Framework for Curriculum Design: use of a design framework for first year curriculum

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Abstract

First year curriculum design should be intentional, cohesive, and supportive to initiate students into academic life and promote engagement and success in learning. This article discusses the process of design and the use of a framework to support planning for development, delivery, and assessment of learning in first year curriculum in a computing course and the subsequent achievement of students. It explores the development of subjects following the framework and shows the process used by academics to design and deliver subjects and reflects on the practice of design. Evidence of achievement is demonstrated through students’ academic results and through improved subject design across the first year of the course. The results show an increase in progress rates of students and improved quality of learning demonstrated through the achievement of improved grades. This article endeavours to share a process and framework used with evidence of improved progress rates and improved grades.

Introduction

The Student Transition and Retention (STAR) project in the Faculty of Business at Charles Sturt University (CSU) was approached with a number of premises in mind. Based on First Year Principles (Kift, 2009), first year curriculum should be designed to transition students into the academic environment and engage them in learning. Following this premise, the curriculum should be purposefully designed and a framework, based on Biggs’ constructive alignment (Biggs & Tang, 2011), was developed and applied to practice across the first year in a computing degree. The framework was designed in such a way to allow academics to see clear alignment between the objectives of the subject and the method of delivery and action of content. The premise of constructive alignment is based on the idea that students can construct their knowledge in alignment with the subject’s learning outcomes. Analysis of the subject’s alignment between objectives and assessment identifies knowledge and skills needed to be taught in order for the students to be able to demonstrate their learning based on the objectives. The analysis identifies gaps in content and delivery while noting what is already occurring in the subject.

Using an analytical framework assists in identifying how assessment aligns with the objectives and shows how skills and knowledge develop across the subject, particularly with the use of Bloom’s taxonomy to show cognitive dimensions mapped against knowledge dimensions (Krathwoll, 2002, pp. 214-216). In addition, assessment was evaluated for adherence to Assessment 2020 principles (Boud, 2010, pp. 2-3), and for relevance to student life, and the workplace. Included in the framework was: assessment mapping for types, timing and value of assessment, ensuring a range of assessment across the first year of the course; timing of assessment across the session; and the value of each assessment appropriate to the skill development and timing of the assessment. Each subject was also evaluated against Australian Qualification Framework (AQF) standards.
Design requires a process to identify elements that scaffold student learning and provide a framework to plan learning and teaching for a positive student outcome. A process of design and the application of a framework to support planning for development, delivery, and assessment of learning in first year curriculum in a computing course and the subsequent achievement of students are discussed. The problem first raised with the course under discussion in this paper was that student retention was low and attrition rates were high. In addition, students with a low socio-economic background and first in family to attend to university made up more than half the of the domestic student cohorts. The issues to be solved included retaining more students, improving the experiences of those retained, and improving the quality of learning of all students.

**Design approaches to learning and teaching in higher education**

An old adage, “fail to plan, plan to fail” encapsulates the problem of failing to plan learning. Design must be approached in an ordered way. A learning design is one of the ways that planning occurs and records evidence of content, delivery and assessment.

There are many online sources of information about learning design including John Biggs’s Constructive Alignment, (Biggs, 2008, p. 95), the Australian Flexible Learning Framework, (2008), UOW’s Learning Designs website, a product of the AUTC project on ICT-based learning designs (University of Wollongong, 2003), and nearly every university has pages on learning design or educational design. The First Year Principles (Kift, 2009, pp. 1-2) begin with the statement of intentional, first year curriculum design. Each one offers guidelines, frameworks or examples of learning designs to guide curriculum design. The literature often offers examples of learning design, such as the UOW’s learning designs site (University of Wollongong, 2003), simulation development for professional practice (Murdoch, Bushell, & Johnson, 2011, pp. 121-140), and the Australian Flexible Learning Framework (2008) but on searching the literature, it proved elusive of the rationale for using a framework. Biggs' use of a simple table format presented a guide to constructive alignment (Biggs & Tang, 2011, p. 156) with a clear rationale for learning designs. Further enhancements of this table added to the capabilities of the table for this project and are shown below.

