

Learning activity design and scaffolding to promote sustainable changes in student's goal orientation

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Abstract: *While previous research has shown that assessments impact how students view the curriculum and influences what they learn and how they learn, the way that students approach their learning is also affected by aspects of the teaching and learning environment. Two different approaches adopted by students are mastery and performance goal orientation. Students with a performance goal orientation plan their approach to achieve a certain grade. This might be a high distinction or simply a pass but they do what has to be done to achieve this grade sometimes with little evaluation of what they have actually learnt. Conversely, mastery students seek to learn as much as possible, they strive to deeply understand the subject material and be able to apply it in different contexts. In this paper we explore the impact of a flipped instruction design and scaffolding to promote sustainable changes towards a mastery goal orientation.*

Introduction

While previous research has shown that assessments impact how students view the curriculum and influences what they learn and how they learn, the way that students approach their learning is directly affected by aspects of the teaching and learning environment (Ramsden, 2003).

Flipped instruction is a form of blended learning that replaces traditional transmission-based lectures with more participative, interactive and collaborative learning opportunities. Flipping is more than changing the method of content transmission but rather an opportunity to improve student learning through the provision of in and out of class discussion, collaboration, self, peer and expert evaluation and feedback. Compared to the traditional lecture format the blended learning in-class activities create an opportunity for academics to provide more dynamic and thus specific feedback to students, and to receive feedback from students about how they learn, the activities they are undertaking, and what they don't yet understand. Furthermore, the discussion/conversations within the activities assist students to develop a language enabling them to articulate, discuss, build and evaluate their learning. In previous studies (Willey & Gardner 2013, 2014 a & b) we found that flipped instruction required many students to take more responsibility for their own learning. For many this challenged the approach to learning they had previously used.

Goal orientation theory has been used to describe approaches to learning and explains how different approaches are linked to academic achievement and learning behaviours (e.g. Elliot 1999, Linnenbrink-Garcia, Tyson & Patall, 2008, Kaplan & Maehr 2007, Kaplan & Flum 2010, Wirthwein *et al* 2013). Using this perspective, researchers argue that students approach a learning situation with one of two types of goal orientations, either mastery or performance.

Mastery oriented students are learning-focussed and their attitudes and behaviour support mastery of the skill/concepts involved. For these students, mistakes are seen as opportunities to learn and they will ask for help as they do not regard this as a sign of weakness (Svinicki 2004). They also demonstrate more perseverance with difficult tasks, deep learning strategies, and self-regulated learning (Kaplan & Flum, 2010). Learning environments that promote mastery goal orientation are those that require deep and complex thinking, include opportunities for students to explore problem-solving strategies individually and collaboratively, and value academic risk-taking and learning from mistakes (Kaplan & Flum, 2010).

Performance goals have been categorised as either performance-approach or performance-avoidance. Students with performance-approach goals work to satisfy themselves and demonstrate to others their high level of ability or competence. Conversely students with performance-avoidance goals work to avoid being seen as incompetent. Mastery and performance-approach goals have been linked to high academic achievement, while performance-avoidance goals are negatively correlated with achievement outcomes (Kaplan & Maehr 2007, Wirthwein et al 2013).

Although students may have a predisposition towards a particular goal orientation, Middleton, Kaplan and Midgley (2004) suggested that some students adopted different goal orientations when they moved to different learning environments. Klein, Noe and Wang (2006) found that *“maximising learning goal orientation appears to be beneficial for all instructional delivery methods but appears to be particularly important in ...blended-learning environments where learners have greater control over when and how learning occurs”*, and so this concept has particular relevance to the flipped instruction environment.

Although not using goal orientation constructs, studies have been undertaken to investigate whether changes in learning behaviour persist into subsequent semesters. Buchwitz *et al.* (2012) conducted a longitudinal study to investigate the effect of a learning intervention on the learning approaches students used in subsequent semesters studying biology. Their findings showed that: *“...learning to study actively, rather than just memorizing, was a major skill they had learned... Students’ responses included a number of specific examples, including doing problems, talking to others, and reviewing one’s own performance...”* (p.279). Learning these skills resulted in higher grades for these students. Ning and Downing (2010) found positive links between learning experience and study behaviour (characterised as deep or surface learning) in a study where final year undergraduate students were surveyed and surveyed again after 12 months. They found that a student’s learning experience exerted significant influence on subsequent study behaviour. This suggests that learning opportunities specifically designed to promote mastery learning may influence student study behaviour in subsequent semesters. In this paper we explore the impact of flipped instruction design and scaffolding in promoting sustainable movement towards mastery goal orientation.

