RUNNING HEAD: An intervention to change students' theory of intelligence

An Evaluation of an Intervention to Change First-Year Psychology Students' Theory of Intelligence

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Abstract

Some people hold an entity theory of intelligence, they think of intelligence as innate. In contrast, others hold an incremental theory, believing that intelligence can be changed. Previous research has shown that an incremental theory is associated with positive outcomes. The aim of this paper was to evaluate an intervention which promoted an incremental view of intelligence in first-year university students. Thirty five students were shown a presentation which discussed research promoting an incremental view of intelligence (intervention group). Forty four students were shown a presentation which discussed research on memory (control group). Participants completed measures of theory of intelligence, goals and behavioural intentions before and after the presentation. Results suggested that the intervention had been successful in promoting an incremental view of intelligence and thus positive learning behaviours. Interventions such as this may therefore have a positive impact on student success at university.

Keywords: theory of intelligence, intervention, transition to university,

According to an influential body of work from Dweck and colleagues (1999) people view intelligence in one of two ways. Some hold an entity theory of intelligence; they believe that intelligence is innate and that some people are naturally more clever than others. In contrast, some hold an incremental theory and believe that intelligence is like a muscle and can be changed over time. These beliefs are implicit, meaning they are fundamental and often difficult to verbalise, but they can have a strong impact on behaviour (Chiu, Dweck & Hong, 1997). Holding an incremental theory has been found to lead to a number of positive outcomes such as choosing challenging goals and persisting following failure (Elliott & Dweck, 1988, Wormington, & Corpus, 2011; Kinlaw & Kurtz-Costes, 2007; Mangels, Butterfield, Lamb, Good, & Dweck, 2006; Wirthwein et al., 2013). However, there is little research examining how we can promote an incremental theory of intelligence in university students. This was the aim of the current paper.

An incremental theory of intelligence has been associated with a number of positive outcomes. For example, those who hold an incremental theory are more likely to espouse learning goals (Dweck & Legett, 1988; Elliott & Dweck, 1988). Learning goals are goals where the learner wants to understand the material and engage with it at a deep level. They want to enhance their skills. An example of this would be a student trying to understand the formula behind the standard deviation, regardless of whether it will be in the assessment. In contrast, those who hold an entity theory are more likely to hold performance goals. These are goals where the learner is primarily interested in passing the assessment and does not want to engage with the material at a deep level. In these cases, the learner is concerned with proving, validating or documenting their ability. An example of this is knowing which buttons to click in SPSS to find the standard deviation to get the correct answer in the assessment; but not understanding what the test is doing. Unsurprisingly, learning goals

have been found to lead to positive outcomes in terms of achievement in the longer term. Therefore incremental theorists may be more likely to succeed in education and more likely to achieve higher grades.

Similarly, an incremental theory has been found to lead to positive outcomes when faced with failure (Robins & Pals, 2002). Everyone is likely to perform badly at some point in their education and their responses to this may have a strong impact on their future performance and likelihood of persisting in education (Hong, Chiu, Dweck, Lin, & Wan, 1999; Stipek & Gralinsky, 1996). Previous research suggests that those who hold an incremental theory are more likely to respond positively to failure (Henderson & Dweck, 1990). This is because they believe that their performance was caused by their efforts and techniques, which can be easily changed. Therefore, failure is a sign that more effort or a new technique is needed. It is also a signal to them that there is an opportunity to learn new things. In contrast, entity theorists see failure as threatening. They believe that intelligence is fixed and difficult to change. Because of this, failure indicates that they are not clever enough to succeed in the task and this fixed view makes them feel that they are also unlikely to succeed in the future. Thus, they are more likely to show low persistence (Dweck, 1999) and also self-handicapping behaviours (Robins & Pals, 2002). This again suggests that an incremental theory of intelligence is associated with positive learning behaviours and academic success.

