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# A Microgenetic Study of the Tutoring Process: Learning Centre Research

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## **Introduction**

University tutoring is an important element in most American universities, yet it is an under-researched area (Terrion & Leonard, 2007). While there are numerous research articles on tutoring and mentoring, fewer research projects focus on tutoring of university students in a natural setting (Fresko, 1996). The focus of literature pertained to teachers and university students, paying special attention to student perspectives and attitudes toward approaches to studying in university courses.

## **The Teaching and Learning Environments**

One rich vein of research that influenced our work was the research of Noel Entwistle and his colleagues at the University of Edinburgh on the nature of students' approaches to studying (see, for example: Entwistle, 2000; 1984; 1997). The work of Carol Dweck (1999; 2006) on achievement and motivation provided another influence on our research. Additionally, the work of Robert Siegler (1991; 1996) and Deanna Kuhn (1995; 2005) has provided us with a perspective on tracking change in intellectual skills. Our previous work also helped us understand the teaching and learning environment of tutoring within a natural setting (Morehouse, Sakharuk, & Kadieva, 2007). The study explored the relationship between tutors' self-theories of intelligence and students' self-theories of intelligence, as well how this relationship may influence students' grades.

## *Student Perspective on Study and Learning*

A group of researchers at Gothenburg University (Marton & Säljö, 1976; Marton, Housel, & Entwistle, 1984) and Edinburgh University (Entwistle & Ramsden, 1983) pioneered much of the research on student approaches to studying and learning. They began by analyzing university students as they prepared for the external examinations. These researchers interviewed students, read essay examinations, and used simulated recall techniques in order to obtain a large picture of how students approached learning tasks (Marton *et al.*, 1984). Their research agenda used these student-studying approaches to further examine the relationships within the teaching/learning environment (Entwistle & Ramsden, 1983; Entwistle & Tait, 1990).

This work led Entwistle and colleagues (1983; 1990) to characterize student approaches to studying into three categories: deep, strategic, and surface. Their work has shown how the teaching/learning environment influenced learning outcomes and students' attitudes toward the learning material. Using naturalistic experiments, these researchers drew attention to qualitative differences in the ways in which students went about the task of reading an academic article (Martin & Säljö, 1976; 1997). The approach to studying taken by students (deep or surface) depended on their intentions and motives as well as their perceptions of the task. The way students integrate the task and view the content of the material influenced their decision to either seek meaning (deep approach to studying) or reproduce the information provided (surface approach to studying) (Entwistle & Smith, 2002). The body of research conducted by Entwistle and colleagues showed that each approach to learning and studying was associated with characteristic intentions or motives—deep with intrinsic motivation and interest in the subject matter; surface with extrinsic motivation and fear of failure; and strategic with achievement motivation (Entwistle & Smith, 2002).

The studies reviewed by Elliot *et al.* (1999) used quantitative approaches but suggested future work should be supplemented with qualitative procedures as a way to “yield additional insight into the processes of self-regulation” (p.560). Entwistle and Smith (2002) conducted such a review. They stated that their aim was to review classroom-based qualitative research on studying “and to identify the major influences on the quality of learning outcomes” (p.231). Their second aim was to develop a research-based conceptual framework that would explain differences in levels and forms of understanding. Entwistle (Entwistle & Entwistle, 2001) looked at the levels of understanding among undergraduates preparing for final examinations. Along with developing various conceptual frameworks for teaching and learning outcomes, these researchers also identified five levels of understanding: mentioning [incoherent

bits of information without any obvious structure], describing [brief descriptions of topics derived mainly from the material provided], relating [outline, personal explanations lacking detail or supporting argument], explaining [relevant evidence used to develop structured, independent arguments], and conceiving [individual conceptions of topics developed through reflection] (Entwistle & Smith 2002, p 5). The hierarchy moves from a surface to strategic to deep approach to studying. Although these levels of understanding provide a tool for determining students' approaches to studying, these should not be seen as a label for individual students because they are dependent on students' perceptions of their teaching/learning environments (Entwistle & Smith, 2002).

While *Approaches and Study Skills Inventory for Students*, or *ASSIST* (Centre for Research on Learning and Instruction, 2006), identifies three approaches to studying (deep, strategic, and surface), Entwistle recently suggested that one way to compare approaches to studying is to conflate deep and strategic approaches and compare this combination with a surface approach to studying (personal communication, 2008). Entwistle's suggestion was adopted in the quantitative portion of the study but not in the qualitative analysis because it was not a direct focus of this section.

Moreover, other researchers (Elliot, McGregor, and Gable, 1999) explored achievement goals, study strategies, and examination performance using mediational analysis. These researchers reported ten studies in which mastery goals are positive predictors of deep processing. They report additional studies in which persistence and effort are related to mastery goals.

