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### Concepts of ability and their effect on approaches to learning and motivational orientation

Romy Lawson

*University of Wollongong*, [romy@uow.edu.au](mailto:romy@uow.edu.au)

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## Concepts of ability and their effect on approaches to learning and motivational orientation

### Abstract

There are a wide variety of experiences, psychological attributes, beliefs, prior knowledge and skills that students enter a learning situation with, that have been acknowledged (Biggs, 1999). They also enter with a range of expectations about their learning (Prosser and Trigwell, 1999). For example, the value that students' place on the learning experience will have an impact on their motivational orientation during their learning (James, 1892). Their self-efficacy will also affect their learning behaviours, with low self-esteem and motivation leading to lack of effort and persistence (Bandura, 1986). The concept of ability (whether it is fixed or changeable), is a belief that has been shown to impact on a learner's behaviour through persistence, effort, and motivation (Dweck, 1999), but no work had been conducted about the effect concepts of ability have on students' approaches to learning. This study explores the relationships between HE students' concepts of ability and motivational orientation, examining whether these factors are related to the approach students take to their learning. It then goes on to explore whether concepts of ability can be influenced by the approach taken to teaching. The implications for educators are discussed in the light of the findings.

### Keywords

orientation, motivational, learning, ability, approaches, concepts, effect, their

### Disciplines

Arts and Humanities | Social and Behavioral Sciences

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## Concepts of Ability and their Effect on Approaches to Learning and Motivational Orientation

R J Lawson

University of Technology Sydney

PO Box 123, NSW 2007, Australia

romy.lawson@uts.edu.au

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### **Abstract**

There are a wide variety of experiences, psychological attributes, beliefs, prior knowledge and skills that students enter a learning situation with, that have been acknowledged (Biggs, 1999). They also enter with a range of expectations about their learning (Prosser and Trigwell, 1999). For example, the value that students' place on the learning experience will have an impact on their motivational orientation during their learning (James, 1892). Their self-efficacy will also affect their learning behaviours, with low self-esteem and motivation leading to lack of effort and persistence (Bandura, 1986). The concept of ability (whether it is fixed or changeable), is a belief that has been shown to impact on a learner's behaviour through persistence, effort, and motivation (Dweck, 1999), but no work had been conducted about the effect concepts of ability have on students' approaches to learning. This study explores the relationships between HE students' concepts of ability and motivational orientation, examining whether these factors are related to the approach students take to their learning. It then goes on to explore whether concepts of ability can be influenced by the approach taken to teaching. The implications for educators are discussed in the light of the findings.

There are a wide variety of experiences, psychological attributes, beliefs, prior knowledge and skills that students enter a learning situation with, that have been acknowledged (Biggs, 1999). They also enter with a range of expectations about their learning (Prosser and Trigwell, 1999). For example, the value that students' place on the learning experience will have an impact on their motivational orientation during their learning (James, 1892). Their self-efficacy will also affect their learning behaviours, with low self-esteem and motivation leading to lack of effort and persistence (Bandura, 1986). The concept of ability (whether it is fixed or changeable), is a belief that has been shown to impact on a learner's behaviour through persistence, effort, and motivation (Dweck, 1999), but no work had been conducted about the effect concepts of ability have on students' approaches to learning. This study explores the relationships between HE students' concepts of ability and motivational orientation, examining whether these factors are related to the approach students take to their

learning. It then goes on to explore whether concepts of ability can be influenced by the approach taken to teaching. The implications for educators are discussed in the light of the findings.

**Keywords:** Concepts of ability, approaches to learning, motivational orientation.

## 1. Introduction

Individuals develop beliefs that structure their world. These individual beliefs or meaning systems impact how the person feels, thinks, and acts in each situation (Dweck, 1999; Piaget et al., 1991), and have been recognised as an important influence on students' thinking. One aspect of the meaning system that must be examined in questioning these beliefs is the individual's concept of ability. This concept can be examined under two frameworks: fixed ability and incremental ability.