What Works? (2012) found that students commonly drop out of university for three main reasons: they are experiencing academic issues; they feel that they do not ‘fit in’ or they are concerned about not achieving their future aspirations. These beliefs may be partially associated with an entity theory of intelligence. Therefore promoting an incremental theory may help to reduce student dropout rates. For example, an incremental

theory may encourage students to view their performance as within their control. This may help them to feel less negative if they do not achieve high grades immediately and may also help them to improve their performance, due to the fact that they are likely to hold learning goals and persist following failure. An incremental theory of intelligence may also lead them to feel that they fit in at university. Some students, particularly those from widening participation (WP) groups, such as those from lower socio-economic groups or attending schools of low progression, may be more likely to feel that they do not fit in at university. They may also perhaps view other students, such as those from more traditional backgrounds, as being more "intelligent" than them. Promoting an incremental view of intelligence may help students feel that they belong in university because they feel that they too have the potential to succeed if they work hard. Finally, an incremental theory could encourage students to feel that they can achieve their broader goals for their future careers by working hard and improving their techniques. This highlights the importance of better understanding how we can promote an incremental view of intelligence in students.

Previous research suggests that an incremental theory of intelligence can be promoted by feedback. For example, process forms of feedback, e.g. "You worked hard in this" can encourage an incremental view of intelligence (Kamins & Dweck, 1999). This is because they explicitly state that success in the task was caused by effort levels or techniques. However, person forms of feedback, for example "You are really clever" promote more of an entity view of intelligence. This is because they suggest that an innate ability has led to success in the task.

The impact of feedback on theory of intelligence has been examined in various experimental settings. For example, Cimpian, Arce, Markman and Dweck (2007) asked young children to draw a picture and then gave them feedback on their drawing. They

found that children who received process forms of feedback were more likely to persist following failure.

Furthermore, Mueller and Dweck (1998) examined the impact of feedback on children's goals, response to failure and academic performance. To begin, all children completed an easy set of problems and were told they had received a high score; they also received either person, process or no feedback. They were then asked questions to ascertain whether they held learning or performance goals. Children were then given a second, more challenging set of problems, and told that they had performed badly in them. They then rated their desire to persist in the task and their attributions for their failure. Finally they were given a set of easy problems again. Results suggested that those children who received process praise were more likely to hold an incremental theory of intelligence. They were more likely to choose a complex task rather than a simple task. Furthermore, when they experienced a failure, those who received process feedback were more likely to state that they would like to persist. Finally, when faced with the final simple set of problems performed well on them. This suggested that process praise led to positive learning behaviours. In contrast, children who were given person praise showed an entity theory of intelligence and chose simple tasks rather than complex ones. These children also showed a helpless response to their failure and when they were faced with a further, easy set of problems failed to complete them. The finding that students were unable to complete the final set of problems which were at a similar level to those they had previously completed with ease, simply because they had recently failed on other problems, illustrates how theory of intelligence can have a strong long term impact on students' academic performance. In addition to this experimental research, it has been found that children whose parents used high levels of process feedback at age two were more likely to hold

incremental views of intelligence when they were eight years old (Gunderson, Gripshover, Romero, Dweck, Goldin-Meadow, & Levine, 2015).

Other research suggests that an incremental theory of intelligence can be promoted with a targeted intervention. For example, Blackwell, Trzesniewski, and Dweck (2007) designed an intervention for secondary school students. This involved eight sessions being delivered to students about the brain and memory. Students in the intervention group also received information about how the brain is constantly changing and how effort can lead to improvement. In contrast, those in the control group were taught about memory in general and specific techniques to improve memory. Results suggested that those in the intervention group showed higher motivation and also performed better academically than those in the control group.