With Entwistle's work (Entwistle, 2000; Entwistle & Peterson, 2004) as a stepping-stone, interaction among tutors, students, and course material was documented. To understand the student/tutor relationship and the students' understanding of the material, four theoretical perspectives were implemented. Entwistle and colleagues have studied extensively the teacher/student relationships and the ways students' approaches to studying interacted with teachers' approaches to teaching within the discipline. From their research, the concepts of deep/strategic and surface approaches to studying were utilized, as an observational touchstone.

### *Achievement and Mastery Orientations*

A second researcher, Carol Dweck, also influenced this study. Self-theories of intelligence are belief sets regarding the nature of intelligence as either unchangeable (entity) or improvable by effort (incremental). She argued for the importance of understanding self-theories of intelligence as an element in understanding students' effort and persistence (1999). Dweck's illustration of the role of self-theories of intelligence has contributed to the current understanding of the causes of students' persistence, especially when faced with demanding tasks. Her work has also shown how a student with an entity self-theory of intelligence tended to acquire an achievement orientation toward studying, while a person with an incremental self-theory of intelligence tended to become a mastery-oriented learner (Grant & Dweck, 2003).

In a recent study, Dweck and her colleagues (Cimpian, Arce, Markman, & Dweck, 2007) looked at the influence of praise on students' performance. For example, the type of praise children (4-year-olds) received influenced their persistence in a given task. Participants who were praised generically ("you're a good drawer") were less likely to persist after failure than students who were given a non-generic praise ("you did a good job drawing").

Dweck's research showed that a student who is a mastery learner or has an incremental self-theory of intelligence shared many characteristics with what Noel Entwistle (personal communication, 2008) called a deep/strategic approach to studying. Dweck's self-theories of intelligence are also compatible with Kuhn's (2005) skills of inquiry and argument. Kuhn argues that these skills are essential elements for learning. We contend that a mastery-oriented learner is likely to focus on those elements of the task that lead to skill development rather than to rote learning.

Research by Carol Dweck and her colleagues showed how self-theories of intelligence (1999), later called mindsets (2006), affect students' achievement and mastery orientation, as well as their persistence when confronted with challenging issues (Dweck, 1999; 2006; Robins & Pals, 2002). Dweck's theory provided a building block for qualitative and quantitative analyses of students' theories of intelligence (1999).

### *An Approach to Studying Change*

Robert Siegler's work also had a major influence on our study. Siegler (Siegler & Crowley, 1991; Siegler, 1996) developed a method for exploring cognitive development and change in children. His focus on the processes of acquiring new skills influenced the way current study examined changes in approaches to learning (Siegler & Svetina, 2006).

Siegler asked what parts of the child's thinking change. He (Siegler & Svetina, 2006) suggested the following for examining developmental changes in cognition:

- (1) the acquisition of new strategies,
- (2) the frequency of existing strategies,
- (3) the speed of execution of the strategies,
- (4) the accuracy of execution of the strategies,
- (5) changes in the automaticity of execution of strategies, and
- (6) the changes in the range of problems to which each strategy can be applied.

These categories provided a beginning point for our analysis, although they were not directly used.

Following Siegler's perspective, we agreed that "[t]he most straightforward way of studying the issue (cognitive development) is observing particular changes as they are occurring, having a high density of observations with that period, and intensively analyzing the changing behavior that is observed" (1992, p.1243).

In our work, we implemented ideas from Kuhn, who examined changes in learning. Kuhn and her colleagues have done extensive work on the skills of learning, focusing on inquiry and argument (Kuhn, 2005). She defines inquiry as the ability to distinguish evidence from theory and argument, as well as the ability to present a premise, support the premise with evidence, articulate a counter argument, and present a rebuttal to the counter argument (2005).

### *Interrelationship between theories*

Kuhn's perspective on skill development (2005) and Entwistle's (2000) orientation to studying shared important elements. A deep approach to studying related evidence to conclusions, used organizing principles to integrate ideas, and worked to understand materials through explaining and conceiving (Entwistle, 2000). Students' approaches to studying and students' self-theories of intelligence may have facilitated or hindered inquiry skills and affected approaches to studying (Dweck, 1999; 2006).

### *Factors influencing change in student perspective*

Anatomy and Physiology (Biology 104) students were chosen for this study in part because other researchers suggested that during the transition between high school and college, shifts in self-theories are likely to occur (Robins & Pals, 2002). The demands of a challenging course also brought about changes in approaches to studying (Entwistle & Smith, 2002). One of our university's most challenging first-year nursing courses is Anatomy and Physiology.

This project extends the work we (Morehouse, Sakharuk, & Kadieva, 2007) began by looking at the impact of tutors' self-theories of intelligence (Dweck, Chiu, & Hong, 1995; Dweck, 1999). We found tutors with strong incremental self-theories of intelligence, believing intelligence can be improved with hard work, influenced both a change in students' mindset, as well as improved course grades compared to tutors who viewed intelligence as less malleable.