<table>
<thead>
<tr>
<th>Subject Learning Outcomes</th>
<th>AQF</th>
<th>Level of thinking required in the objectives</th>
<th>Assessment meeting the subject learning outcome (description of how the assessment meets the learning objectives)</th>
<th>Learning experiences / activities that meet assessment requirements</th>
<th>Topics relating to the learning experiences</th>
</tr>
</thead>
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**Constructive alignment framework for design**

The literature also draws attention to the need for compliance to bodies such as the Tertiary Education Quality Standards Agency (TEQSA) or other accrediting professional bodies who demand satisfaction of standards before accreditation. The requirements to meet the Australian Qualifications Framework (AQF) have also placed demand on universities to ensure that their degrees are at an appropriate standard for each qualification level (Australian Qualifications Framework, 2013). Compliance with these standards can provide students and other stakeholders with the assurance of knowing that the course they are undertaking is of sufficient quality for the level of the degree (Harman & Meek, 2000, p. 108). Casualisation is an issue at the forefront of staffing in higher education institutions. A high level of casual academic staff teach in universities (May, Strachan , Broadbent, & Peetz, 2011) (Halcomb,
Andrew, Peters, Salamonson, & Jackson, 2009), (Percy, & Beaumont, 2008) with consequent lack of involvement in the design process prior to teaching and at times, poor handover practices of existing subjects. Part of the approach utilised in the STAR project was designed to mitigate that problem by developing a sustainable approach to subject delivery by documenting the design approach and delivery to students along with the rationale for the design and information about the subject. This has multiple effects as the casual lecturer is better able to understand the history of the subject and the rationale for its teaching design as well as that of the assessment process within the subject. In addition, the development of a framework can help develop coherence in the delivery and learning of multiple cohorts, each usually delivered in different cities across the country or the world.

There are a number of models identified in the literature that are used in educational design for learning such as the ADDIE process, first developed in the mid 1970’s, SOLO taxonomy developed by John Biggs, or the Universal Design for Learning (UDL) from the National Center on Universal Design for Learning to name a few. Each of these models outlines different methods of design but primarily each has the same purpose, to assist teachers in their development of learning experiences for students and provide a framework to support that design. Although these and others have been available to higher education professionals for many years, it was apparent that they were not put into practice generally in the degree under discussion here. The course at the focus of this article was chosen for its high incidence of low socioeconomic students, first in family to attend university, and high failure rates. It was apparent from talking with the lecturers that there was little knowledge of frameworks or guidelines and little application of them to the design of learning.

Experience as a learning designer had showed that while academics were often willing to try new technologies or products, the process of getting started or incorporating the innovation was often quite difficult. In addition, there was often resistance to planning, or design, as it is seen as taking up research time or unnecessary, or even that design is being imposed on the academic staff (Bates, 2012, para 13). Initially, an ad hoc approach to developing resources was mostly implemented by time poor academics sometimes resulting in poorly designed and unimaginative learning activities for students. Formative evaluation was undertaken to gain specific understanding of the resistance, and anecdotal evidence by lecturers to the designer often indicated that they did not wish to engage fully with the design process due to time constraints. Over time, this resistance was reduced with academics asking for further assistance to improve their subjects as they saw improvements in grades achieved by students. In addition, academics then instituted the approach described in this paper to subjects in other courses citing that the process made sense and assisted them in their design to improve student learning.

Change is inevitable in higher education and should be carefully managed (Levy, 2003, p. para 5), (Kotter & Schlesinger, 2008, p. 130). The approach undertaken after review of the literature on learning designs was to develop a framework to make it easier to identify, through analysis, gaps in existing materials and activities and recognise where to insert improved resources and scaffolding to support first year students in their transition to university. As with any change in practice, there was resistance from some lecturers so the designer put effort into making the process as uncomplicated and transparent as possible and to engage them in the process.

The design process in action
The course described in this paper is a bachelor level information technology course with a common first year, and four specialisations available to students in the second and third years. The first year consists of seven core subjects. These subjects were identified and analysed for the purpose of implementing the process of constructive alignment for an approach to design. A whole course approach was taken so all first year subjects were considered in their relationship to one another and mapped to identify content, skills and assessment across all subjects in the first year of the course. All subjects were identified and relationships drawn between the subjects to acknowledge how each fitted into the overall design of the course.