Therefore, it appears to be possible to influence theory of intelligence via feedback or intervention programmes. These sorts of interventions may be particularly effective and important during periods of transition. When young people transition from one educational environment to another they may find it challenging as the standard of expected work increases and they may well be studying a subject that they have not previously studied. Students who hold an incremental theory of intelligence may be more likely to cope better with this transition as they are likely to show positive learning behaviours such as choosing challenging learning goals, responding positively to the academic challenge and believing that they can succeed with effort (Dweck, 1999). Additionally, as previously discussed, they are more likely to respond positively to failure. Indeed Henderson and Dweck (1990) found that students who held an incremental theory of intelligence were more likely to achieve better grades during the transition to high school than those who held an entity theory, controlling for previous grades.

However, most of this research has been conducted with children and less has been conducted with university students. Some research suggests that students who received process feedback were more likely to persist following failure (Skipper & Douglas, 2012); this suggests that students' theory of intelligence may also be changed by teacher feedback. In addition to examining the impact of teacher feedback, some research has more explicitly examined how students respond when they are given information about what skill is being tested. In a study by Aronson (1999) (cited in Aronson, Fried & Good, 2002) students took a challenging verbal test. Before they took the test they were told that the questions would test verbal ability which was either described as malleable, fixed or they were given no further information. Results showed that those in the 'fixed' ability condition were most anxious and scored lower than those in the control condition, while those in the 'malleable' condition showed the lowest anxiety and scored the highest. This suggests that teacher feedback and also teachers explicitly explaining what is being tested for can impact students' learning behaviours and performance.

Additionally, Aronson, Fried and Good (2002) designed an intervention-style experiment to manipulate college students' theories of intelligence and in turn their grades. To do this they asked college students to participate in a scholastic pen pals programme where they received letters from school children who were struggling academically and were asked to write letters to encourage them. Some were asked to write to the children about an incremental theory of intelligence, and how intelligence could be changed. Another group were asked to write to the children about multiple intelligences and how everyone has strengths. A control group did not write letters. In order to promote these views of intelligence, participants watched a video discussing research which showed evidence supporting these theories. In fact, the letters which the students received were

not written by children and the aim of the study was to encourage the students themselves to view intelligence in these ways. Results suggested that those in the malleable intelligence condition showed more learning goals and performed better in tests than those in the other conditions. This suggests that the study was successful in promoting an incremental theory of intelligence. However, it would not be possible to deliver this intervention to students across different year groups because students who had participated in previous years would be likely to discuss the study and reveal the deception to new students, which would reduce efficacy of the intervention.

Thus, research suggests that an incremental theory of intelligence can be promoted via feedback and also via training programmes. However, there is currently no simple intervention which could be used for a large number of university students, particularly during transition to university. This is an important gap in the literature. A simple intervention which could be delivered to a large number of students as a part of First Year class activities has the potential to have a strong impact on students' experiences of university. Additionally, interventions as part of the curriculum rather than as an 'add on' has been found to enhance their success (What Works? 2012). Thus, the aim of the current paper was to examine whether it is possible to change students' theory of intelligence via a short intervention and whether this could impact other variables such as learning goals and behavioural intentions.

Eighty students were recruited in their first year at university and were randomly assigned to the intervention or the control group. Two presentations were created. The presentation for the intervention group discussed research showing how the brain changed as participants learned new things. The presentation for the control group discussed research relating to memory in general. Participants completed a questionnaire before the

presentation and immediately afterwards. It was hypothesised that those in the intervention group would show a more incremental theory of intelligence and in turn more learning-focused goals and show different behavioural intentions in that they would be more likely to choose more complex tasks and less likely to choose simple tasks than those in the control group.

Method

Participants and Design

Participants were 80 psychology students who were in their first year of university. This was a convenience sample. Participants were drawn from six seminar groups, which were randomly chosen and all students within the groups were invited to participate. All participants were aged 18-21 (*M*=19 years 5 months, *SD*=2.41) and 66 were female. Participants were from a variety of ethnic groups including 57 White British participants; the other 23 included a number of ethnic groups such as, four Asian British, three African British and three mixed race participants.