This research integrated three conceptual areas regarding the nature of student studying, with a unique perspective of tutoring for first year students originating from a learning centre. The main thrust of this project was the use of microgenetic/qualitative data to gain a fine-grained picture of the session-by-session experiences of tutors and students over the course of the semester. This part of the investigation concentrated on two tutoring groups whose sessions were video recorded. The investigative technique attempted to explore the interpretive paradigm of the tutor/student interaction. The qualitative examination used constant comparative analysis, in which the videos were transcribed and assessed. Through unitizing and discovery, the interaction was looked at in more detail and theories were formulated about the tutor/student relationship.

The quantitative part of the investigation explored the relationship between all tutored students and their tutors. A prediction was made that there would be a correlation between student scores on *ASSIST* (Centre for Research on Learning and Instruction, 2006) and student scores on *Theories of Intelligence Scale- Self Form for Adults* (Dweck, 1999), relating a deep approach to studying with an incremental theory of intelligence. It was further hypothesized that students with a deep approach to studying would obtain higher grades than students with a surface approach to studying. Finally, we hypothesized that students with an incremental self-theory of intelligence would also obtain higher grades in the course. To support our hypotheses, we implemented several statistical techniques. Tests of differences and associations were conducted to quantify some of the qualitative findings.

## Methods

For the qualitative portion of the study, all tutoring sessions were video recorded for two tutors (eight sessions for one tutor and seven sessions for the other), capturing the details of each session. This method enabled us to observe the patterns of change in students' approaches to studying, their perspective on Anatomy and Physiology, and their ways of relating ideas, use of evidence, and interest in ideas. Microgenetic analysis allowed us to find some important patterns of tutors' instructional approaches, students' orientations toward studying, and the interaction between tutors and students. This study provided some insight into tutoring in a natural setting, an understudied area in education (Terrion & Leonard, 2007).

### Participants

Initially, 11 tutors led 29 study groups with all but one tutor leading more than one group. The total number of students in the original sample was 96. Because of students dropping out of the tutoring program and students not fully completing all the required instruments, 53 students remained in the sample. One tutor was also eliminated from the study as neither of her students completed the research instruments.

Two of tutor-led study-groups were followed in detail, through videotaping and completing verbatim transcriptions of each session. The two groups were selected based on tutors' scores on Dweck's *Theories of Intelligence Scale- Self Form for Adults* (1999). The tutor's incremental score was the criteria for selecting one group. The second group was chosen based on a tutor's entity score.

The incremental tutor (Tutor-three) had a score of 6; meaning she understood intelligence to be acquired through effort. The entity tutor (Tutor-six) had a score of 2.7, meaning she understood intelligence as fixed. A total seven sessions for Tutor-three and eight sessions for Tutor-six were video recorded.

Tutor-three's scores on the *ASSIST* instrument were 45 deep / 61 strategic / 46 surface, which placed her in the deep/strategic approach, with an emphasis on strategic over deep approach to studying. Tutor-six's scores on the Entwistle's *ASSIST* instrument were 65 deep / 72 strategic / 49 surface; these scores placed her within the deep/strategic approach to studying category, with an emphasis on a strategic approach over a deep approach. Both tutors fall within the deep/strategic approach with an emphasis on strategic approaches to studying; however, Tutor-six (an entity theorist) had a higher score on the deep approaches to studying.

### Instruments

All students in the tutor-led study-groups were given pre- and a post-tests using Dweck's *Theories of Intelligence Scale-Self Form for Adults* (1999) and Entwistle's *ASSIST* instrument (Centre for Research on Learning and Instruction, 2006). Final grades for all of the students were collected as well. Tutors were given both instruments only at the beginning of the semester.

### Data Analysis

The overall approach to data analysis taken in this study was to view our research project as an interpretive undertaking. Following Yanchar and Westerman (Yanchar, 2006; Westerman, 2006), we see both quantitative and qualitative data as interpretive. The intention was not to make any positivist claims but rather focus on the relational aspect of the interactions between and among tutors, students, and course material.

The data analysis was in several parts. To start with, the constant comparative method of qualitative analysis was used. After completing the verbatim transcripts and unitizing the results, that is, breaking the transcripts into the smallest unit of meaning, a beginning framework activity, called discovery was conducted. The discovery categories were our best guess as to our potential findings based on our reading, reviewing, transcribing and unitizing the data. Each card was read aloud and placed it in a discovery category based initially on a "look/feel-alike criteria" (Maykut & Morehouse, 1994). Once there were five cards in a category, a rule was introduced that provided guidelines for inclusion and exclusion. Categories were created based on group discussion; all cards belong to one of the categories. From these categories, three propositions were created; quotes supported and elaborated each proposition.