Background

Previously we have discussed the importance of assessment design including its impact on student behaviour, self-efficacy and goal orientation and the importance of dialogue and feedback to learning. We have also discussed learner independence and argue that it is an academic’s responsibility to provide students with the opportunity to learn and to institute an assessment regime that provides assurance that students who pass the subject have met all the learning outcomes at least at a satisfactory level. We subsequently explored these themes in the context of a flipped learning environment.

In our study we aligned the performance oriented students with one of two categories, grade achievement or just pass. Grade achievement students aim to be competent enough to achieve the particular grade they are aiming for (whether high distinction, distinction or pass). For these students understanding of material is a means to an end, rather than an

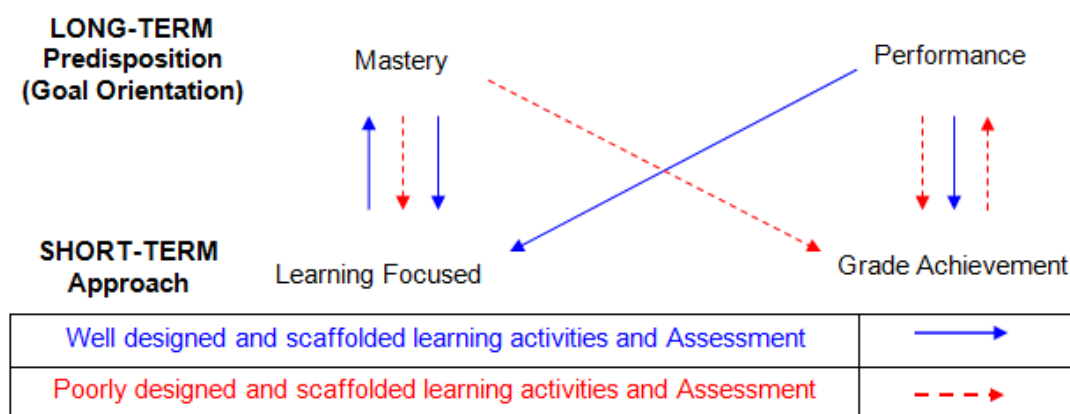
end in itself, and not necessarily a requirement. They are often satisfied with the capacity to mimic learning in assessable activities, or underutilise their capacity to learn focusing on doing what has to be done to achieve their desired grade often with little regard to what they have actually learnt. ‘Just pass’ students have performance-avoidance goals, being satisfied with passing as it both signifies competence and allows them to progress through their course. They differ from the grade achievement students in that they don't necessarily have the metacognitive or learning skills to achieve higher grades. Hence their achieved level of performance is often not a voluntary decision.

In contrast, learning mastery students approach a subject to learn as much as possible, they seek to deeply understand the subject material and be able to apply it in different contexts.

A student’s goal orientation will impact on how they engage with a learning opportunity. Figure 1 shows potential pathways of change in goal orientation as a result of the quality of the learning opportunity. We suggest that in the long term, performance-oriented students can be moved towards behaving like a mastery student through well designed and scaffolded learning opportunities and, in particular, appropriate and well-designed assessment.

The level of competency of grade achievement performance students allows an easier goal orientation transition. These transitions may be accompanied by a change in learning culture, an increase in either the perceived value of their learning opportunity or motivation to learn or discovering that learning can be satisfying. In contrast the ‘just pass’ performance students often have a metacognitive or learning skills deficit which needs to be addressed. Their transition to mastery, if at all, takes much longer as they acquire the skills required for the transition. These students could be considered as having to first transition to grade achievement performance students before they can change to mastery.

Conversely learning mastery students may revert to performance grade achievement in courses/programs where assessment and learning opportunities are poorly designed.



subject result). In an attempt to mitigate these effects we used a combination of each student's self-identification plus characteristic phrases in their open-ended survey responses, focus group and or interview dialogue, correlated with their criterion-referenced subject result as an indication of their academic achievement to classify them as taking a mastery, grade achievement or just pass performance-approach to their learning. In most cases this evidence placed students clearly in one category. In those instances where the categorisation was less clear students was placed in the category that had the most supporting evidence.