All participants were studying psychology. Twenty eight students were studying single honours psychology, and the remainder were studying dual honours degrees. Of these, 15 were studying psychology and criminology, nine psychology and neurobiology, six psychology and biology and three psychology and forensics.

The design was mixed methods, using both quantitative and qualitative measures. The quantitative element involved a repeated measures design, comparing participants' answers before and after the intervention. The independent variable (IV) was whether participants had been randomly assigned to the control group or the intervention group.

The dependent variables (DVs) were theory of intelligence, goals and behavioural intentions to choose simple and complex tasks.

Materials

Intervention

The intervention itself consisted of two PowerPoint presentations, one for the intervention group and one for the control group. Both were one hour long and contained information and an activity. The presentation for the intervention group included research studies which provided evidence that effort and technique were vital to success. For example, Ericsson (1991) worked with violinists studying at a music academy. The students were streamed into three groups, those expected to become international soloists, those who were expected to become performers in top orchestras and less able students who were expected to teach. They found that the only significant difference between these three groups was the number of hours of practicing they had done. Other studies exploring brain plasticity, such as that of Maguire, Woolett and Spiers (2006) were presented. In this study, the brains of London taxi drivers were compared to brains of bus drivers using an MRI. Results showed that taxi drivers had greater gray matter volume in mid posterior hippocampi, a region specialising in acquiring and using complex spatial information to navigate efficiently. Taxi drivers had to navigate around London by memory while bus drivers followed a set route. Their behaviours had changed their brain structure, thus suggesting that the brain could be developed like a muscle. A number of other studies were also presented as well as more informal facts about learning and memory but always focused on how effort and techniques led to success.

The control group presentation focused on memory. Research around the impact of music on memory was presented, for example Ludke, Ferreira, and Overy (2013) asked

students to learn Hungarian phrases either by singing them or by saying them. Results suggested that those who sang performed better in later memory tests. Other research presented examined the impact of drugs on memory, for example research by Smith et al., (2014) which suggested that students who had smoked marijuana showed decreases in the size of the thalamus and striatum, areas that are important for processing rewards, learning and working memory and that they also performed poorly on a memory test. Therefore, this session focussed on research into memory techniques and how it can hindered via drugs. It was important that the experience of the control group was as similar as possible to the intervention group or it could be argued that the extra information the intervention group had received or techniques for improving memory could to have impacted students' learning and achievements rather than the focus on theory of intelligence.

All students then completed an activity based on research by Mantyla (1986). Students were asked to listen to a list of 20 words and write down two words which they associated with them. Students were then asked to try to remember the words without their cues. After attempting this, they were allowed to use their cues to remember the words. The activity was then explained slightly differently depending on the group participants were in. Those in the experimental group were told that the reason the cues helped was that they helped them to remember what they were thinking about when they learned the information. This then was explicitly linked to how neurones form connections when we learn new information and therefore linked the activity to brain plasticity. Those in the control group were simply told that we remember things better when we link ideas together and this was presented as a memory technique.

Questionnaire

The students completed questionnaires before the presentation. The questionnaire was repeated immediately following the intervention. The questionnaires were also repeated across the course of the year at times when students received feedback on summative assessments. However, this data will not be presented here as data analysis is still in progress.

The questionnaire consisted of a number of sections. The first of these included demographic questions such as date of birth and gender. As well as this, participants were asked questions about what grade they would like to get in their degree and also what grade they thought that they would get in their degree. To answer these questions, students circled a grade classification from 1st class to 3rd. Students were also asked to answer the question 'What factors do you think will influence your success at university?' This was a free response question and was asked before students could complete the rest of the questions to avoid biasing their responses.

Theory of intelligence was measured by asking students to complete an equation showing what percentage of intelligence was due to effort and what percentage was due to ability. They were reminded that the numbers needed to add up to 100%. This was adapted from Mueller and Dweck (1997).