We then began a second phase of analysis. Entwistle (2002) provides five categories for looking at tutor/student interactions. We used these categories of understanding as outcomes of learning, which were: (1) mentioning, (2) describing, (3) relating, (4) explaining, and (5) conceiving, as described earlier.

The next phase of analysis built on the application of the theories of Carol Dweck. As one tool for analysis, Dweck's work (Cimpian, Arce, Markman, Dweck, 2007) on types of praise was used, specifically, looking at praise for effort (attempts at comprehension) versus praise for ability (a correct answer).

Our final phase of analysis was to apply quantitative analysis methods to our data. We conducted t-tests to quantify some of our findings. A linear regression test and Pearson correlation test were employed to examine associations in the data.

## **Results**

### *Propositions*

Our close look at the transcripts yielded three propositions: (1) tutors organized and taught their sessions based on their own self-theories of intelligences by using different levels of understanding, (2) tutors' self-theories of intelligence affected the overall student approach to studying, and (3) based on the self-theory of intelligence, the two tutoring sessions differed with regard to the frequency and types of tutor praise as well as the number and quality of student-initiated questions. Each of the propositions presented below is supported with quotes from the verbatim transcripts.

*Proposition 1: Tutors organized and taught their sessions based on their own self-theories of intelligence by using different levels of understanding.*

The two tutors took different approaches to the way they organized and taught students within their sessions. The first major difference in approaches to tutoring was the use of worksheets prepared by Tutor-six. She used these worksheets to ask a series of multiple-choice (recognition) questions. The questions she chose were much like the questions that had been used in the past as examination questions. Recognition questions orient students to think about the right answer and direct them to thinking within the frame of a multiple choice test. The recognition questions prepared students toward passing the test, while recall questions encouraged students to seek understanding of the topic. Rarely did Tutor-six use fill-in-the-blank questions on the worksheets. Many of her sessions went as follows:

- Tutor-six: Number 2, what are the functions of the Schwann cells?
- Student-three: "E."
- Tutor-six: Yep, it's "E" all of those ...

Tutor-three differed in this respect by using recall questioning, rather than recognition questioning. Recall questions are more demanding of the memory and require the student to tap into their broader knowledge of Anatomy and Physiology. This organization of the session challenged students to search for their own answers. Tutor-three tended to work from her notes but did not use a worksheet. A typical session went as follows:

- Tutor-three: Do you guys remember what the blood barrier does?
- Student-three: Protects your brain...

- Tutor-three: Mhmm, and it keeps...
- Student-three: and ... ( ) ....chemicals.

Moreover, Tutor-six, who understands intelligence as fixed, used a surface approach to tutoring though she scored deep/strategic on Entwistle's ASSIST). This quote from Tutor-six shows how entity and surface go hand in hand:

- Student-two: ... That was a good guess too.
- Tutor-six: It's nice to be lucky sometimes. 'Cause you remember seeing it, but then you're like, 'I don't know.'

The word "lucky" signifies this tutor believes no effort was being put in to figuring out the answer. The wording rather indicates only an ability to guess. In other words, this example shows that entity theorists value ability more than effort. The tutor goes further into saying "you remember seeing it" which implies the student ought to rely on memory rather than comprehension of the topic, when taking a test. This statement indicates how the tutor's surface approach to studying is synonymous with routine memorizing.

Tutor-three, on the other hand, is an incremental theorist. This mindset appears to come across as a deep approach. The following quote shows this:

- Student-four: Pineal gland.
- Tutor-three: Yes, What does that do?
- Student-four: Secretes melatonin.
- Tutor-three: Mhmm, and one other function?
- Student-four: Uhm, and it regulates daily clock.
- Tutor-three: Exactly, daily clock has to do with your sleep and wake cycles
- Student-four: Oh, okay.
- Tutor-three: And so like... they say it may, they're not exactly sure how those things are regulated, but that's basically talking about like, your body kind of gets into rhythm. Like I am kind of used to waking up every day about 8 o'clock, even on Saturdays, when I want to sleep. Your body is like "Oh wake up time" and kind of has to do with like, the sun and the sun setting and the whole day and when you do that. And it can get really messed up when someone's in like Alaska, where they can have sun for like 24 hours and then it can be dark for 24 hours, so that's just a little side note.
- Student-four: What does "melatonin" mean?
- Tutor-three: Do you remember it?
- Student-four: No...
- Tutor-three: Where you find "melatonin"?
- Student-four: Oh! The skin
- Tutor-three: Yes, melatonin has to do with like, your skin.
- Student-four: Oh, it's like pigment... I remember.
- Tutor-three: See, you remember stuff! It's like you're reviewing...

The tutor is clearly implementing deep approaches to aid the students in learning. In the example, the student asked a closed-ended question, which could have been answered with one sentence. However, instead of simply providing an answer, the tutor appears to be interested in the student's understanding of the subject. Moreover, a hint such as, "where do you find melatonin?" indicates the tutor's attempt to relate ideas and use evidence to assist the students to come to her own conclusion to the question (Entwistle, 2000).