Initially subjects were mapped using Excel spreadsheets to document the components of the subject and chart subject information such as learning objectives, level of thinking required, assessment, learning experiences and content knowledge. Analysis of this information against AQF standards and Bloom’s taxonomy using Krathwoll and Anderson’s knowledge dimensions (Krathwoll, 2002, p. 214) identified the capacity of the subject to meet an adequate level of thinking and promotion of skill development suitable for first year throughout the subject delivery scaffolding students in their transition to university. Analysis of each objective was undertaken to identify where they met the knowledge dimensions identified by Krathwoll and mapped against Bloom’s taxonomy to develop an understanding of what students were being asked to do so that appropriate learning activities could be created, designed to suit the development of skills and knowledge throughout the first year, across the subject and across the first year of the course. This enabled the lecturer to identify what skills and knowledge needed to be taught and when it was needed in order to provide the scaffolding needed by first year students entering a new learning environment. The principles of constructive alignment (Biggs, 2008, pp. 191-191) were applied to ensure that assessment and learning activities were aligned to subject learning objectives and to guide the design of learning experiences. This analysis raised awareness of the activities that students were expected to action in the learning process and identified what additional resources were needed or scaffolding could be provided for additional support for transitioning students.

Assessment was examined in this process and adjustments made to include stepped assessment for developing skills where needed and appropriate timing and values applied to the tasks. Tasks were examined for relevance to practice and students’ lives to help their understanding. In all analysis, reference was made to the First Year Experience principles to measure how actions taken incorporated them. Diversity of student background and prior knowledge was considered, and development of a range of resource types and delivery mechanisms was encouraged. Student engagement was to be stimulated through the design of activities to initiate them into tertiary education and to develop their academic skills needed in their future academic and professional lives.

**Analytical Framework**

The framework consisted of a linear analytical table to record the subject objectives, assessment, and teaching and learning activities that assisted in ascertaining the skill development and the knowledge required to apply learning to practice and assessment through alignment across the table. This table ensured clarity around experiences the students underwent and the resources and scaffolding required to support students through their learning. An overview of all core subjects was undertaken to understand what knowledge, skills and application of knowledge and skills was required of students.

**Assessment Analysis and Design**
Thorough analysis of a subject using the process of constructive alignment demonstrates every element of the subject. The level of thinking required for each objective was identified as it became apparent that the levels of thinking required for assessment or learning activities did not always align with those of the learning objective. This process resulted in the rewrite of some learning objectives to improve clarity and improve the overall aim of the subject in terms of skill and knowledge development. The purpose in this process was to ensure that the first year curriculum was designed to develop academic and professional skills (Kift, 2009, pp. 2-3).

Analysis of assessment content ensured that the assessment aligned with the objective and the learning experiences detailed. This included contents of lectures, activities undertaken in lectures and tutorials, resources to support the activities, and any online components providing a blended and flexible approach. In short, any resource, activity or action used in teaching was documented and evaluated to determine its use in the subject and direct relationship to what the students needed to learn. Gaps in support were identified and materials improved, removed or added for additional scaffolding. Assessment types across the first year of the course were identified to ensure that students had a range of different assessment experiences to develop the skills they would need in later years of the course. Poor development of foundation skills can lead to poor performance in consequent years with a decrease in retention over the whole course. This particular course consists of seven core subjects, which make up the basic skills and knowledge for more specialised streams. Assessment was mapped and the maps shared amongst the responsible academics to plan for a coordinated approach to assessment timing across the four and three subjects of each semester respectively. The assessment was staggered in timing to reduce stress on the first year students in their transition to university. In addition, early low stakes assessment was introduced to identify at risk students, allow student to monitor their own progress and to receive feedback from the lecturer early in the course to assist in transitioning them into the academic culture of assessment. In one programming subject, assessment was broken down from the existing two major assessment pieces into smaller components so students received feedback on earlier steps in programming before continuing on to more complex assessment. This same procedure also occurred in a database subject which had significant failure rates in earlier cohorts to better scaffold students through the database design process. In both cases, significant improvement in overall grade achievement as well as progress rates ensued.