Fixed ability (or entity belief) is a concept whereby ability is understood as a fixed trait. Those holding this conceptual definition of ability believe that people have a certain amount of ability, and nothing can be done to change that amount (Bandura and Dweck, 1985; Dweck and Legget, 1988). The second framework is the concept of malleable ability (or incremental belief). This is a belief that ability levels are cultivated through learning, and that these levels can be increased through effort (Dweck and Leggett, 1988). People who hold this concept do not deny that there are differences in individuals' ability levels, but perceive that everyone can improve their personal level through guided effort (Binet, 1909; Nicholls, 1978; 1984; Mueller and Dweck, 1998).

These two frameworks are seen as independent of each other, rather than on a continuum, and are conceptualised as having an orthogonal relationship (Biddle, 1997). This means that individuals may score high on both incremental and fixed ability when measured, which appears contradictory. Although people's fixed concepts may determine the limits of their ability (e.g., I am capable of being a 2:1 student), they can apply an incremental concept to their learning within these capabilities (e.g., if I study hard I will be able to improve my research skills to obtain a high 2:1 grade in my dissertation).

Both of the concepts of ability have repercussions for learners. Fixed ability students with high ability levels may worry about the amount of ability they possess and how they can demonstrate this to their peers (Sorich and Dweck, 1999). Therefore, in order to be able to maintain an appearance of competence, learners with fixed concepts are more likely to choose easy, low-effort tasks which they can achieve easily so they can be seen as able by those around them (Dweck and Bempechat, 1983). This means that challenges are seen as a potential threat to self-esteem, in so much as those holding an entity theory of ability may avoid learning opportunities if those opportunities are likely to show inadequacies (Stone, 1998). Boosting self-esteem can encourage these vulnerabilities, with praise for ability fostering an entity theory.

Holding a high incremental concept of ability makes students want to learn. In contrast to those with fixed concepts, these learners are not deterred by failure or by the perceptions of their peers, but favour opportunities to learn and develop (Sorich and Dweck, 1999). This is true even when the learner's confidence levels are low; they will still thrive on challenge (Stone, 1998; Henderson and Dweck, 1990), with self-esteem raised by effort and a feeling that learning has been achieved.

Dweck (1998) observed that many talented students do not seek challenges. She noticed that they sometimes struggle to cope with failures and question, if not condemn their ability, when faced with setbacks. However, many less-accomplished students however were not affected at all by failures and continued to seek challenges even after setbacks. This led Dweck to believe that these behaviours were not the result of actual ability levels. With her colleagues, she went on to identify two reactions to failure. These were helplessness and mastery-oriented patterns (Dweck, 1998). Students show helplessness reactions when they believe they have no control over the situation. It was proposed that this belief is associated with a fixed concept of ability, or concerns about their competences. On the other hand, mastery-oriented patterns were demonstrated when students remained focused on their goals, believing they could achieve despite any current difficulties.

Elliot and Dweck (1988) suggested that those students who adopt a helplessness approach and those who implement mastery-oriented patterns set different types of goals (see also Eccles and Wigfield, 2002; Covington, 2000). Two types of achievement goals were linked to these two different patterns. Performance goals focus on positive judgements about competence and avoid negative ones. This type of goal is often found when students are concerned with their level of ability. They need to appear capable to both themselves and others, and avoid looking unintelligent. This type of student will play it safe to avoid failure, or select harder tasks in which they are confident they can succeed, but will be motivated to impress others, rather than to learn (Roeser, Midgley and Urdan, 1996).

The second type of goal is a learning goal, which focuses on increasing competence levels. This goal has been seen to foster and sustain greater intrinsic motivation and higher interest levels in tasks (Duda, Fox, Biddle and Armstrong, 1992; Butler, 1987; Mueller and Dweck, 1998; Deci and Ryan, 1985). For example, Goudas, Biddle and Fox (1994) found that students appeared to be differentially motivated for different tasks. Those adopting task orientated/learning goals had greater intrinsic interest for the activities.

Both of these achievement goals are normal, with students striving to have their achievements validated as well as wanting to improve (Elliot and Church, 1997). However, in particular situations these two goals are often in conflict, and students have to opt for one goal or the other (Dweck, 1999). This is where differences can be found in students' behaviour in learning. Those students who select performance goals often fall into a helplessness response when they are failing, whereas those who

have learning goals do not feel their intellect is being threatened by failure, and so persist in mastering the task, trying out different strategies to achieve. Cury, Biddle, Sarrazin and Fambose's (1997) studies into participation in sporting tasks, showed that those who were ego/performance-involved had a weaker investment in the training situation than those who were task/learning-involved, regardless of the perception of their ability. Ego-involved pupils used an attributional bias to minimise the effect of effort on performance. A second study confirmed these results, by underlining the motivational deficits of ego involvement for those with a low perceived ability.