In addition, the tutor's comments "do you remember?" and "where do you find melatonin?" indicate the tutor's incremental self-theory of intelligence. In the face of the student's setback (not knowing an answer), Tutor-three was attempting to implement mastery-oriented strategies to assist the student. Furthermore, the tutor praised the student for the ability to work through and find an answer by commenting, "see, you remember stuff!" A comment such as this appears to indicate the tutor's belief in the utility of effort. In other words, the tutor may believe that hard work, not innate ability, is the key to success in a task.

The tutors also differed in their use of levels of understanding that were implemented during the tutoring process. It appears that mentioning and describing are more surface-oriented, while relating, explaining and conceiving are deep-oriented. Tutor-three used mentioning and describing 50.9 % of the time when she was articulating content to the students, while Tutor-six used mentioning and describing 71.6 % of the time. Tutor-three used relating, explaining and conceiving strategies 49.1 % of the time, and Tutor-six used these three categories 28.4 % of the time. For each deep articulation of the material, Tutor-six used four surface articulations. This correlates with Tutor-six's surface approach to the tutoring process, despite her high score as a deep learner. On the other hand, Tutor-three used about equal amounts of surface and deep articulations of the material which was consistent with her high score as an incremental self-theorist.

In addition to the ways the tutors articulated the course content, we also kept track of more general comments made by the two tutors that could be classified as deep or surface in nature. Tutor-three used deep/strategic comments 83.3 % of the time, while Tutor-six used deep/strategic comments 46.8 % of the time. This means that for every one surface comment, Tutor-three made five deep/strategic comments, coinciding with her incremental mindset. Tutor-six, on the other hand, made one surface comment for every deep/strategic comment.

Noel Entwistle's five levels of understanding as outcomes of learning were used as a way of examining how students interacted with one another and with the tutor (Entwistle, 2000). One of the techniques used by the tutors observed was the use of personal examples. Following Entwistle, personal examples were understood to be points that illustrate or clarify a concept drawn from the tutors' personal experience with the test when they were students in Anatomy and Physiology, or other ideas and points they picked up during that time frame. When looking at the use of personal examples, Tutor-six used this technique 4 times more than Tutor-three.

*Proposition 2: Tutors' self-theories of intelligence affected the overall student approach to studying.*

One important change that was observed was that, over time, students increased in one type of question and decreased in others, depending on the tutor who led each session. Students with Tutor-three decreased in their surface questions over the semester, while increasing their deep questions. A typical surface question for Tutor-three at the beginning of the term might be:

- Student-four: Do you need to know every single bone?"

A typical deep question in the interaction between the tutor and students at the end of the term might be:

- Tutor- three: Uhm... The long sustained contractions lead to what?
- Student-three: Tetanus.
- Tutor-three: Yep... what kind of tetanus?
- Student-three: Incomplete tetanus.
- Tutor-three: Good job! And why is leading to tetanus?
- Student-three: Because the muscle doesn't fully relax.
- Tutor-three: Mhmm. And what organ is it that isn't relieving?
- Student-three: Heart.
- Student-four: Oh! That makes sense... Isn't that how, like, what does the tetanus shot like, do? Like ...
- Tutor-three: That's different ...
- Student-four: Oh it is? I was thinking this is .... Ok ... I was trying to relate it somehow so that I understand.
- Tutor-three: I mean, I don't know exactly, but I'm pretty sure ...
- Student-four: Oh, I was just ... like ... Never mind I'll just stop talking. I'm just trying to make it click.

The students in Tutor-six's group decreased in their deep questions over the semester and increased the amount of surface questions asked. A typical deep question at the beginning of the semester, which was rarely found at the end of the semester, might be:



- Student-two: So ok, what do they mean exactly by that? Does that mean that most of this, because it's long bone, is going to be consisting of yellow marrow? And this is going to be more, red bone marrow?"
- Tutor-six: Um...
- Student-two: Would it be axial and appendicular thing? That's part of the /?/.
- Tutor-six: No, let me think of it. Let me see, I'll look in the book.

The typical surface question for Tutor-six might be as follows:

- Student-four: Do we need to know it connects to the process or can we just say, I mean, but that's probably not technically the name for it.
- Student-one: Well you don't need to know the process just the bone.
- Student-four: Yeah, so is it actually infra... or is it the oral?
- Tutor-six: It's the oral.
- Student-four: So that's all we need to know that
- Tutor-six: Yep, and then it abducts. Like the abducts the head or rotates it. I mean...
- Student-four: That's pretty easy.

Moreover, the amount of tutors' praise for student responses was tracked. Tutor-three was relatively consistent in the amount of praise across time while Tutor-six decreased her amount of praise over time. Tutor-three's average number of praises per session were about 22. Tutor-six, on the other hand, praised nine times in the first session and once during the final session.