In order to examine students' goal orientation, a measure was taken directly from Grant and Dweck (2003). Students were asked 12 questions relating goals. An example item for performance goals is: "I really want to get good grades in my classes" and an example item for learning goals is: "I strive to constantly learn and improve in my courses". These 12 items were answered on a scale of 1 (strongly disagree) to 7 (strongly agree).

In order to examine their behavioural intentions, students were given a scenario. It said:

"In your next seminar your tutor describes the principles of research design and choosing the best statistical test. Your tutor then gives you the option of two tasks. Task 1 is something you could do very easily; you would probably get all the answers right but wouldn't learn anything new. Task 2 is something you couldn't do very easily; you would probably get some answers wrong but would learn something new."

Students were asked how likely they would be to choose each task on a scale of 1 (very unlikely) to 6 (very likely). This procedure was adapted from Mueller and Dweck (1998) where participants were asked to choose simple or complex tasks to complete in future.

Immediately following the presentation, students repeated the questionnaire. They again answered the same questions on their theory of intelligence, goals and task choice.

Procedure

Participants in seminar groups were recruited in the first week of term. Three seminar groups were randomly assigned to the intervention group and three to the control group, giving a total of 36 students in the intervention group and 44 in the control group. Participants were told that the researcher was interested in their experiences of transitioning to university level study and the presentation and activities, as well as the questions they would be asked would allow them to reflect on this. The participants were given an information sheet and after reading it, signed a consent form if they wanted to participate. It was made clear to students that the questionnaire element was entirely optional but the presentation would be useful in their development and understanding of the course. Participants then listened to the presentation which was delivered by the same female teacher to all groups, and participated in the activity. Immediately following this, participants completed a second questionnaire.

Students were asked to give their date of birth on the questionnaire. This allowed their responses across time points to be matched, but maintained anonymity. This was made clear to participants. This also meant that if students wished to withdraw their data they could give the experimenter their date of birth and their information could be removed. After they had completed all the questionnaires across the year, participants were debriefed and given the opportunity to ask questions.

Results

To begin, the grades which the students wanted to achieve and believed they could achieve in their degree were examined. Descriptive statistics for overall aspirations and beliefs across all students are shown in Table 1. Furthermore, results examining individuals' responses suggested that only 26% of students felt that they would achieve the grade they wanted (whether that was a first or a 2:i) while 70% indicated that they would achieve a grade lower than they would like and 5% predicted they would get two grades lower than they would like (4% missing values).

INSERT TABLE 1 HERE

The free response question asked students what led to success at university. Due to the fact that most participants wrote only a sentence in answer to this, a light touch content analysis was performed to give a flavour of the common responses. A more detailed qualitative analysis would not have been appropriate due to the small extracts. To begin, participants' responses were read a number of times until common clusters (categories) of similar answers became apparent (e.g., effort / teachers / peers). I noted down the number of times each cluster of answers was mentioned. Participants discussed a wide variety of reasons for what might impact their success at university. For example, the largest proportion of 26% mentioned effort as being important in predicting their success at

university. Half of these were in the intervention and half were in the control group. Similarly, 15% of students mentioned that the number of hours they put into studying would impact their success. This again suggests an incremental view. Interestingly, only 4% mentioned ability as being important to their success at university. The second most commonly mentioned factor was friends (24%). Friends were thought to influence success both in a positive way, for example discussing courses and giving support, but as well as this, students recognised that friends could actually lead them to be less successful by distracting them. This leads on to the third most commonly mentioned element, time management which was mentioned by 19% of students. Motivation was also seen as important by 17% of participants. Finally, good teachers were seen as key by 17%.

To examine students' learning goals, questions relating to performance goals were reverse coded, then the average goal including both learning and performance goal measures was calculated. Therefore, a higher number indicates more learning-focused goals and less performance-related goals.