Bandura and Dweck (1985) proposed that the reason for this goal choice derives from the way students think about their ability. In a study comparing students' views on intelligence, they found a clear and significant relationship between students' concepts of ability and their motivation goal choices. The stronger the fixed concept, the more likely they were to choose a performance goal, whereas those with a strong incremental belief were more prone to learning goals and were more intrinsically motivated. The mastery-oriented pattern is self motivating, with those students who adopt it seeking more intrinsically oriented motivation, like challenges (Dweck, 1999).

Although most of these studies have used the task/ego categorisation of motivation, this present study investigates using the self-determination continuum, which utilises intrinsic and extrinsic motivational factors. However, these two ways of categorising have been considered to have overlapping characteristics. Ego orientation is linked to extrinsic motivation, in that behaviour is motivated and controlled by external factors, whereas task and intrinsic motivation are more internally managed.

The author is not aware of any empirical work to investigate the relationships between approaches to learning and concepts of ability; however, links have been made between approaches to learning and motivational orientation. A deep approach is characterised by an intrinsic motivational orientation, a surface approach by an extrinsic motivational orientation, and a strategic approach by achievement or competence motivation (Entwistle and Ramsden, 1983; Entwistle and Tait, 1994). Empirical studies that provide evidence for the associations between motivation and approaches to study generally focus on competence-motivation, rather than on the intrinsic-extrinsic motivation continuum.

Purdie and Hattie (1995) used motivation training techniques with secondary school students and compared changes in motivation with changes in approaches to study (surface, deep, and achieving). They found differential effects of this training on high or low achieving students, and suggest that these differences are associated with the self-perceptions of competence that are critical for expectations of achievement. In this study, it is also hypothesised that as an incremental concept of ability has been shown to be related to intrinsic motivation, and intrinsic motivation to a deep approach, there will be a relationship between incremental concept of ability and deep

approach to learning. Similarly, as entity concept of ability is related to extrinsic motivation, and extrinsic motivation to surface approaches to learning, it is anticipated that there will be a relationship between entity concept of ability and surface approach to learning.

Questions to be addressed in this study are whether these concepts of ability affect student intentions, and whether they can be manipulated by the teaching and learning environment. Dweck (1999) and Hong, Chiu, Dweck and Lin (1998) conducted studies with college students, and found that the teaching climate could strongly influence students' concepts of ability. However, a follow up study found that it was not only the teaching climate during classes that impacted on students' concepts of ability, but also the feedback about students' performance on the task that was provided that affected future learning behaviour. They found that students, who received positive feedback that they had performed well, were more likely to accept tutorial help to improve further, regardless of the teaching climate, indicating that they had an incremental concept of ability. Those who received negative or no feedback about their performance reacted differently to the offer of extra tutorial help, showing more fixed concepts of ability.

These studies by Dweck demonstrate that conceptions of ability can be manipulated through both the actual teaching climate and the type of feedback students receive, but these effects can be viewed as tenuous. Therefore, it is valid to continue this line of research to investigate these relationships further in HE students.

## 2. Methodology

The study involved 796 undergraduate students (366 Male, 430 Female; ages ranging from 18-49 years old, mean age of 22) studying a variety of subjects (15 modules, each taught by a different teacher) at the University of Wales, Bangor. All the participants provided data at the beginning of the module, and 361 students (142 Male, 219 Female; ages ranging from 18-49 years old, mean age of 23) provided repeat data at the end of the module.

The following validated questionnaires were used in this study:

- Motivational Orientation - The Academic Motivation Scale (AMS) (Vallerand, Pelletier, Blaise, Bri  re, Sen  cal and Valli  res, 1992)
- Approaches to Learning - The Revised Approaches to Study Inventory (RASI) (Entwistle and Tait, 1994)
- Concepts of Ability – Theories of Intelligence Scale (TIS) (Dweck, Chiu and Hong, 1995)
- Approaches to Teaching - Approaches to Teaching Inventory – ATI (Prosser and Trigwell, 1999).