#### *Statistical support for qualitative propositions*

Elliot, McGregor, and Gable (1999) reported that a person with an entity self-theory of intelligence is likely to coincide with a surface approach to studying. We originally hypothesized that approaches to studying (deep/strategic or surface) would be a key element in determining tutoring style. This research finding by Elliot *et al.* (1999) allowed us to speculate that an incremental self-theory of intelligence might have a positive influence on a deep approach to studying in a student. Another speculation was that an entity tutor would likely increase surface approach to studying among the students she taught.

Our entity tutor's students' post- surface *ASSIST* scores ( $\bar{x} = 49.7$ ) showed a significant increase to their pre-surface *ASSIST* scores ( $\bar{x} = 46.7$ ) (t-test:  $p = .003$ ). This supports our qualitative research, with an entity theorist showing a surface approach to tutoring, influencing her students' surface approaches to studying. Tutor-six's students showed no significant difference in deep, strategic, deep/strategic or self-theories of intelligence scores over the course (see Table 1).

Tutor-three, an incremental tutor, showed a statistically non-significant difference in her students' deep *ASSIST* score between pre ( $\bar{x} = 57.4$ ) and post ( $\bar{x} = 61.9$ ) tests in all of her students (t-test:  $p = .090$ ). Her student's pre-strategic *ASSIST* scores ( $\bar{x} = 66.8$ ) were marginally greater than their post-strategic *ASSIST* scores ( $\bar{x} = 61.9$ ) (t-test:  $p = .070$ ). There was no significant difference in surface *ASSIST* scores or their Dweck scores. Though the difference is small, this fits in with the qualitative piece of the study (see Table 2).

In this study, there were nine incremental tutors with 46 students. These students showed no significant difference in movement away or towards surface or strategic approaches to studying. They also showed no difference on Dweck's scale. However, the students had a post- deep *ASSIST* score ( $\bar{x} = 60.6$ ) that was significantly greater than their pre-deep *ASSIST* score ( $\bar{x} = 56.0$ ) (t-test:  $p = .002$ ). More consistent with Entwistle's understanding that deep and strategic should be combined, these same students also showed a significant difference between their post-deep-strategic *ASSIST* score ( $\bar{x} = 62.2$ ) and their pre-score ( $\bar{x} = 59.2$ ) (t-test:  $p = .017$ ). These statistics are consistent with the qualitative portion, reported earlier, that showed the incremental tutor taught with a deep approach to study (see Table 1).

*Table 1: Tutors' Effect on Students' Approaches to Studying*

Type of Tutor	Deep Approach	Strategic Approach	Deep/Strategic Approach	Surface Approach
Incremental	4.6***	1.3	2.9**	.81
Entity	-1.2	2.0	.42	2.0***

Note. \*\* $p < .05$  \*\*\* $p < .005$

*Table 2: Tutor-three's (Incremental) and Tutor-six's (Entity) Effect on Students' Approaches to Studying*

Type of Tutor	Deep Approach	Strategic Approach	Deep/Strategic Approach	Surface Approach
Tutor-three	4.5*	-4.9*	.19	4.4
Tutor-six	-1.2	2.0	.42	2.0***

Note. \*\* $p \leq .09$  \*\*\* $p < .005$

While we did not compare the tutored students to non-tutored students, those in the tutoring process showed a significant difference in pre-deep *ASSIST* scores ( $\bar{x} = 56.1$ ) and their post-deep *ASSIST* scores ( $\bar{x} = 60.1$ ) (t-test:  $p = .005$ ). All tutored students, with either incremental or entity tutors, also showed a significantly greater post-deep/strategic *ASSIST* score ( $\bar{x} = 62.1$ ) to their pre-deep/strategic *ASSIST* score ( $\bar{x} = 59.4$ ) (t-test:  $p = .016$ ). There was no significant difference in surface scores of all students or their self-theories of intelligence over the semester. We did not monitor all students in Anatomy and Physiology, so we do not know if the change is due to being involved in the study groups, participating in the class, or being at the university level in general.

*Proposition 3: Based on the self-theory of intelligence, the two tutoring sessions differed with regard to the frequency and types of tutor praise as well as the number and quality of student-initiated questions.*

Tutor-three praised all students more consistently, praising 6.5 times more often than Tutor-six. Tutor-three praised students by name on occasion, while Tutor-six never praised students by name (implications for praising students by name are yet to be studied).

Praise for accomplishment (good job) and praise for effort (good try) were also looked at. Tutor-three praised for accomplishment 156 times over all sessions and praised for effort 12 times, with a ratio of 13 to 1. Tutor-six praised for accomplishment 27 times over the course of the semester and praised for effort 15 times over the course of the semester with a ratio of 1.8 to 1. Here is an example of praise for effort:

- Tutor-three: You were close! And see when we first did it, it was only callus, but you did soft and hard, so, but good job! You were close.