Next, a one way ANOVA with group (intervention or control) as the IV and measures of theory of intelligence, behavioural intentions and goals as DVs was conducted to examine whether there were any significant differences between the two groups before the presentation. Results from this analysis were not significant for theory of intelligence $F(1,74)=1.132$, $p=.291$, choosing an easy task $F(1,79)=.181$, $p=.672$, choosing a complex task $F(1,79)=.534$, $p=.467$ or goal orientation $F(1,78)=.290$, $p=.592$ (See Table 2 for descriptive statistics). This suggests that before the presentation, there were no differences between the intervention and the control group.

The changes from pre- to post-intervention, based on group were then examined. Means and standard deviations are presented in Table 2. A difference score was calculated

by subtracting scores at pre-test from scores at the post-test. A one way ANOVA with condition (intervention or control) as the IV and the theory of intelligence difference score as the DV revealed that immediately following the presentation, those in the intervention group came to view intelligence in a more incremental fashion, but the control group did not $F(1,72)=56.23$, $p<.001$.

Other ANOVAs showed that students in the intervention group became significantly more likely to choose a complex task $F(1,69)=4.27$, $p=.043$. In terms of choosing a simple task, the effect was not significant, but means tended in the hypothesised direction $F(1,69)=3.37$, $p=.071$. Students also came to hold more learning than performance related goals $F(1,60)=6.74$, $p=.012$.

INSERT TABLE 2 HERE

Discussion

Results from the current evaluation suggest that the intervention was successful in changing students' theory of intelligence in the short term and that this also changed students' goal orientation and behavioural intentions around choosing complex tasks. Furthermore, the intervention group became less likely to choose simple tasks and effects may have been significant with a larger sample size.

This is in line with previous studies which suggest that theory of intelligence can be changed. Previous research has changed theory of intelligence to a more incremental view in the short term by giving process feedback (Mueller & Dweck, 1998, Kamins & Dweck, 1999). Similarly, Blackwell et al., (2007) and Aronson, Fried and Good (2002) were able to change theory of intelligence in the longer term with a targeted intervention. This also

changed motivation and achievement. The current paper tentatively suggests that theory of intelligence can be changed by a short term intervention. Future evaluation of this intervention will examine whether these effects are found in the longer term across the academic year. It will also examine whether this intervention has also had an impact on academic performance and dropout rates.

A strength of this intervention is that it was targeted at first-year students. Upon entering a new educational establishment there is the opportunity to change perceptions and behaviours. Students are unclear as to what 'success' looks like in the new establishment and what they need to do to perform well. This is therefore a good time for interventions to be delivered which suggest to students what will lead to success at university. Promoting an incremental theory at this important time may encourage students to feel that effort and techniques will be key to their success at university and this is likely to lead to positive academic behaviours and, in turn, improved long term achievement (Dweck, 1999). This sort of intervention may also help to negate some of the variables which are associated with student drop out, such as feelings of not fitting in and concern about achieving future aspirations (What Works? 2012).

The intervention also formed part of the usual classes and drew on psychological research to make it appear to be a 'normal' seminar activity. What Works? (2012) suggests that setting interventions within the curriculum can enhance their efficacy, thus also illustrating a strength to the current approach. Additionally, the intervention was only one hour long and is easy to administer. If it is found to be successful in influencing perceptions, behavioural intentions and performance in the longer term it could therefore form part of early curriculum activities for students.

However, it is unlikely that a one hour intervention will be successful in changing perceptions and behaviours across an entire academic year. It will be important to repeat the intervention in some way to ensure that an incremental theory continues to be promoted. This may be particularly important when students receive grades for their work as at this time they are likely to try to understand why they have achieved the mark they did. The intervention could therefore be 'topped up' when student performance is being evaluated by using process feedback. This could be delivered both verbally on tasks, for example in small group teaching and also in written feedback on essays. As previously discussed, process feedback has been found to be very effective in promoting an incremental view of intelligence, and in turn learning goals and a mastery response to failure (Mueller & Dweck, 1998, Elliott & Dweck, 1988). Thus, combining an intervention and feedback may lead to a stronger and longer term impact. Again this also has the benefit of fitting easily into existing practice.