Students were asked in the first lecture of their module to voluntarily complete a series of questionnaires (AMS, RASI, and TIS). This process was then repeated during the last two weeks of the 15 week module. The lecturers for each of these modules were also asked to complete the ATI at the beginning of the module.

### 3. Results

#### 3.1. Relationship between concepts of ability and approaches to learning.

Using data from the 796 undergraduates, Pearson Product Correlation analysis was used to examine the relationships between concepts of ability and approaches to learning at the beginning of the module. Table 1 shows the weak but significant results, which were generally consistent with expectations.

*Table 1: Correlations between Approaches to Learning and Concepts of Ability at the beginning of the module*

		Fixed Concept	Incremental Concept
Deep approach	Pearson Correlation	-.153(**)	.079
Surface approach	Pearson Correlation	.038	-.009
Strategic approach	Pearson Correlation	-.185(**)	.158(**)
Lack of Direction	Pearson Correlation	.292(**)	-.078
N=796			

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

#### 3.2. Relationship between concepts of ability and motivational orientation.

Pearson's Product Correlations were conducted on the 796 undergraduates for the subcomponents of motivational orientation and the concepts of ability at the beginning of the modules. The weak but significant relationships can be seen in Table 2.

*Table 2: Correlations between Motivational Orientation and Concepts of Ability at the beginning of the module*

		Fixed Concept	Incremental Concept
to know	Pearson Correlation	-.090(*)	.143(**)
to accomplish	Pearson Correlation	-.009	.105(**)



to experience Stimulation	Pearson Correlation	.008	.043
identified regulation	Pearson Correlation	.001	.130(**)
introjected regulation	Pearson Correlation	.017	.097(**)
External regulation	Pearson Correlation	.099(**)	.123(**)
N = 796			

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

As the initial correlations provided some significant but weak relationships, the author felt the data warranted further exploration to investigate the extent of the impact of concepts of ability on approaches to learning and motivational orientation.

### 3.2.1. Differences in approaches to learning for different categories of concept of ability.

In order to examine if high or low levels of incremental and fixed concepts of ability showed differences in approaches to learning, the scores for the two concepts of ability were each divided into three groups; normatively high, mid and low. Two one way ANOVAs (using the categories of concept of ability (3) as the independent variable, and approaches to learning (3) as the dependent variable) were then conducted (one for each concept). Only students who fully completed all questions for each factor on the instrument were included in the analyses. In the fixed concept ANOVA, there was a significant within subject effect for concept category in deep approach to learning ( $F(2,520)=4.847;p<0.01$ ,  $\eta^2=0.018$ ). Tukey's HSD test showed that the higher fixed group scored significantly lower on deep approach than the low scoring fixed group did ( $p<0.01$ ). There was also a significant difference within strategic approach ( $F(2,519)=8.238;p<0.01$ ,  $\eta^2=0.031$ ), with the mid and low fixed groups scoring significantly higher than the high group on strategic approach ( $p<0.01$ ).

For the incremental category, there was a significant within-subject difference in scores for strategic approach ( $F(2,517)=3.118;p<0.05$ ,  $\eta^2=0.012$ ), with the high scoring incremental group scoring significantly higher than both the mid and low incremental category groups ( $p<0.05$ ).

The students were then categorised to reflect their high and/or low scores on both concepts (that is: high incremental and high fixed (HiI/HiF); low incremental and low fixed (LoI/LoF); high incremental and low fixed (HiI/LoF); and low incremental and high fixed (LoI/HiF)). A one-way ANOVA (with concept category (4 levels) as the dependent variable, and approaches to learning as the dependent variable (3 levels)) was used to examine the data. Significant within-subject differences for deep

approach to learning ( $F(3,178)=2.949;p<0.05$ ,  $\eta^2=0.047$ ) were found, with follow-up Tukeys showing the HiI/LoF group scoring significantly higher than the LoI/HiF group ( $p<0.05$ ). There were also significant differences for strategic approach ( $F(3,175)=3.477;p<0.05$ ,  $\eta^2=0.056$ ), again with the Tukeys showing the HiI/LoF group scoring significantly higher than the LoI/HiF group ( $p<0.05$ ).

