynamic and digital form.
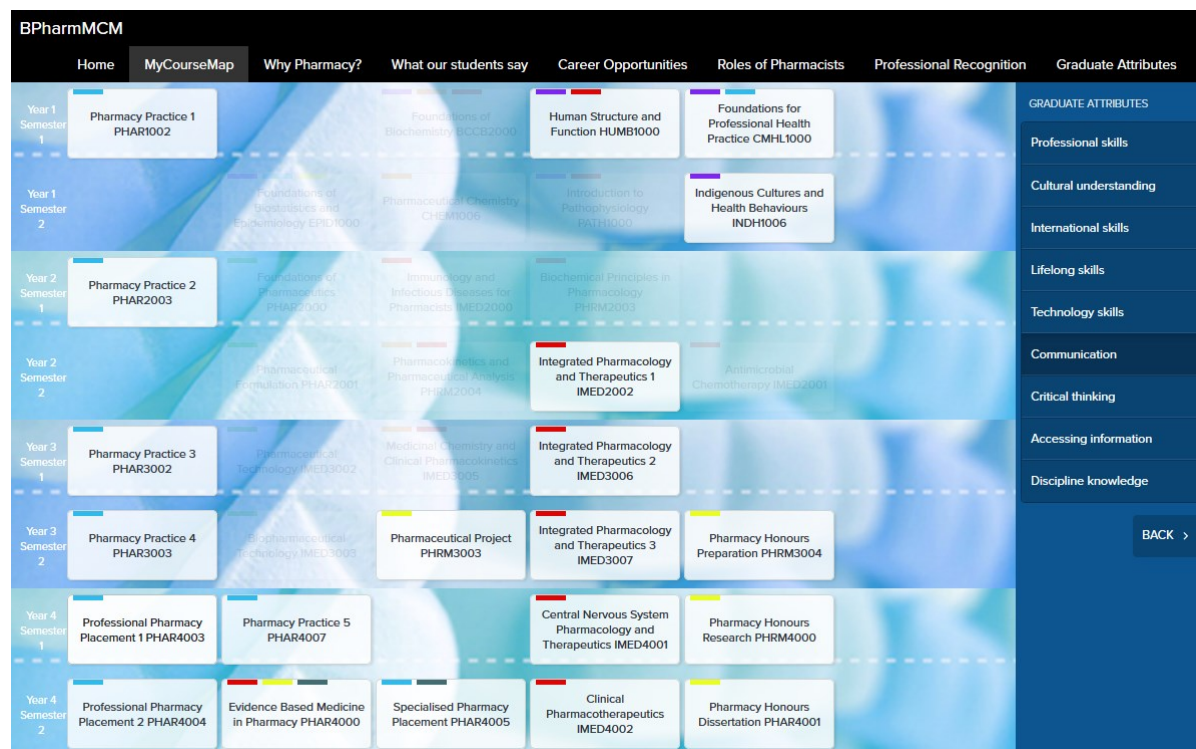
Figure 2
Units linked to the graduate attribute of communication skills

Our study aimed to explore and gather the participants' perception of curriculum visibility and to evaluate aspects of the MyCourseMap concept in its effort to increase curriculum visibility for students and staff, specifically by addressing:

1. awareness and importance of course learning outcomes,

2. awareness and importance of graduate attributes, and

3. the capability of the MyCourseMap concept to expand current curriculum visualisation and strategies implemented in tertiary education systems that aim to enhance the visibility of curriculum and graduate attributes.

Methods

Expression of staff interest in participating in a professional learning workshop to initiate academic conversation about curriculum visibility using the MyCourseMap tool was received from 30 institutions in Australia, four from Canada, one from Japan, two from New Zealand, two from Singapore and nine from the United Kingdom (Tee, 2019). Within Australia, the workshop was carried out in three universities in Western Australia, two in Victoria, one in Queensland and one in New South Wales. All workshops were presented in three parts: (a) demonstration of the MyCourseMap concept for enhancing curriculum visibility, (b) evaluation of the MyCourseMap tool through a Qualtrics survey and (c) focus group discussions to gather the participants' perception and awareness of graduate attributes and course learning outcomes. The data for this article was drawn from online surveys administered via Qualtrics to academic and professional staff, as well as to students from several health sciences disciplines.

Workshops were conducted in person, except one that was conducted online in collaboration with ASCILITE's Transforming Assessments webinar series that are open to Australasian countries (a full report available in Tee, 2019), and purposively involving staff only. In addition to circulating through ASCILITE, recruitment was undertaken through a purposeful selection of prospective participants and subsequent snowballing method, through identification of their experience and current academic roles and duties. This scaffolded and multifaceted recruitment method enabled diverse and rich data to be collected, addressing the objectives of this study.

The survey was disseminated to students and staff participants in several ways; it was posted on students' learning management systems, circulated through staff emails, and conducted in workshops held for both students and staff that sought to generate conversation about the visibility of curricula to students. In Australia, a total of 17 workshops were conducted: 11 for staff and 6 for students.