In previous studies we found the majority of participating students liked the flipped instruction approach more than the traditional lecture style. Their reasons included that it prompted them to work more consistently, provided ongoing evaluation of their learning, afforded opportunities to receive help in class and the flexibility to engage with material in their own time.

"I found it helpful doing the collaborative exercises with other students - I think everyone is more likely to ask questions (not as embarrassing as asking the lecturer during his lecture) and you learn a lot from being able to explain something to others and vice versa".

"...there were weekly assessments (formative) of my knowledge. This was an interactive way to test what I had learned in class the previous week. It also helped me prepare for the class approaching, allowing me to develop concise questions about gaps in my knowledge".

We found that mastery students worked more consistently and regularly, enthusiastically engaging in both the summative and formative activities. They took responsibility for not only their own learning but managing their time and found their own additional resources. They sought and received regular feedback from both their peers and the subject lecturer. They described an approach to learning that included consistent and regular study, feedback and review. They characterised their approach to learning as *"I learned it to the point where I can explain it."*

However, mastery students reported taking a more surface approach to learning and becoming more grade achievement orientated in subjects where one could do well in the assessments by simply practising and with only slight variations regurgitating the tutorial problems often from memory with limited understanding:

"... too many subjects it's too easy to get by, by just reading the lecture notes which means you don't really understand it but you can give the lecturers what they are looking for in the exam."

This also occurred in subjects that were poorly designed or regarded by the students as uninteresting.

Conversely grade achievement performance students would move towards a learning mastery approach in subjects they found interesting, perceived as valuable, were well designed (including learning activities aligned with subject learning outcomes and providing a variety of contexts for self and peer inquiry, application, evaluation and feedback) and had assessment tasks that required them to demonstrate substantial non-memory activities requiring application, judgement and interpretation.

We also found evidence to suggest that designing learning activities that introduced multiple perspectives promoted learning mastery in students (Willey & Gardner, 2013, 2014 a & b). An expert views a problem from multiple perspectives. In contrast a novice often uses only one approach or perspective to solve a problem. In Continuous Communications all topics were explored and problems solved using several different approaches (perspectives) including the frequency domain, time domain, mathematics or visually through an online laboratory or demonstration. Multiple perspectives help students to develop a complex knowledge base in relation to the subject area (Lasry, Mazur & Watkins, 2008) and also make visible aspects of the phenomenon/problem that may not be obvious when using a

single paradigm. Students reported that multiple perspectives helped them to develop a deeper understanding of subject concepts, to more easily understand difficult and / or non-intuitive concepts and that it motivated them to learn, commenting that:

Sometimes I “find it difficult to translate the maths into an understanding of what is actually going on, different perspectives allowed me to gain a rounder understanding of problems, which made them easier to understand”.

“...instead of just learning to solve problems the approach helped me develop a deeper understanding of the subject material”

We were now interested in investigating whether this positive learning experience has any impact on students future goal orientation. Students who undertook flipped instruction that had a deliberate focus and scaffolding to promote mastery learning were interviewed and surveyed six months later to identify any sustainable impacts on the way they approached their learning in subsequent semesters.

Approach

Continuous Communications (stage 6 of 8) is a Telecommunications subject within the Information and Communication Technologies (ICT) Engineering degree at the University of Technology, Sydney (UTS). In autumn semester 2014 the first author taught this subject for the second time. The subject content was delivered through a combination of a series of short videos (21 in total, approximately 5 minutes in length, 15 specific content, 6 in the form of online demonstrations, made on the instructor's PC using inexpensive software and a document camera), notes, inquiry based learning activities, tutorial exercises and a series of formative individual and collaborative assessments. The videos intentionally did not cover all the content but rather targeted the more difficult and/or threshold concepts within the subject. In addition, students were expected to consult one or more of the many textbooks available on the subject material.

Students were expected to undertake out of class preparation including a combination of readings, watching videos, individual quizzes and enquiry based laboratory preparation. The in-class participative activities included collaborative multiple attempt quizzes, enquiry based discovery activities, tutorial problem solving and discussions, laboratories and demonstrations.

The resources, instruction and in-class exercises explicitly introduced multiple perspectives in addressing the learning outcomes to assist students to overcome learning thresholds, and to develop professional identity and expertise while supporting them to transition from novice towards expert. Our learning design included numerous opportunities for students to practice and evaluate the impact of applying multiple perspectives to situations and problems.