Additionally, the current evaluation measured behavioural intentions using a scenario. Scenarios have been used in educational research to examine students' responses to a range of stimuli. These have often been used for ethical reasons, for example in examining the impact of teacher criticism (Skipper & Douglas, 2015). Similarly, scenarios can allow us to examine behavioural intentions in a large number of participants easily. However, intentions do not necessarily become behaviours. Therefore future research should examine real task choice and behaviours in students rather than simply hypothetical choices.

It is also interesting to note that most students believed that they would receive a grade lower than they would like in their final degree. It could be that the students wanted a first class degree, but that they were being realistic in the goal they felt they could

443 achieve. However, another possible reason for this could be that they do not want to set a
444 challenging goal which they may then fail to achieve. This could indicate an entity view of
445 intelligence as it minimises the risks of failure. Additionally, if someone truly holds an
446 incremental view of intelligence then they should believe that they can achieve a higher
447 grade than they currently are achieving. In later stages of this evaluation, students will be
448 asked about their current grades and the grades they think they can achieve in their final
449 degree. Based on the literature (e.g. Dweck, 1999) it would be expected that students who
450 hold an incremental theory of intelligence should believe that they can achieve a higher
451 grade than they are currently achieving. Measuring this will then provide further evidence
452 as to the efficacy of the intervention in changing theory of intelligence.
453 However, it is also important to consider the broader educational and social
454 environment in which students find themselves. Teachers can have a strong impact on
455 students by giving feedback (Hattie & Timplerley, 2007) or delivering an intervention such as
456 the one described above. Teacher behaviours can also enhance student motivation and
457 enjoyment of classes (Hattie, 2012) and this was discussed by students in the content
458 analysis. However, peers and classmates can also have a strong impact on student
459 academic performance (Hattie & Yates, 2013). In fact, due to limited contact hours and
460 teaching from a large number of staff, peers are likely to have a stronger impact on
461 students' perceptions and their performance than teachers. The content analysis in the
462 current study showed that many students raised the point that friends could help them to
463 achieve more, for example by encouraging them to work hard. However, it was also noted
464 that peers can distract them and they need to find a balance between work and social life.
465 Additionally, other students' beliefs about intelligence may influence their peers.
466 For example, those who hold an entity theory may downplay down the amount of time they

spent on a task in order to make themselves seem more intelligent while incremental theorists may emphasise their effort levels or techniques (Dweck, 1999). Therefore, students may unconsciously promote their own view of intelligence to their peers. Explicitly discussing these implicit theories and encouraging students to reflect on them may lead them to better understand the effects their beliefs have on their own behaviour. This may help to minimise the potential negative impact of comments such as these from peers. However, the broader learning community is clearly key in fully understanding students' perception and performance.

The current paper suggests that this intervention was successful in changing students' theory of intelligence, goal orientation and behavioural intentions in the short term. However, further research is needed to examine whether these changes can be maintained over a longer time period and perhaps how this could be combined with feedback in order to have a long term impact on students' theory of intelligence and therefore performance in first year at university.

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Table 1: Students' predictions of the grades they hope to achieve and the grades they feel that they will achieve in their degree

	Percentage of students stating that they hoped to achieve this grade	Percentage of students stating that they thought they would achieve this grade
First	74	13
2:i	23	70
2:ii	0	15
Third	0	0
Missing	3	2

Table 2: Means and standard deviations pre and post-test measures of theory of intelligence, behavioural intentions and goals

	Intervention Group				Control Group			
	Pre test		Post test		Pre test		Post test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Incremental Intelligence	51.77	13.51	65.32	17.36	54.81	13.90	54.37	13.74
Easy task	3.64	1.11	3.21	1.29	3.65	1.32	3.61	1.31
Complex task	4.27	1.13	4.54	1.03	4.15	1.00	4.13	1.11
Goal	4.26	.65	4.41	.67	4.09	.61	4.05	.64