Separate surveys were provided to staff and students to reflect the inherent differences between the groups. For example, staff were asked to discuss the barriers to implementation of the MyCourseMap concept and whether they would adopt this concept at their institutions, while students were not. By asking such questions, we were seeking to understand systemic barriers and views, best represented by the staff perspective. The survey's main purpose for staff and students was to collect data on the visibility of curriculum and awareness of graduate attributes and course learning outcomes.

Before commencing in-person workshops, staff and students were provided information sheets and consent forms to sign and return prior to their participation. Information and consent forms were embedded at the beginning of the survey to ensure that participants who did not attend a workshop also had access to information sheets and consent forms. The Qualtrics survey link was made available in the webinar forum to all attending staff after the ASCILTE webinar. The research was approved by the Curtin University Human Research Ethics Committee (Approval number HRE2016-0458).

Survey Design

Two Qualtrics surveys were developed to address the overall aims. Survey 1 contained 12 questions to explore students' perception and awareness of course learning outcomes and graduate attributes. Survey 2 contained 15 questions for students and 18 questions for staff to gather and evaluate perspectives on the MyCourseMap tool in enhancing curriculum visibility by evaluating the MyCourseMap features listed in Table 1. Both survey instruments were validated before the administration of surveys (Tee, 2019).

In an open response format during the focus group discussions, participants were invited to provide their views on:

– what they know about course learning outcomes and graduate attributes, specifically the roles and intent of course and whether they are visible,

– how the MyCourseMap tool influences their awareness of course learning outcomes and graduate attributes,

– the application of MyCourseMapin presenting curricula information, and

– the most valuable aspect learnt from the workshop showcasing the MyCourseMap concept.

Table 1
MyCourseMap features to enhance visibility of curriculum to students

Features
Entire course map in one screen. Visual links on the relevance of units to the course as a whole
Ease of access: Information about course structure and content is easy to access
Interactive unit buttons link to detailed information about units
Visual links to Graduate attributes (these are skills which students acquired to prepare them for their future employment following graduation)
Visual links to Course learning outcomes
Relevance to career: Testimonial from industry
Testimonials from students about units of study are included in the course material
Home page to provide information of school and teaching area

In an attempt to understand the features which best enhance student engagement with curriculum in MyCourseMap, participants were asked to rank the 8 features, from one (most important) to eight (least important). Staff and students were asked to rank the same 8 features. Finally, staff participants were also asked whether they would implement the MyCourseMap concept in their courses/institutions and to identify any barriers in doing so. Staff participants were required to consider how likely they were to implement it by responding with one of the following options; definitely yes, probably yes, maybe, probably not and definitely not.

Results

Since the survey contained a range of response formats (ranking, open response and forced-choice), descriptive frequencies were used to analyse ranking and forced responses (as provided by Qualtrics output), while open responses were analysed using a summative content analysis informed by Hsieh and Shannon (2005). A summative content analysis was deemed appropriate based on the small to moderate level of detail provided in the open responses and the specific focus of the research. As outlined by Hsieh and Shannon (2005), the following steps were conducted; (a) searching for repeated words/ideas (e.g., ease of access, accreditation) (b) calculating the frequency of each reoccurrence, while at the same time identifying the speaker (i.e., staff or student) (c) based on the highest frequencies of reoccurring words/ideas, exploring their relevance to the research focus (e.g. MyCourseMap's ease of access encouraged students to view their graduate attributes) and (d) synthesising and presenting results alongside supporting quotations. NVivo 12 was used to categorise and record the frequency of reoccurring words/ideas.

A total of 253 participants completed the online survey in a satisfactory manner (at least 75% of questions completed). Of these participants, 176 were students. Of the 176 students, 161 were undergraduate and 15 were postgraduate students. Students were predominately studying Pharmacy ($n = 131$), followed by Nursing ($n = 38$), Psychology ($n = 5$), and Health Sciences ($n = 2$). The remaining participants ($n = 77$) were staff from various higher education institutions, who occupied some roles including administrative support ($n = 12$), course coordinator ($n = 11$), Dean or Director of Learning and Teaching ($n = 6$), IT support ($n = 3$), learning and teaching centre staff ($n = 18$), marketing ($n = 1$), senior management ($n = 2$), student support services ($n = 4$), teaching team member ($n = 14$), unit coordinator ($n = 18$) and others ($n = 17$).

Student perception on course learning outcomes and graduate attributes

When asked whether students knew what course learning outcomes were, 57.2% responded "Yes," 19.1% were unsure and the remaining 23.7% responded "No." Those students who responded "Yes" were prompted for further elaboration (see Table 2), which revealed that students predominately thought that course learning outcomes are an outline of the knowledge/skills they are expected to have after completing the unit. Other students demonstrated their awareness by listing their course-specific learning outcomes.