### **3.3. Differences in motivational orientation for different categories of concept of ability.**

The high and low grouping for fixed and incremental ability categorisation was used again to conduct another two one-way ANOVAs (with category of concept (either fixed or incremental) as the independent variable, and motivational orientation subcomponents as the dependent variables). Fixed concept of ability group results indicated significant differences ( $F(2,775)=4.878;p<0.01$ ,  $\eta^2=0.012$ ), and follow-up tests found these differences to be between the intrinsic motivation subcomponent to know, with the high scoring fixed concept students significantly lower in their to know scores than the mid group ( $p<0.01$ ). Tukey's results were also recorded for the most extreme extrinsic motivation component, external regulation, with the mid fixed concept group scoring significantly lower on external regulation than the higher scoring fixed concept group ( $p<0.05$ ). Also the amotivation scores revealed significant differences, with the high scoring fixed concept students scoring significantly higher on amotivation than both the mid and low scoring groups ( $p<0.05$ ), when the fixed concept categories were considered.

The ANOVA exploring incremental concept of ability groups found there were significant differences between the groups ( $F(2,772)=4.448;p<0.05$ ,  $\eta^2=0.011$ ). Tukey's follow-up analyses found differences for identified regulation, with the high incremental concept group scoring significantly higher on identified regulation than the low incremental group ( $p<0.05$ ). The high scoring incremental group also scored significantly higher than both the mid and low scoring groups in external regulation ( $p<0.01$ ), and the low incremental group scored significantly higher on amotivation than did the high scoring incremental group ( $p<0.01$ ).

Students were categorised into the four groups using both incremental and fixed concept scores, and a one-way ANOVA was used to explore motivational orientation. Significant differences were found within subjects for the external regulation category ( $F(3,270)=2.924;p<0.05$ ,  $\eta^2=0.031$ ), with follow-up tests showing the HiI/HiF group scoring significantly higher than the LoI/LoF group ( $p<0.05$ ). Differences were also found within amotivation ( $F(3,270)=8.254;p<0.01$ ,  $\eta^2=0.084$ ) with Tukeys showing the HiI/HiF group, and the LoI/HiF group both scored significantly higher than the HiI/LoF group ( $p<0.01$ ). Also, the LoI/HiF group scored significantly higher than the LoI/LoF on amotivation ( $p<0.01$ ).

### **3.4. Changes over time in concepts of ability, motivational orientation and approaches to learning.**

A paired sample t-test over time, for those individuals that were tested at the beginning and end of the module ( $n=361$ ), found a significant difference ( $t(1,338) = -5.052$ ;  $p < 0.01$ ) in fixed concepts of ability, with fixed concept scores being significantly higher at the end of the modules.

Differences were also found for “to know” ( $t(1,365) = 2.740$ ;  $p < 0.01$ ), with a significant decrease found over time and amotivation ( $t(1,350) = -2.459$ ;  $p < 0.05$ ), with amotivation significantly higher at the end of the teaching periods. All the approaches to learning were found to significantly decrease over time (surface ( $t(1,142) = 6.186$ ;  $p < 0.01$ ); strategic ( $t(1,148) = 8.573$ ;  $p < 0.01$ ) and deep ( $t(1,150) = 6.161$ ;  $p < 0.01$ )) with all the approaches significantly decreasing over time.

### **3.5. Relationship between concepts of ability and approaches to teaching.**

A Pearson’s Product Correlation was conducted on the data from the 361 students who completed the questionnaires at the end of the module, to examine if there was an overall relationship between approaches to teaching (conceptual change or information transmission) and students’ concept of ability (incremental or fixed) by the end of the module. A significant but weak negative relationship was found between conceptual change student focused approach to teaching, and fixed concept of ability ( $r = -0.248$ ;  $p = 0.01$ ), and a significant but weaker positive relationship was evident between information transmission and fixed concepts of ability ( $r = 0.170$ ;  $p = 0.01$ ).