**Developing a team approach to design**

Subject lecturers were encouraged to work in teams to design and develop assessment and learning materials to ensure a high quality of materials and so all cohorts received the same materials and assessment. This has encouraged professional development in principles of first year experience and subject development best suited to first year based on those principles. The Academic Lead of the STAR program undertook evaluation at the end of each session by evaluating feedback from lecturers and discussion of the results from students. Redesign of the subjects was based on the evaluation and feedback from online evaluation from students. In 2012, the majority of subjects in the first year moved to online and flexible delivery as all are taught to both internal and distance education students in multiple cohorts. In doing so, lecturers were encouraged to think about the design of the online environment and to deliver in a consistent method and appearance to provide a familiar and constant experience for students (Kift, 2009, p. 1).

**Documentation for continuity and cohesive experiences**
As there is high casualization in higher education at present, a subject summary information sheet is being produced to improve handover procedures to casual staff. This will outline design details, technology used, assessment types and reasons for assessment, delivery methods and teaching information. This document is felt to provide more information for the casual lecturers so that students have the opportunity for a positive and consistent experience with all lecturers. In addition, a set of first year standards is being developed based on the skills and knowledge required by the course which meets accreditation standards of the AQF and the Australian Computer Society (ACS). This provides a measure of the standard students can be expected to meet at the end of the first year and may provide them guidance for their first year as well as giving academics an understanding of all the skills and knowledge required and consequently some streamlining of the course content.

**Results**

The results of a designed approach to curriculum improvement for first year experience have been multiple. Not only is there improved documentation of each subject, there is an increased awareness of subject content, assessment and delivery of materials to students, both within the subject and across the course. The documentation through the constructive alignment table raised awareness when lecturers became more cognizant of what was actually being delivered to students as well as the learning activities that the students were experiencing. Because of this awareness, a broader range of scaffolding through the development of online activities, resources and classroom activities are available to students. For example, students now undertake a series of practical exercises leading to mastery of difficult concepts and practices in programming with regular formative and summative feedback to inform them of issues in their learning. An introductory subject to computing now incorporates practical computing calculations with worked examples and linked to online examples to show relevance to the real world. Some academics have commented on a greater awareness of design and apply the same principles to other subjects they teach. As a result, two of the subjects in this course have now been redesigned with a subject team approach working together to ensure a better approach for students, a reduction in overlap of the subject and an improvement in the consistency of the subject. Academics have acknowledged that it is better to work together to design the subjects to mesh in improve delivery and learning for the students.

In addition, assessment now offers a greater range of assessment types to students. Assessments are broken down into more manageable portions, which assist students to gain the knowledge they need with adequate feedback at appropriate times throughout the session. Assessment timing is now considered in view of all the subjects the students undertake in the first and second sessions of the first year, which assists in relieving the pressure on students still transitioning to academic life. Where prior to this program, programming students had a higher failure rate, now that assessment consists of five smaller stepped assessment, allowing students to gain mastery of each required step before progressing to the next, there is an increased level of achievement and a reduced failure rate in the subject. Anecdotally, student comments indicate that the design of subjects allowing them to build their knowledge slowly with frequent assessment is a preferred method.

Two of the seven core subjects in the first year have shown significant changes in progress rates in the first two years of the project for the domestic student cohort studied with increases of 18% and 13% respectively. Another two have had reasonable improvements of 8% average progress rates while the remaining three have not shown positive results to date. These results are attributed in part to the redesign and delivery of the subject, and the
redesign of the assessment tasks. Other variables have not been considered at this point, although it is acknowledged that the quality of students entering the cohorts and their previous experience will vary and have impact on the results.