Table 2
Student's perception of course learning outcomes (n = 63)

Category	Skills
Knowledge/skills	The knowledge you will have on the completion of your course
	The outcomes that the student can understand and apply at the end of the course
	What students can expect to learn during the course if they apply themselves to the tasks assigned
Course-specific skills	Demonstrating ethical practice, effective communication, reflective learning and practice, safe nursing care, evaluate information
	Establishing patient care management

Fewer students were aware of what graduate attributes were, with only 34.8% responding "Yes," 35.5% responding "No" and 29.6% of students responding that they were unsure. Based on students' extended responses (see Table 3), most who responded "Yes" understood that graduate attributes are skills they are expected to have demonstrated/possess at the end of their course and that these skills will be expected by their future employers. More specifically, 51.9% of students knew graduate attributes are linked to employability. Only 10.5% thought they did not know the link between graduate skills and employability, and the remaining 37.5% were unsure.

Table 3
Student perception of graduate attributes (n = 41)

Graduate attributes
Qualities (high-level education, understanding, skills, knowledge, professional and excellent interpersonal skills) of a person who graduated from a tertiary level
Skills learnt in the course that can be generalised to post-university life
Skills that the university has agreed that the students need to develop and display throughout the course
Students' competency levels expected by employers
Skills desired by employers upon completion of the unit
The skills and knowledge developed that enable the student to transition to the workforce

Additionally, we asked students whether course learning outcomes and graduate attributes were visible in their curriculum. Most students (42.7%) were unsure, followed closely by 42.1% of students who responded" "Yes," then 15.1% who responded "No." For those responding affirmatively, their extended responses revealed that course learning outcomes were visible in unit outlines or during classes, even though they were often unsure where graduate attributes were located. Some of the students' comments were as follows:

– "Both in the unit outline"

– "But they aren't eye-catching or easily accessible so they go unnoticed"

- "CLOs are listed on the unit outlines and assessment briefs. Graduate attributes are not clearly outlined anywhere, it's inferred"
- "Learning outcomes are available in the unit outlines, but I'm unsure about the graduate attributes"
- "On the table with the weird markings??? I think so [graduate attributes]"

The Best Aspects of the MyCourseMap Tool to Increase Curriculum Visibility

A total of 151 students and 67 staff provided comments concerning the most positive aspects of MyCourseMap. In accordance with a summative content approach, we present reoccurring words/ideas in Table 4, alongside their examplar quotes and their frequency.

Table 4
Student and staff opinions on the best aspects of MyCourseMap

Reoccurring theme	Exemplar quotes	Freq.
Student opinion (*n* = 151)		
Easy to use (i.e., navigate information)	– That everything is easily accessed and is explained to the point. – Easy to use and navigate through. The colour code system is excellent, helping link attributes to specific learning outcomes/units.	76
Enhances the relevance of units/course to the student	– How easy it is to understand and how it shows you how units link together. – It has all the units in our course on a single page as well as colour codes to show what topics they fall under. It helps to give a clearer understanding of how relevant our course content is to us both now and in the future.	49
Whole course on one screen	– Seeing the whole course on one page and what units are related to each other. – Lets you see everything on one page so you can compare what you've done to what you have to do.	36
Interactive	– A clear, interactive, comprehensive way to view the whole course. Great idea. – Easy to use and shows an overview of the whole course; also, it's interactive, which makes finding information easier.	11
Staff opinion (*n* = 67)		
Easy to use (i.e. navigate information)	– It is attractive, easy to use and shows all the important information that is usually buried in PDF links. – Easy-to-use information obtained quickly.	30
Enhances relevance of units/attributes to staff and students	– Intuitive and easy to use overview of how the units in the course relate to each other. – The whole of course visualisation, ability to build student understanding of outcomes and capabilities across the course. – The interactive nature of the tool allows students and staff to understand where each unit is found in the overall course.	21
Whole course on one screen	– Shows the students the course in a simple layout. – Easy to visualize the whole course on one page and then scroll down for further details of different kinds.	21
Visually appealing	– The visual maps are very appealing and easy to follow.	10
Interactive	– The professional and inviting look and the interactivity of the tool; easy to use.	8

The Most Valuable Aspect Learnt from the Workshop Demonstrating the MyCourseMap Concept

The findings from the 151 students and 66 staff that responded to this question are presented in the shape of reoccurring words/ideas in Table 5, alongside examplar quotes and their frequency.

Table 5
Student and staff responses to the most valuable thing learnt

Reoccurring theme	Exemplar quotes	Freq.
	Student opinion (*n* = 151)	
Structure of the degree	– I learned what units to expect in the coming years. – The general overview of my course and the direction in which I am going.	63
An awareness of graduate attributes and their importance for future careers	– I did not know about [graduate] attributes. This learning experience has opened my ideas to the expectations from students and what the ideal attributes are for potential employers in my area. – The graduate attributes. Some units that I have taken in the past seemed to be useless to my course, but MyCourseMap has won me over to the viewpoint that I have developed graduate attributes.	34
The relevance of units to one another and the course	– Seeing how important one unit is and how it is really interrelated to the others. – How my units are interrelated and how I can apply knowledge learned in one unit to another unit.	24
Nothing learnt	– Nothing.	20
MyCourseMap provides easy and clear access to course information	– The presentation of the information was clear, logical and easy to navigate and understand.	19
Inadequacies of the current system	– Information on the course website can be a bit confusing to navigate.	10
	Staff opinion (*n* = 66)	
How MyCourseMap works	– About how and why it was developed and plans for the future. – How to navigate the system. – Getting to see the platform in action, and interact with it.	22
A tool to minimise problems is available	– That there is a possibility of having the curriculum made more engaging for both staff and students - we do not have to be stuck with the tools and spreadsheets we have now - there are other opportunities.	15
MyCourseMap is easy to use	– The elegance of the tool – a one-stop-shop for students. – How easy it is to use and how useful it can be for both students and staff.	11
It has the potential to assist students and staff in seeing the relevance of their units	– Helps to share learning on tools to support curriculum design and to assist students in understanding their learning journey. – The potential to illustrate connections and relationships between units in a course in such a friendly and easy way.	10
Unsure	– Unsure.	5
Institutions encounter the same problems	– I learned that various institutions face similar problems in planning and implementing their courses/programs.	5