The class was small, having only 21 students and, although senior undergraduate students, all were undertaking flipped instruction for the first time. After institutional ethics approval, students were invited to complete an online survey consisting of a number of Likert scale multiple-choice and free response questions and subsequently to be interviewed.

Discussion and Results

Being conducted six months after students had completed the subject in question and just before their three-month summer break it was difficult to get students to participate in the interview process. Hence while seven of the 21 students who had undertaken the subject volunteered to complete the survey only one agreed to a follow-up interview. Given that we were only able to conduct one follow-up interview the results presented in this paper cannot be considered robust, however, they do suggest that learning activities with a deliberate

focus and scaffolding to promote a mastery approach have at least in the medium-term a positive impact on the way students approach their future learning.

All 7 participants who completed the survey agreed they worked more consistently in Continuous Communications than in most of their previous subjects; however they commented that in addition to the instruction format that provided opportunities to practice, discuss and receive feedback in class the threshold exam contributed significantly to their motivation for learning (Willey & Gardner 2012). Their reasons for working more consistently included:

“...there were weekly assessments (formative) of my knowledge. This was an interactive way to test what I had learned in class the previous week. It also helped me prepare for the class approaching, allowing me to develop concise questions about gaps in my knowledge”.

“I knew I had to or I would be overwhelmed with the content later in the course, and also because the format meant that I was motivated to complete the quizzes (formative) regularly and therefore stay on top of the material”.

Goal orientation

Six of the seven students reported that the experience of viewing problems from multiple perspectives as a way of deepening their learning had such an impact that they tried to apply it in the subjects they undertook in the following semester even though it wasn't a requirement.

An example was in their design class which two of the responding students undertook. They described approaching their design in the early stages by deliberately seeking out different perspectives and views to help them achieve a broader understanding of the problem at hand.

“We talk about perspective when it comes to design. Each party involved has a different perspective of the same design (be it a Phone ...etc). The perspectives showed different features of the phone, but” also *“emphasized that when we look at things from multiple perspectives we gain a better understanding of it”.*

Students were specifically asked whether their experience of flipped learning and using multiple perspectives in Continuous Communications the previous semester had any impact on how they studied the material in their subjects this semester. Three students reported that they did less rote learning and tried to understand the material, two said that they worked more consistently instead of just studying as assessments were due, while another student said they made a conscious effort to keep up the good study habits they had developed.

One student said that it had no impact on their studies this semester as the way they were taught and the assessments used meant they could get the grade they wanted without a deep understanding of the subject material. Volunteering that in their *“other subjects ... that completing assessments when they arise will result in a decent grade”.*

Analysing the information with respect to a student's goal orientation (reported in Table 1) indicates that the mastery students' experience in Continuous Communications had an impact on their approach to learning in the following semester's subjects. One mastery student reported that they worked more consistently while the other said they did less rote learning and tried to understand the material (it is interesting that a mastery student saw rote learning as a valid way of learning, even if only applied to memorising formulae rather than being able to derive them or understand their derivation). These results are not unexpected given that mastery students by nature are learning-focussed and their attitudes and behaviour support mastery of the skill/concepts involved. For the mastery students the main contribution of Continuous Communications appears to be that it highlighted the benefits of

using multiple perspectives to improve understanding in particular, of difficult concepts and an appreciation of the benefits of dialogue and challenging each other's ideas.

Table 1: Mastery and performance students' responses to the impact of the approach used in Continuous Communications on their studies this semester.

| <i>Did your experience of flipped learning and using multiple perspectives in Continuous Communications have any impact on how you studied the material in your subjects this semester?</i> | Mastery | Performance | |
|---|---------|-------------------|-----------|
| | | Grade Achievement | Just Pass |
| I did less rote learning and tried to understand the material | 1 | | 2 |
| I worked more consistently instead of just studying as assessments were due | 1 | 1 | |
| I kept up some of the good study habits I developed | | | 1 |
| The way the subjects were taught and the assessments used meant that I could get the grade I wanted without a deep understanding of the subject material. | | 1 | |

Similarly the mastery student who was interviewed reported applying the approaches learnt in Continuous Communications to their subjects in the following semester including:

- Consistently working throughout the semester,
- Engaging in dialogue with other learners, taking the initiative to find students to work in a small group in each subject recreating the small group/peer learning experience of Continuous Communications. They commented how much teaching other students helped them learn “especially if I don't really know it” with the act of explaining the concepts helping them identify what parts they didn't yet understand, and
- Using multiple perspectives in problem-solving.