### **3.6. Differences in concepts in ability for different approaches to teaching.**

When the approaches to teaching (conceptual change or information transmission) were categorized as high, mid, or low, and a MANOVA (with teaching categories as the independent variable, and concept of ability as the dependent variable) conducted, a significant difference was found for fixed concept of ability ( $F(178,2) = 8.126$ ;  $p < 0.01$ ,  $\eta^2 = 0.084$ ). Teachers in the high and mid information transmission approach had students who scored significantly higher in fixed ability at the end of the module than those taught by the low information transmission group.

## 4. Discussion

The results from this study generally support the framework proposed by Dweck and her colleagues, showing that students' concept of their ability has a relationship with motivational orientation, and with the new line of investigation, approaches to learning.

The first hypothesis proposed that there would be a positive relationship between incremental concepts of ability and intrinsic motivation. The data supported this, showing a weak correlation, with two of the subcomponents of intrinsic motivation: to know and to accomplish. A positive but weak relationship was also found with identified regulation, which is classified as an internalised form of motivation on the self-determination scale. Although weak, these findings support earlier works (Elliot and Thrash, 2001; Mueller and Dweck, 1997) that proposed a relationship between incremental concepts of ability and intrinsic motivation. As the intrinsic motivation components and identified regulation involve placing personal value on learning, the relationship with an incremental but not with a fixed concept of ability is not unexpected. The intrinsic category that was not found to correlate with incremental concepts of ability was to experience stimulation. This subcomponent is more connected with a feeling rather than an action, which may explain why it did not show a relationship. However, these findings do indicate that overall an incremental concept of ability is associated with a self-determined motivation, which is most likely to lead to positive achievement behaviours. This needs to be of note to educators who recognise the importance of creating an intrinsic environment for learners. Identifying students who do not have a high concept of ability, and who may be at risk of being less intrinsically motivated early in a module, would allow opportunities for lecturers to work with these students, reinforcing that fact that it is possible for all students to develop within a subject.

The positive relationships with the motivational subcomponents introjected and external regulation with incremental concepts of ability were not expected. It could be suggested that even though the students have a belief, they can improve and set learning goals, so they may still be influenced by more external factors, such as avoiding anxiety or guilt if they do not develop their levels of competence (or by rewards for showing improvement). Learners who have a more incremental concept of ability may also believe that they are capable of achieving more, and thus are motivated to gain external rewards. It is important to note that motivational orientation is not exclusive, and so it is plausible for an individual to be both intrinsically motivated at the same time as being extrinsically motivated. For example, a student may be motivated to study in order to learn and understand, but at the same time want to gain a first class degree, and please significant others. Therefore, even though correlations were found with the more external components of the motivation, it does not preclude learners from being motivated in what is viewed as a productive manner as well, intrinsically. It could also be suggested that it is in fact the level of motivation that is important, and that having an incremental concept of ability that

promotes motivation will therefore drive learning. The concern with this view is that if the extrinsic motivation is not matched with equal or higher intrinsic motivation than if rewards are not forthcoming or negative reinforcement is received, both of which are externally controlled, then motivation is likely to reduce.

A positive relationship was not found between deep approaches to learning and incremental concept, which was unexpected. However, a significant relationship was found with strategic approach, which suggests that the students are not continually striving to reach a higher level of understanding, but recognise that they can develop by focusing on the parts of their subject in which they need to spend more time to gain an understanding. Being strategic means considering what must be done to achieve the highest grades and this might involve adopting a deep or a surface approach, depending on what is perceived as required by the teacher. Considering learner behaviour, it is quite acceptable that students are strategic in their approach. Students are often time-poor, especially in the present day when many undergraduates have to work at the same time as studying, and so they have to be strategic in their work. Depending upon the class requirements the student will make decisions about what type of approach is needed for the different elements of their study and adopt a deeper approach when prompted to by the learning and assessment design. This, again, reinforces the importance for academics to design their learning so that it fosters a deep approach to learning.

Categorising students into high, medium, or low levels of incremental concepts of ability enabled the researcher to examine the differences between the groups. These tests mirrored the correlation results, showing that with the subcomponents of motivational orientation, the high scoring incremental concept group was significantly higher scoring than the low group for identified regulation, higher than the low and mid groups for external regulation, and lower on amotivation than the low incremental concept group. This helps to re-affirm the initial findings, with the addition of the students with lower levels of incremental concept showing higher levels of amotivation. This can be explained, as those students who do not have a strong belief that they can improve are more likely to be low in motivation than those who can see that they are capable of developing.