By evaluating MyCourseMap, students often gained a valuable understanding of the existence of graduate attributes and their importance or relevance to future employability. Students also *comprehended the structure of their entire degree*, which was often attributed to the *easy access* to information that MyCourseMap provides, specifically relying on its clear presentation. While most students ($n = 131$) reported learning something of value, a few ($n = 20$) students stated that *the process was not valuable.*

Staff predominately valued having the opportunity to interact with the tool and understand the MyCourseMap concept. Staff also noted that many institutions face the same problems as they do in engaging students and designing curriculum, but felt MyCourseMap was a tool that could minimise associated problems.

Features of MyCourseMap to Enhance Student Engagement to Course of Study

Results from students (see Table 6) indicate that having the entire course map on one screen was the most important feature for the purpose of enhancing engagement, followed by having a home page providing information about the school or teaching area. Of least importance was the inclusion of video industry testimonials linking the unit's relevance to a career. When staff were given the same ranking task; their reports roughly echoed student ranking (see Table 6), specifically on the importance of viewing the entire course on one screen, having course information easily accessible, and the low ranking of testimonial videos.

Table 6
Student and staff ranking of most important features of MyCourseMap

Students ($n = 159$)	Staff ($n = 75$)
1 Entire course map in one screen	Entire course map in one screen
2 Home page to provide information of school or teaching area	Information about course structure and content is easy to access
3 Information about course structure and content is easy to access	Home page to provide information of school or teaching area. The relevance of a particular module/unit to overall program/course structure is clear.
4 Graduate attributes visibly linked to units in the curriculum	Course learning outcomes visibly linked to units in the curriculum
5 Course learning outcomes visibly linked to units in the curriculum	Interactive unit buttons link to detailed information about units
6 Interactive unit buttons link to detailed information about units	Student testimonial videos to explain the relevance of units
7 Student testimonial videos to explain the relevance of units	Graduate attributes visibly linked to units in the curriculum
8 Industry testimonial videos link units to career relevance	Industry testimonial videos to explain the relevance of units

Adoption of MyCourseMap Concept: Likelihood of Implementation and Potential Barriers

Sixty-six staff responded, with 66% of staff selecting "definitely yes/probably yes" when asked if they would use MyCourseMap in their course. Only 6% of staff would not use the tool, while the remaining responded as maybe (Table 7).

While the majority of the staff indicated they would use the MyCourseMap tool based on its concept, the main barriers discussed by staff, as detailed in Table 7, were concerns that the implementation of MyCourseMapbeing would be *time- and resource-intensive.* Specifically, staff expressed concern for the potential extra workload related to manually inputting data and learning the system and the monetary cost of purchasing the system. Staff were concerned that MyCourseMap would not be aligned with current policy, and that some staff were also *resistant to change.* Finally, concerns were expressed that MyCourseMap *does not integrate* with other university systems, and may not have the *ability to handle complex degree structures.*

Table 7

Staff perspectives: Barriers to the implementation of MyCourseMap (n = 65)

Reoccurring theme	Exemplar quotes	Freq.
Time- and resource- intensive (i.e., cost, time to manually input data, time taken to learn the system; the effort required by staff)	– The workload for staff and the research to gather the information – Manual input for academics who are already busy – Uptake of teachers, representing an extra tool, extra work – Cost of implementation – Developing proficiency with the tool	38
Change resistant attitudes	– The challenge would be to convince other staff members of the versatility of the tool. – Unsure but suspect time/cost demand may be an issue together with entrenched "always-done-it-this-way" attitudes.	13
Inability to integrate with other systems	– I believe a possible problem will be the inability of the tool to connect to university internal systems or the learning management system in that matter. – Lots of different systems at [University] don't speak to each other. This significantly increases workload. Some systems are mandatory and have to take priority.	13
Ability to handle complex course structures	– My course is only a small part of a much larger curriculum. I expect MyCourseMap works best for relatively defined courses such as the BPharm and BNurs, but it will involve a bit of thought to adapt it to the large open-ended degrees offered at my institution.	3

Discussion

The results indicate that MyCourseMap, as a tool designed to enhance the transparency of curricula for both staff and students, yielded predominately positive outcomes and was perceived as a good conceptual model.