Another example of praise for effort is:

- Tutor-six: That's a good question, because we were looking for that earlier.

An example of praise for accomplishment was the simple statement "good job". The examples of praise for ability and effort provide some insight into how the tutors interact with students during a typical question and answer session (See Table 3 for numerical data on types of praise).

Table 3: Types of Praise by Tutor

Tutor	Praise for effort	Praise for ability	Total praise	Difference in # of praises and ratio
Tutor-three	7% (12)	93% (156)	100% (168)	Tutor-three praises 6.5 times more than Tutor-six
Tutor-six	36% (15)	64% (27)	100% (42)	

Another difference between the two tutor-groups is the number and type of student-initiated questions. Tutor-three's group initiated 37 questions, while Tutor-six's group had 52 student-initiated questions, however, Group-six had one more session. The average number of questions per session in Group-three was 5.3 versus 6.5 questions per session in Group-six.

We monitored three types of questions: deep questions, strategic questions, and surface questions. An example of a typical deep question is: can you help me to understand that better? A strategic question can be phrased as follows: how can I memorize that? While a surface question might be: what's on the test?

Following the suggestion of Noel Entwistle (personal communication, 2008), we combined the deep and strategic approaches through the study. Tutor-three's group asked deep/strategic questions 51.4% of the time. Students in Tutor-Six's group asked deep/strategic questions 44.2% of the time. It is important to note that the differences between the two groups would be greater except for the large number of student questions asked in one session of Tutor-six's group. In this session, Tutor-six states that she does not understand the material well.

- Tutor-six: I know it is a confusing chapter. I am still pretty ...Not the best at this stuff either. So if you have any questions, I will try to answer them later."

This statement seems to lead to greater student-tutor interaction in their attempt to try to understand the material, though this may or may not have been the tutor's intention.

### Quantitative Results

We hypothesized there would be a correlation between student scores on *ASSIST* (Centre for Research on Learning and Instruction, 2006) and student scores on *Theories of Intelligence Scale- Self Form for Adults* (Dweck, 1999), relating a deep approach to learning with an incremental theory of intelligence. There is a non-significant association in the positive direction between a deep/strategic approach to studying and an incremental self-theory of intelligence in students pre-test scores (Pearson correlation:  $r = 0.29$ ,  $n = 29$ ,  $p = 0.127$ ). There was no significant correlation between Dweck's entity scores and Entwistle's surface approach to studying scores. This analysis was done with students who completed a pre-test for both Dweck's (1999) and Entwistle's (2006) instruments.

It was further predicted that students with a deep approach to studying would obtain higher grades than students with a surface approach to studying; this was not the case. Students who are deep or surface learners showed no significant difference in their grades. However, surface scores affected their grades, the higher the surface scores on *ASSIST* the lower the grade (linear regression:  $p = .059$ ).

Finally, we hypothesized that students with an incremental self-theory of intelligence would also obtain higher grades in the course. Incremental students showed no statistically significant difference compared to entity students when it came to their final grades. Yet, students with an incremental tutor received an average final grade of a B average, while the entity tutor's students averaged a BC grade, though this difference was not statistically significant ( $t$ -test:  $p = .231$ ).

### Discussion

This study explores the relationship between students' approaches to studying (Entwistle, Tait & McCune, 2000) and self-theories of intelligence (Dweck, 1999; 2006). The work of Noel Entwistle and his colleagues began by examining university students' learning from the students' perspective using qualitative methods as their central

research tool (Marton, Hounsell, & Entwistle, 1984; 1997). These qualitative studies eventually led to the development of *ASS/ST* (Centre for Research on Learning and Instruction, 2006). The first part of our study focused on gaining insight into the interaction of students with their tutors and the course materials. By using microgenetic/qualitative data analysis, we saw how tutors' approaches to studying, theories of intelligence, and intuitive sense of the nature of inquiry and argument, influenced their style and approach to the material and how they interact with the students. Among the more interesting findings of this study is the relationship between incremental tutors and the manner in which they present material to students, in addition to how this presentation affects the students. We found that incremental tutors tend to present material at the upper levels of Entwistle's levels of understanding (2000), while entity tutors presented material in the lower levels of understanding.

The use of praise was also of interest. Tutor-three (incremental) praised more often for ability than Tutor-six (entity). Tutor-three scored in the incremental category on Dweck's *Theories of Intelligence Self Form for Adults* (1999), yet seemed to praise (by raw count) in a manner more consistent with performance goals. Meanwhile, Tutor-six praised in a manner more consistent with mastery goals, although she had an entity score on the Dweck scale. Looking past the raw count, the differences may be explained by the fact that Tutor-six is less experienced than Tutor-three, and therefore many of the praises for effort statements were of the "good question" variety that were given when the tutor seemed to be struggling to provide an appropriate answer. Removing the "good question" related responses, the two tutors' praise for effort statements were approximately equal.