The second hypothesis was also accepted with the finding of a positive relationship between a fixed concept of ability and external regulation. This supports Dweck's proposal that individuals with a high fixed concept are motivated in a much more externalized manner, trying to show competence to others in order to appear capable, rather than trying to develop as a learner. However, the strength of this relationship was weaker than the relationship found between external regulation and the incremental concept of ability. This was not expected. The negative relationship found between fixed concept and the intrinsic component "to know" (which could be interpreted as remembering facts) does reiterate that students with fixed concepts are not striving to learn, but merely to demonstrate their competencies.

It was also encouraging to find the expected negative relationship between fixed concepts and both deep approaches and strategic approaches to study, although no positive relationship was found with surface approaches. The negative relationships are important factors of which educators should be aware. A good teaching environment should try to encourage students to adopt a deep approach to learning. If climates can be created that encourage students to believe that they are able to improve, rather than believe that they have no control over their ability, students are more likely to adopt a deeper approach to their work.

Again, the categorisation of students into high, medium or low fixed concept groups re-affirmed these findings. The motivational orientation results mirrored the correlations, also showing a difference in amotivation scores, with the high scoring fixed concept group scoring significantly higher than both the other two groups. This fits with previous understanding of concepts of ability, showing that students who do not believe that they can improve in an area are less motivated than those who believe that they can. The approaches to learning ANOVAs showed a difference in deep approaches, as well as strategic approaches. The students with higher concepts of fixed ability scored significantly lower than those in the low fixed concept group, which was the finding that was predicted but not found through the correlation analysis.

Fixed and incremental concepts are not mutually exclusive, and it is therefore possible for students to score high or low in both scales. As a result, a final analysis was conducted with students grouped into four new groups (high fixed and incremental, low fixed and incremental, high fixed and low incremental, and low fixed and high incremental). The findings of this analysis found differences in deep approaches to learning, with the students with high incremental and low fixed scores scoring significantly higher in deep approaches than the low incremental/high fixed group. This, again, supports earlier research by Dweck and her colleagues, who discuss how students with a belief that they can improve in an area in which their ability is not restricted are more likely to adopt an approach to their learning that looks at learning and developing. This result was not evident for the incremental results, which can be explained in light of these findings, by the influence of the fixed ability concept in conjunction with incremental beliefs, which acts as a moderator. The same groups were also found to be significantly different for strategic approaches to learning, with the high incremental/low fixed once again scoring higher. This suggests that although these students are more driven to adopt an approach that seeks understanding, they are still strategic in order to invest their efforts in the best possible manner to ensure success.

Again external regulation provided a puzzling result. The high fixed and high incremental group scored significantly higher on external regulation than the low fixed and low incremental groups. This finding was unexpected, but may indicate that those who scored high on both concepts of ability are simply more highly motivated than those who scored low on both. External regulation is not bad, as it is a measure

of motivation, which is what stimulates action. Motivation that is at the self-determined end of the spectrum is more robust in the face of difficulties, but external regulation can be just as powerful in its stimulus for action. There were significant differences between the groups on amotivation scores with both of the groups with high fixed concepts of ability scoring higher than the ones with low fixed concepts. This result shows the strong influence that fixed concepts have on motivation, regardless of the level of incremental concepts of ability. Therefore, it would suggest that learning climates that persuade students that ability is fixed are more likely to result in a higher proportion of amotivated students.

Lack of direction was also found to be related to the concepts of ability, with fixed concept having a positive relationship, and incremental a negative one. In order for a student to perform at their optimal level, they need to have a focus that they can use to set goals. They have to have an understanding of what is required in order to be able to approach their learning in the most constructive manner. This data shows that those students who have a fixed concept belief do not have this focus, as they are high in lack of direction, whereas those with an incremental concept do not score highly in lack of direction. This is another reason to try and create learning opportunities that encourage an incremental concept of ability.