Students reported increased awareness and understanding of graduate attributes and course learning outcomes after becoming familiar with MyCourseMap. The preceding lack of awareness of graduate attributes may be linked to a lack of coherence in the visibility of course information in the current systems. Students currently access information in several ways (e.g., websites, unit outlines, and online learning management systems) that were described by staff from several universities, Australia-wide in this survey, as disjointed and difficult to navigate. The end-user needs transparency, not more complexity. When exhibited, the MyCourseMap tool was described by both staff and students as an easy way to access and view information, which could indicate that the clear design of the MyCourseMap tool can significantly increase the awareness of graduate attributes and career relevance. Furthermore, focus group discussion with staff

including the curriculum management team, indicates an appetite for current institutions to develop a more responsive, easy-to-visualise curriculum mapping tool (Tee, 2019). Research reports that students' subjective competency of graduate attributes can increase when they are emphasised to students (Treleaven & Voola, 2008). The extent to which students are aware of graduate attributes is unclear, and is identified by Trowler (2010) as an area that is missing the student perspective.

In dissecting the features of MyCourseMap further, students confirmed that being able to view the entire course on a single screen was useful in understanding how knowledge and skills are developed throughout the degree and in enabling them to better plan for future studies (i.e. by being able to see pre-requisites and unit equivalents). Staff echoed such statements, noting that this feature could enhance students' understanding of the course and outcomes. This feature was also highly commended in the pilot trial of MyCourseMap in 2015, in which students identified it as a useful tool in preparing for their entire course and enhancing the learning experience (Tee et al., 2015).

Being able to view an entire course on a single screen may represent an opportunity to address many researchers' calls for clearer communication of course structures to students (Baik et al., 2015; James et al., 2010; O'Neill et al., 2014). Specifically, it addresses staff's concerns that students are unaware of how current units build upon prior knowledge (O'Neill et al., 2014; Wijngaards-de Meij & Merx, 2018). In MyCourseMap, when viewing the course on a single screen, students can filter their map by unit type (i.e., core, elective, all) year, graduate attributes, learning outcomes, and discipline focus. When filtering by one of these categories, the relevant units are highlighted. The benefits of this feature are twofold; first, it supports the ideas of Coates (2008), Hockings et al. (2008), and Merrill (2002), who report that students who draw connections between past and current learning are more academically engaged. Secondly, it may better address the informational needs of vulnerable cohorts, such as first-year students. First-year students' difficulty in navigating course information (i.e., often leading to poor course selections), and calls for better course advice, are well documented (James et al., 2010; Krause, 2005; Moogan et al., 1999). Rather than using disjointed information sources such as unit outlines, handbooks and websites, or relying on extracting course information from advisory staff, MyCourseMap offers students a preview of an entire degree, providing important information about the efforts required of the student (e.g. length of course, units per semester, opportunities for modification of structure). By creating transparent course structures (i.e., the single screen, filtered and unfiltered), the likelihood that students withdraw due to inaccessibility of clear course information may be reduced. However, it must be noted that prospective students who are not familiar with university enrolment may not find all the features beneficial.

The interactive nature of MyCourseMap was also valued by students and staff. They valued the ability to filter what is highlighted when viewing the entire course on one screen. We are teaching a virtual generation, as opposed to verbal generations and as such, the popularity of interactive multimedia technology is rising (DiLullo, 2020; Evagorou et al., 2015; Evans et al., 2016; Proserpio & Gioia, 2007; Reilly, 2012). Embedding interactive features/tools in learning have yielded positive results. Interactive whiteboards, audience response systems, touch technology (iPads), and visualisations tools report an increase in student engagement (Beauchamp & Childress, 2001; Funnell, 2017; Higgins et al., 2007; Liang & Sedig, 2010; Micheletto, 2011). The fact that the interactive nature of MyCourseMap was received positively was likely due to its alignment with the needs of the virtual generation.

In analysing other features ranked highly by both staff and students, a pattern of importance emerged. Besides the ability to view the entire course on a single screen, staff and students ranked features that addressed immediate concerns (i.e., what information is needed now) before features that oriented them towards their future. For example, features such as a home page that provides information about the school and teaching area and information about course structure and content was ranked either second or third by both staff and students. Both staff and student were not future-focused, and ranked employers' testimonial videos linked to career relevance as less important than most other features. Research by Dyjur and Lock (2016) supports this ordering for staff. Staff can become highly focused on the units they are currently engaged in and may neglect to consider the units' role in the wider course and to future careers due to heavy workloads. However, for students, their ideas for improvements contradicted the initial conclusion—that students have an immediate rather than future focus. While students ranked industry information as the least important feature, they requested more industry information such as course advice, to maximise job prospects, potential career pathways stemming from the degree, and career advice.