Some improvement in grade achievement has occurred in six subjects. These subjects showed significant improvements in the achievement of High Distinction by up to 9% in six out of seven subjects and up to 8% in Distinction grades in three subjects. There has been a corresponding decrease in Credit and Pass grades in these subjects and four have shown a decrease in fail rates of up to 9%. Three of the subjects have had the most and earliest change effected on them with the remaining subjects having smaller increments of change over the past two years. Further design is underway in all subjects in an effort to improve achievement across the first year of the course, to increase the retention of students, and to improve the scaffolding, delivery of subjects, the interactivity and engagement of students, particularly in the first year of the degree. Evaluation of the effectiveness of the process has been conducted through monitoring of the progress rates, attrition rates and the achievement of grade levels. A further research project is currently underway to gain the student voice to inform further developments.

**Discussion**

A confirmation of the positive effect of the above results is the significant improvement of grade level achievement of students in the first year of the degree as indicated above. The documentation of well-designed cohesive units of work that form the first year of the course which incorporate adequate scaffolding and support for first year students, and in particular, the students with a low socioeconomic status (LSES) and those who have little cultural capital upon entering academic life.

Through using a framework to document the constructive alignment, a clear picture emerged of how the subjects fit together, and the Academics now have the capacity to communicate this to students, which increases their understanding of the course as a whole and why they are studying these particular subjects. This may also in the future enable the design of subjects with more interrelationships and cohesion. It is apparent from discussion with the academics developing the subjects that the information gathered through analysis is informing their subject development, identifying the learning activities occurring across all cohorts and informing them of where additional scaffolding of student learning can be applied. It is also clear from the discussions around subject design that increased understanding of the pedagogical design process is occurring with resulting changes in subject design. In addition, the development of first year standards will further enhance the
design process, ensuring a cohesive experience for students across the degree. Enthusiasm for the development of clearly articulated first year standards is apparent from subject teams and from students, who indicate that a consistent approach to similar types of assessment would be appreciated.

With the introduction of different design methods, issues emerged in the conception and carriage of the design. It was clear that professional development was needed in constructive alignment, AQF standards, levels of thinking development using Krathwoll and Anderson’s (Krathwoll, 2002, p. 214) knowledge dimensions of Bloom’s taxonomy, and the need for planning and the process used. Professional development was offered in a range of these areas through one on one interactions, group sessions and supported by the Faculty at School retreats and Faculty Learning and Teaching symposiums. There has also been greater emphasis on the importance of teaching and learning which supported this focus. However, it should be noted that for any process to succeed that there must be more than nominal support. Time and practical support to design and develop subjects, particularly when developing for a blended approach, is needed. Culture change is a slow process and needs sustained support from both the Faculty and the University (Fullan, 2007). Charles Sturt University (CSU) supports teaching and learning through development of a University Strategy (2011-2015) (Charles Sturt University, 2011, p. 2) to identify commitments for the student experience.

A strong dependence on textbooks was another issue as encouraging a design process that concentrated on student activity and demonstration of learning rather than reading of the text and completing review questions was a difficult concept and continues to be. However, most lecturers have engaged with this process, albeit slowly, and have gained a greater understanding of assessment and subject design requirements in the constructive alignment process. Regular professional development and supporting information online have helped this process as across the faculty, academics are now required to show the alignment of their subject learning objectives to assessment and learning practices.

Early low stakes assessment has raised discussion from some lecturers as finding the right early assessment has proved elusive in some subjects. Evidence from tracking student results shows that early assessment does not always indicate at risk students, as some students completed the early assessment and submitted no others. This has led to resistance to early assessment from some lecturers as they feel it adds to their workload with insignificant benefits.

**Conclusion**

The conclusion drawn from this project is that curriculum needs design, and a framework can offer a practical method to assist in organising this. It provides a clear view of what is taught, what is assessed and what is missing. The results demonstrate that improved design can result from using the framework when principles of design and first year experiences are applied. In addition, the careful planning of a stepped process that develops student skill and knowledge can result in improved quality of learning, evidenced by student results. Analysis of subject content, delivery and assessment can lead to a clear picture of current student experience leading to improved practices in future iterations. As well, the stronger collegial practices in designing and delivering learning and the application of principles applied to other subjects are strong indicators of a successful process.

**References**


Framework for Curriculum Design: use of a design framework for first year curriculum, refereed paper.