It was a concern to find that when all the students were considered together, their fixed concept of ability increased over time. Changes were also found for motivational orientation, with the intrinsic component to know decreasing, and amotivation increasing, and for all the approaches to learning decreasing from the beginning to the end of the module. These findings showed that the different elements were dispositional, and could alter over time. Follow-up studies then examined if the approach to teaching had an influence on students' results at the end of the module.

A follow-up analysis took place at the end of the module to discover if the approach to teaching showed a relationship with the students' concept of ability. Relationships were found between fixed concepts of ability and approaches to teaching. Those teachers who adopted a conceptual change approach to their teaching showed lower student scores on fixed concepts, whereas those teachers who used information transmission approaches to teach had students with higher fixed concept scores. The approach to teaching did not affect the students' incremental concepts of ability. This was an important finding in this study, as it shows that the learning climate created by the teacher can impact the students' concepts of ability. Knowing from both these and previous results that incremental concepts of ability correlate with intrinsic motivation and strategic approaches to learning; it is encouraging to know that by adopting an approach to teaching that requires students to engage with content in order to develop their understanding, and in doing so change their conceptions of the material, they will also develop a concept of ability that sees it as possible to improve in a subject. Educators should be alerted to this finding so that they can adapt their teaching to a more student focused/ conceptual change mode that will promote incremental concepts of ability.

When the teachers' approaches were considered in categories of high, medium, and low for each of the two approaches, again lecturers who adopted a high or medium information transmission approach to teaching had students with significantly higher fixed concepts of ability, than did those who had low scores on information transmission. This confirms expectations, and indicates that concepts of ability themselves are malleable.

This shows that concepts of ability are not trait but state, and educators can influence their students. It is especially important in light of the higher levels of amotivation and the lower scores in deep approach to learning found in the fixed concept students. These results showed that teachers who adopt a teacher-focused, information transmission approach to their lecturing influence students to have an increased fixed concept of ability, which relates to more negative learning characteristics, for example, extrinsic motivation.

The findings reported in this study support the hypotheses; however, the results are not as strong as would have been expected. Therefore, it is recommended that more work is conducted in this area to further explore the impact of concepts of ability on approaches to learning and motivation, in order to see the impact of teaching styles has on these concepts of ability. These future studies may consider the instrument used to measure concepts of ability; though it has been found to be valid and reliable, it has predominantly been used in the United States ( and mainly by Dweck and colleagues), and so the language should be re-examined. It could also be reviewed to be made more specific to the learning in the modules in which it is used, so that the data collected could be deemed more relevant. Complementing the quantitative methodology with some open-ended questions would also help investigators to decipher the responses given on the instrument, and strengthen further work.

## 5. Conclusion

These findings are of interest to educationalists, but what is perhaps of the greatest interest is the impact that approaches to teaching can have on changing concepts of ability over time. It is important to acknowledge that the approach to teaching can affect the students' fixed concept of ability, a concept that is detrimental to achievement through approaches to learning and motivational orientation. Therefore, educators need to provide learning environments that will allow students to adopt lower levels of fixed beliefs about ability.

The general belief (Dweck, 1999) is that students with high ability and conceptual understanding exhibit mastery-oriented qualities, but frequently worry about failure and question their competence levels. Another widely-held belief is that success leads to both mastery-oriented qualities in students and a drive to seek challenges. This is not always the case, as students who are accustomed to success do not necessarily have highly developed coping strategies for dealing with failure, and so tend to select



tasks that are within their capability level (Dweck, 1998). Praising intelligence in students leads to mastery-oriented qualities and a relish for challenge is another belief, but these words of praise can make the learner fear failure and disappointing others, and so they avoid this by not taking risks. These students live in doubt when failure does occur and no praise is evident. The last belief is that confidence levels in students leads to selecting challenges and the adoption of mastery-oriented qualities, but these students do not want their competences tested, as self-esteem and confidence can be easily affected.

Why some individuals function effectively and others act in self-destructive ways when faced with the same situation is continually of interest in educational research. Evidence suggests that the learners react differently in learning situations based upon their perception of ability. This is not based in reality, but on a reaction to the situation, whether it appears as helplessness or mastery-oriented patterns. Some students will perceive their failure as a learning opportunity, whereas others who show vulnerability will perceive their lack of success as a public measure that cannot be altered.

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