While this study aimed to use the MyCourseMap tool to demonstrate how institutions may present curriculum more visibly, some staff raised interest in adopting and trialing the tool. The staff however expressed the need to ensure seamless alignment and integration of MyCourseMap into existing institutional systems, which may be logistically challenging. There is also a concern about who is creating the course maps and whether the educators have a strong background in curriculum and pedagogy. When introducing new technology to staff, the concern for the extra workload is well documented (Howell et al., 2017; Kregor et al., 2012; Pajo & Wallace, 2001). We acknowledge these concerns and plan to pursue developments in the MyCourseMap technology that will address this issue. Such developments will streamline the resources provided to students and eliminate the need for staff to manually review and input course information. Despite these promising outcomes, the staff communicated an additional barrier not easily resolved via technological advances, but instead produced by it, highlighting change-resistant attitudes. Such attitudes have been documented as concerns in several research projects that present new teaching-related technologies, such as blended learning (Benson et al., 2011), recording materials (Reed, 2014) and Information Technology more broadly (Howard, 2013). According to Howard and Mozejko (2015), technology-resistant attitudes are significantly affected by technological and pedagogical support, leadership and shared group vision. In moving forward with MyCourseMap it will be important to draw on the large amount of literature that proposes solutions to resistant attitudes; however, a review of this field is beyond the scope of this article.

Limitations and Future Directions

First, the views expressed by students originate from mostly health sciences students, therefore this limits the scope of findings, which does not extend to students from other faculties. Second, the majority of students were completing single degrees, with relatively straightforward and fixed course structures. The structure of our participant's courses suited the current capabilities of MyCourseMap well and likely contributed to the positive reviews. However, a few staff and students did express concern that the MyCourseMap concept would not be able to accommodate degrees or students with complex course structures, such as students with double degrees or students who defer/swap courses. Research is needed to further explore these concerns/needs, to inform developments in the MyCourseMap tool. As informed by our participants' suggestions

for improvements, other developments in the tool should include exploring ways to automate the integration of MyCourseMap with the University's existing online learning tools.

While we can affirm that the tool has the potential to enhance the visibility of curricula and awareness of graduate attributes for staff and students (main aim) as well as many other values discovered during this study, the findings of this study provide a significant but preliminary justification to implement the tool in tertiary education settings. This implementation should also include further research components that cannot be described during a preliminary study. An area worthy of future investigation is to explore further students' awareness of graduate attributes and course learning outcomes. Research in this area of students' awareness of the importance of graduate attributes is scarce (Trowler, 2010); however, the large increase in students' awareness of graduate attributes in our research indicates one of three possibilities, (a) students were previously unaware of graduate attributes, (b) transparency of graduate attributes in current systems is poor or, (c) both. Further exploration of this topic is needed to direct future efforts to better promote graduate attributes' visibility to students (Oliver & Jorre de St Jorre, 2018). This work further highlights enquiry-based research opportunities, including custom curriculum mapping for students, enrolment and resourcing planning, marketing, engagement and accreditation compliance.

Conclusion

Education is costly for both students and the sector, hence the importance of increasing the visibility of curricula to assist with decision-making in choice of study to help mitigate extensive course switching, deferrals, and withdrawals. There is also a need to standardise curriculum terminology across Australia and we recommend that this could be undertaken by TEQSA (Tee, 2019). Assurance of learning and graduate skills are paramount for graduate success and employability. Hence, it is important to embed implicit and explicit graduate attributes in the curriculum through a collaborative approach, working in partnership with students, academics and employers for curriculum transformation. This study suggests that MyCourseMap offers a possible concept model to assist in this transformation while it is still early on in the technology adoption life cycle.

Acknowledgements

References

Arafeh, S. (2016). Curriculum mapping in higher education: A case study and proposed content scope and sequence mapping tool. *Journal of Further and Higher Education*, *40*(5), 585-611. **https://doi.org/10.1080/0309877X.2014.1000278**

Baik, C., Naylor, R., & Arkoudis, S. (2015). *The first year experience in Australian universities: Findings from two decades, 1994-2014*. Melbourne Centre for the Study of Higher Education. **http://melbourne-cshe.unimelb.edu.au/...**

Barnett, R., & Coate, K. (2004). *Engaging the curriculum*. McGraw-Hill Education.

Barrie, S., & Pizzica, J. (2019). Reimagining university curriculum for a disrupted future of work: Partnership pedagogy. In J. Higgs, W. Letts, & G. Crisp (Eds.), *Education for employability* (Volume 2, pp. 143-152). Brill Sense.

Beauchamp, T., & Childress, J. (2001). *Principles of biomedical ethics* (5th ed.). Oxford University Press.

Bennett, D. (2018). Graduate employability and higher education: Past, present and future. *HERDSA Review of Higher Education*, *5*, 31-61. **http://herdsa.org.au/...**

Benson, V., Anderson, D., & Ooms, A. (2011). Educators' perceptions, attitudes and practices: Blended learning in business and management education. *Research in Learning Technology*, *19*(2), 143-154. **https://doi.org/10.3402/rlt.v19i2.10353**

Coates, H. (2008). *Attracting, engaging and retaining: New conversations about learning. Australasian student engagement report.* Australian Council for Educational Research, Australasian Survey of Student Engagement. **http://research.acer.edu.au/...**

DiLullo, C. (2020). Learners of a new generation. In L. K. Chan & W. Pawlina (Eds.), *Teaching anatomy* (pp. 11-21). Springer. **https://doi.org/10.1007/978-3-030-43283-6_2**