Hence the learning experience of Continuous Communications provided the mastery students with additional approaches to learning to support those they already use to achieve their mastery objective.

Similarly, all three of the ‘just pass’ performance students reported that their Continuous Communications experience had a positive impact on their current approach to learning. While you would not describe their new approach as mastery there was a concerted effort to spend more time on task (learning/studying) and to use methods and approaches other than rote learning and repetitive practice to achieve a better understanding of the subject material. Hence they were transitioning to grade achievement.

At first glance the comparison between the two grade achievement performance students looks more interesting with one saying that their experience in Continuous Communications motivated them to work more consistently in the following semester subjects and the other saying that it had no impact at all.

The student that reported working more consistently in the current semester commented that it had become “*important for me to actually understand what I was doing, as I was able to pass (a previous subject de-identified for this paper) without really knowing a lot of what was happening*”. This comment shows some movement towards mastery goal orientation in that they are valuing what they had learnt rather than focusing on what was required to achieve the grade they desired. However if one was to analyse their other comments, you could reasonably take an alternative view. For example in reference to Continuous Communications the student said “*I felt motivated to get a good grasp on everything, and I didn't feel like I wasted my time going over material that wouldn't really be necessary to complete the subject*”. However they commented that in other subjects that this is definitely

not the case *“as some of the material will be introduced but not tested very heavily, or it is easy to complete that particular subject requirement through an easier assessment task rather than an exam”* and *“I know that I didn’t know everything required for all my subjects towards the end of the semester, but for some cases that was because I had completed an assignment regarding a particular topic and knew it wouldn’t be tested again”*.

These comments could be interpreted in two ways. Firstly, that the student normally has a performance orientation but when assessment design, methods and the learning opportunity are of high quality (as they have stated they found in Continuous Communications) they move towards a mastery orientation approach.

Alternatively, you could reason that the student normally has a mastery focus and hence they adopted this approach in Continuous Communications but when assessment design, methods and learning opportunities are of poor quality they reverted to a performance orientation approach.

In contrast the student who reported no impact on their approach to learning this semester has more clearly a performance focus. While commenting quite articulately that their learning experience in Continuous Communications was positive, *“I worked more consistently because there were weekly assessments (formative) of my knowledge. This was an interactive way to test what I had learned in class the previous week. It also helped me prepare for the class approaching, allowing me to develop concise questions about gaps in my knowledge”*, in describing their approach to study in the following semester they commented that:

“There is one subject that ... there is no time to ask questions individually, nor is the prep work re-visited in class as it was in Continuous Communications. If there was more incentive to complete the prep work for this subject (other than a minute percentage of my final mark) I would have taken the liberty of completing it. I would have preferred a setup where we prepare before class, bring questions to class and discuss them with peers and the tutor”; and

“My other subjects are such that completing assessments when they arise will result in a decent grade” and *“due to the fact that assessments are few and far between with most of my current subjects, there are times where I go weeks without opening a book. This has started to become obvious with finals approaching”*.

The fact that this student’s goal orientation did not change may be influenced by the fact that they also said they were *“losing interest in Engineering due to the length of my degree”*.

Summary

When students experienced a flipped instruction design including viewing learning from multiple perspectives and scaffolding aimed at promoting a mastery learning approach in the subsequent semester their response depended on their goal orientation.

Mastery students kept their mastery approach while adopting a number of newly experienced approaches to learning to support those they already used to achieve their mastery objective.

Grade achievement performance students adopted a mastery approach when the subject was well designed, interesting and perceived to be valuable but reverted to a performance approach where the learning opportunities were of poor design. While ‘just pass’ performance students made changes to their learning approach, they lacked the capacity at least at this stage, to take a mastery approach to their learning.

These findings align with our previous studies and support the model proposed in Figure 1. While most students reported adopting learning approaches experienced in Continuous Communications to their studies in the subsequent semester, because of the limited nature

of this study there is insufficient evidence to definitively find sustainable changes in a student's goal orientation towards mastery.

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