The deep/surface processing distinction is widely understood in study strategies as having conceptual and predictive utility (Elliot, McGregor, & Gable, 1999). Based on our findings, we can also argue that performance goals are consistently unrelated to deep processing, but positively related to surface processing. Research also shows a positive trend between deep processing and performance on examinations (Elliot, McGregor, & Gable, 1999).

Entwistle (2000) describes "relating" as presenting an outline using a personal explanation that lacks detail or a supporting argument (p. 5). This strategy fits into a strategic approach to teaching/learning. Entwistle sees this strategy as helpful for students to connect with the material. Based on our analysis, the use of personal explanation (relating) would be considered a deep/strategic approach to studying. This is consistent with Tutor-six's deep/strategic approach to studying, but overall the orientation corresponds to her surface approach to tutoring, related with her score as an entity self-theorist. The combination of being an entity self-theorist and a person with a deep/strategic approach to studying may explain this apparent anomaly. Since relating is the lowest level of deep/strategic approach to study, it makes sense that she would use this level of understanding when articulating content to the students.

Following Dweck's findings (Cimpian, Arce, Markman, & Dweck, 2007) on the benefits of non-generic versus generic praise, praise after correct answers were counted. Tutor-three praised all students more consistently, praising 6.5 times more often than Tutor-six. This is consistent with Tutor-three's incremental self-theory of intelligence. Furthermore, Tutor-three praised students by name occasionally, while Tutor-six never praised students by name. Finding of praise by name has not been fully studied, however this is an avenue to explore in further research.

From further investigation, we concluded that when it comes to the tutor's approach to studying, one can have either a deep or surface approach, but when it comes to the actual tutoring process, it is the entity or incremental mindset that primarily influences the perceived teaching approach. In other words, one's self-theory of intelligence influences teaching by the way it is perceived by the learner as either deep or surface. This is seen in the two tutors who were observed, with Tutor-three showing the characteristics of recollecting, relating, explaining and conceiving approaches in proportion with her incremental mindset. Tutor-six, who is an entity self-theorist, uses recognition, mentioning and describing, which is consistent with her mindset.

The second phase of our project tested three hypotheses with mixed results. Hypothesis one (there would be a correlation between students' *ASS/ST* scores and their Theories of Intelligence scores) was confirmed in that there is a positive, but non-significant correlation between them. This finding is consistent with a research review conducted by Elliot *et al.* (1999).

Our two other predictions were not confirmed. We thought students with a deep/strategic approach to study would obtain higher course grades. While this hypothesis was not confirmed at a statistically significant level ( $p = 0.059$ ), it was in the predicted direction. Hypothesis three also was not confirmed. This finding runs counter to our own work (Morehouse *et al.*, 2007) that found a significant correlation between Dweck's incremental learners and test-scores. Even though this was not a significant finding, the results were in the predicted direction with incremental students scoring a half-grade above entity students (B versus BC).

This study should be seen as an initial exploration of the tutoring process within a natural setting. Some of the limits of the study include the small sample and the need to create effective ways to use concepts from Entwistle and Dweck as tools for qualitative analysis. An additional problem relates to understanding the impact of the course instructors. Entwistle has argued that the role of the course instructor is important in shaping the approaches to learning among the students in a class. While we knew in detail the orientation of the tutors, both from examination of the video records and transcripts, as well as from the tutors score on the Dweck's and Entwistle's scales, we did not know the orientation of the teachers in either the lecture or the lab sections.

Another weakness of the study was the lack of information from the students in the course who did not seek tutoring. With ASSIST (2006) and Theories of Intelligence Scale- Self Form for Adults (1999) scores of all students, a better picture of the overall effects of the tutoring process could be attained. However, we found that, overall, if a student is tutored, his or her deep approach to studying increases, but there was no data on whether changes occurred with those students not in tutoring.

The role of self-theories of intelligence in an achievement-oriented class was also explored. In this regard, some support for an incremental tutor having a more positive effect on students' grades than an entity tutor does, as our previous study (Morehouse *et al.*, 2007) indicated was found. Furthermore, Dweck has shown that students with an entity self-theory of intelligence tend to acquire an achievement orientation to studying, while students with incremental self-theories of intelligence tend to become mastery-oriented learners (Grant & Dweck, 2003). We would argue mastery-orientation is similar to a deep approach to studying. Mastery oriented learners tend to work toward solving challenging problems (Dweck, 1999), in like manner a student with a deep approach to study is likely to focus on the explaining and conceiving levels of understanding (Entwistle, 2000).

This study provides some support for integrating the theories of Dweck and Entwistle as tools for understanding tutor/student interaction. It also sheds some light on the way approaches to studying are related to mastery and achievement goals. This study may potentially provide some tools for further qualitative exploration of tutor/student relationships in a naturalistic environment.

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