Dyjur, P., & Lock, J. (2016). A model to build capacity through a multi-program curriculum review process. *Journal of Professional, Continuing, and Online Education*, *2*(1). **https://doi.org/10.18741/p9bc77**

Evagorou, M., Erduran, S., & Mäntylä, T. (2015). The role of visual representations in scientific practices: From conceptual understanding and knowledge generation to 'seeing' how science works. *International Journal of STEM Education*, *2*, article 11. **https://doi.org/10.1186/s40594-015-0024-x**

Evans, K. H., Ozdalga, E., & Ahuja, N. (2016). The medical education of Generation Y. *Academic Psychiatry*, *40*(2), 382-385. **https://doi.org/10.1007/s40596-015-0399-5**

Funnell, P. (2017). Using audience response systems to enhance student engagement and learning in information literacy teaching. *Journal of Information Literacy*, *11*(2), 28-50. **https://doi.org/10.11645/11.2.2238**

Hamilton, D., & Weiner, G. (2000, April). *Subjects, not subjects: Curriculum pathways, pedagogies, and practices in the United Kingdom* [Paper presentation]. Internationalization of Curriculum Studies Conference, Baton Rouge, United States. **http://eric.ed.gov/?id=ED442715**

Harden, R. M. (2001). AMEE Guide No. 21. Curriculum mapping: A tool for transparent and authentic teaching and learning. *Medical Teacher*, *23*(2), 123-137. **https://doi.org/10.1080/01421590120036547**

Higgins, S., Beauchamp, G., & Miller, D. (2007). Reviewing the literature on interactive whiteboards. *Learning, Media and Technology*, *32*(3), 213-225. **https://doi.org/10.1080/17439880701511040**

Hockings, C., Cooke, S., Yamashita, H., McGinty, S., & Bowl, M. (2008). Switched off? A study of disengagement among computing students at two universities. *Research Papers in Education*, *23*(2), 191-201. **https://doi.org/10.1080/02671520802048729**

Holmes, D. W., Sheehan, M., Birks, M., & Smithson, J. (2017). Development of a competency mapping tool for undergraduate professional degree programmes, using mechanical engineering as a case study. *European Journal of Engineering Education*, *43*(1), 126-143. **https://doi.org/10.1080/03043797.2017.1324404**

Howard, S. K. (2013). Risk-aversion: Understanding teachers' resistance to technology integration. *Technology, Pedagogy and Education*, *22*(3), 357-372. **https://doi.org/10.1080/1475939x.2013.802995**

Howard, S. K., & Mozejko, A. (2015). Teachers: Technology, change and resistance. In M. Henderson & G. Romeo (Eds.), *Teaching and digital technologies: Big issues and critical questions* (pp. 307-317). Cambridge University Press.

Howell, J. A., Roberts, L. D., Seaman, K., & Gibson, D. C. (2017). Are we on our way to becoming a "Helicopter University"? Academics' views on learning analytics. *Technology, Knowledge and Learning*, *23*(1), 1-20. **https://doi.org/10.1007/s10758-017-9329-9**

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277-1288. **https://doi.org/10.1177/1049732305276687**

James, R., Krause, K.-L., & Jennings, C. (2010). *The first year experience in Australian universities: Findings from 1994 to 2009*. University of Melbourne, Centre for the Study of Higher Education. **http://hdl.handle.net/10072/134870**

Krause, K-L. (2005, September). *Understanding and promoting student engagement in university learning communities* [Keynote address]. The James Cook University Symposium 2005. Sharing scholarship in learning and teaching: Engaging students. **http://melbourne-cshe.unimelb.edu.au/...**

Krause, K.-L., & Coates, H. (2008). Students' engagement in first-year university. *Assessment & Evaluation in Higher Education*, *33*(5), 493-505. **https://doi.org/10.1080/02602930701698892**

Krause, K.-L., Hartley, R., James, R., & McInnis, C. (2005). *The first year experience in Australian universities: Findings from a decade of national studies*. University of Melbourne, Centre for the Study of Higher Education. **http://melbourne-cshe.unimelb.edu.au/...**

Kregor, G., Breslin, M., & Fountain, W. (2012). Experience and beliefs of technology users at an Australian university: Keys to maximising e-learning potential. *Australasian Journal of Educational Technology*, *28*(8), 1382-1404. **https://doi.org/10.14742/ajet.777**

Laurillard, D., Oliver, M., Wasson, B., & Hoppe, U. (2009). Implementing technology-enhanced learning. In N. Balacheff, S. Ludvigsen, T. de Jong, A. Lazonder, & S. Barnes S. (Eds.), *Technology-enhanced learning* (pp. 289-306). Springer. **https://doi.org/10.1007/978-1-4020-9827-7_17**

Lawson, R., Taylor, T., Fallshaw, E., Summers, J., Kinash, S., French, E., & Angus-Leppan, T. (2013). *Hunters and gatherers: Strategies for curriculum mapping and data collection for assuring learning*. Department of Industry, Innovation, Science, Research and Tertiary Education, Office for Learning and Teaching. **http://researchrepository.murdoch.edu.au/...**

Liang, H.-N., & Sedig, K. (2010). Can interactive visualization tools engage and support pre-university students in exploring non-trivial mathematical concepts? *Computers & Education*, *54*(4), 972-991. **https://doi.org/10.1016/j.compedu.2009.10.001**

Margolis, E. (2007). *The visible curriculum*. Routledge.

Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development*, *50*(3), 43-59. **https://doi.org/10.1007/bf02505024**

Micheletto, M. J. (2011). Using audience response systems to encourage student engagement and reflection on ethical orientation and behavior. *Contemporary Issues in Education Research (CIER)*, *4*(10), 9-18. **https://doi.org/10.19030/cier.v4i10.5970**

Moogan, Y. J., Baron, S., & Harris, K. (1999). Decision-making behaviour of potential higher education students. *Higher Education Quarterly*, *53*(3), 211-228. **https://doi.org/10.1111/1468-2273.00127**

O'Neill, G., Donnelly, R., & Fitzmaurice, M. (2014). Supporting programme teams to develop sequencing in higher education curricula. *International Journal for Academic Development*, *19*(4), 268-280. **https://doi.org/10.1080/1360144X.2013.867266**

Oliver, B., Ferns, S., Whelan, B., & Lilly, L. (2010). Mapping the curriculum for quality enhancement: Refining a tool and processes for the purpose of curriculum renewal. In *Proceedings of the Australian Quality Forum 2010. Quality in uncertain times* (pp. 80-88). **http://hdl.handle.net/20.500.11937/26655**

Oliver, B., & Jorre de St Jorre, T. (2018). Graduate attributes for 2020 and beyond: Recommendations for Australian higher education providers. *Higher Education Research & Development*, *37*(4), 821-836. **https://doi.org/10.1080/07294360.2018.1446415**

Owen, S., Stupans, I., Ryan, G., Woulfe, J., & McKauge, L. (2011). *Outcomes-based planning, graduated descriptors and quality indicators for pharmacy experiental placements*. Australian Learning and Teaching Council. **http://ltr.edu.au/...**

Pajo, K., & Wallace, C. (2001). Barriers to the uptake of web-based technology by university teachers. *Journal of Distance Education*, *16*(1), 70-84. **http://ijede.ca/...**

Proserpio, L., & Gioia, D. A. (2007). Teaching the virtual generation. *Academy of Management Learning & Education*, *6*(1), 69-80. **https://doi.org/10.5465/amle.2007.24401703**

Reed, P. (2014). Staff experience and attitudes towards technology enhanced learning initiatives in one Faculty of Health & Life Sciences. *Research in Learning Technology*, *22*. **https://doi.org/10.3402/rlt.v22.22770**

Reilly, P. (2012). Understanding and teaching Generation Y. *English Teaching Forum*, *50*(1), 2-11. **http://eric.ed.gov/?id=EJ971235**

Stern, E., & Wall, S. (2018). The visible curriculum. In A. D. Peterkin & A. Skorzewska (Eds.), *Health Humanities in postgraduate medical education* (pp. 115-142). Oxford University Press.

Sumsion, J., & Goodfellow, J. (2004). Identifying generic skills through curriculum mapping: A critical evaluation. *Higher Education Research & Development*, *23*(3), 329-346. **https://doi.org/10.1080/0729436042000235436**

Tee, L. (2019). *Making curriculum visible: Engaging students in learning outcomes and career relevance through a multi-dimensional interactive map* [Final report]. Australian government, Department of Education and Training, Higher Education Group. **http://hdl.handle.net/20.500.11937/84238**

Tee, L., Ferns, S., & Hughes, J. D. (2018). The capabilities that count for early professional success in pharmacy: A case study of graduates, employer and course teaching team perspectives. *Journal of Teaching and Learning for Graduate Employability*, *9*(1), 23-40. **https://doi.org/10.21153/jtlge2018vol9no1art679**

Tee, L., Hattingh, L., Rodgers, K., Ferns, S., Chang, V., & Fyfe, S. (2015). MyCourseMap: An interactive visual map to increase curriculum transparency for university students and staff. In *Proceedings of the Australasian Society for Computers in Learning and Tertiary Education Conference* (pp. 285-296). **http://2015conference.ascilite.org/...**

Thomas, L. (2012). *Building student engagement and belonging in Higher Education at a time of change* [Final report]. Paul Hamlyn Foundation. **http://phf.org.uk/...**

Treleaven, L., & Voola, R. (2008). Integrating the development of graduate attributes through constructive alignment. *Journal of Marketing Education*, *30*(2), 160-173. **https://doi.org/10.1177/0273475308319352**

Trowler, V. (2010). *Student engagement literature review*. The Higher Education Academy. **http://www.advance-he.ac.uk/...**

Uchiyama, K. P., & Radin, J. L. (2009). Curriculum mapping in higher education: A vehicle for collaboration. *Innovative Higher Education*, *33*(4), 271-280. **https://doi.org/10.1007/s10755-008-9078-8**

Wijngaards-de Meij, L., & Merx, S. (2018). Improving curriculum alignment and achieving learning goals by making the curriculum visible. *International Journal for Academic Development*, *23*(3), 219-231. **https://doi.org/10.1080/1360144x.2018.1462187**