Attributional beliefs and strategic knowledge of students in Years 5, 7, and 9: Comparisons across subject domains

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Abstract

This paper reports part of the first year of a three year longitudinal study of primary and high school students' motivational beliefs and strategic knowledge in English, Mathematics, Social Sciences and in general school learning. 391 Year 5, 804 Year 7, and 664 Year 9 students completed the global Causal Attributions Scale (Chan, 1994) as well as three domain-specific versions of the Chan scales. In addition, all completed the
global
Self-regulated Learning Strategies Scale (Youlden & Chan, 1994), the Mathematics Learning Strategies Scale (Fairbairn, Moore & Chan, 1994), the Social Sciences Learning Strategies Scale (Rodwell & Moore, 1994), and the English Learning Strategies Scale (Youlden & Chan, 1995). Across Year comparisons are made for general and domain specific attributions as well as for strategic knowledge and reported strategy use (generally and in subject domains). The results are discussed in terms of instructional practice and directions for combined attribution and strategy training.

This paper reports preliminary results from the first year of a three-year longitudinal study of primary and high school students' motivational beliefs and strategic knowledge in general school learning as well as learning in the specific subject domains of Mathematics, Social Sciences and English. (The English results are reported more comprehensively in a companion paper by Youlden & Chan, 1995). The paper follows directly from Fairbairn, Moore and Chan (1994) in which the development of the motivational scales and the strategies scales for the same study was presented.

The motivational construct of concern to this paper is attributional beliefs, students' perceptions of the reasons for their successes and failures in learning (e.g. Weiner, 1984). While earlier work in attributions centred on ability, effort, task difficulty and luck, more recent research has demonstrated the importance of strategy attributions as a critical motivational factor (Borkowski, Carr, Rellinger & Pressley, 1990; Clayton-Jones, Rodwell, Skehan, Archer, Chan and Moore, 1992; Chan, 1994). As Chan notes, there are advantages in encouraging strategy attributions in students as failure outcomes may then be interpreted as a need to acquire more effective strategies rather than something such as bad luck or inability which are beyond their control.

Essential to strategy attributions is a student's understanding of the
role of strategies, particularly the self-regulatory strategies of planning, selecting, monitoring, evaluating and revising ongoing performance. These metacognitive activities of planning, evaluating and regulating necessitate effort, initiation, willingness to try as well as a level of persistence when encountering difficulties. However, if there is little likelihood of success, students will likely spend less effort, or even actively avoid tasks which they see as producing failures. Borkowski, Chan and Muthukrishna (in press) highlight the need to assess attributional beliefs in measuring any aspect of self-regulation. They suggest that four beliefs must be developed and maintained before students engage in planning, evaluating, and regulating strategy use:

1) They must value a good performance on the task, that is, they want to do well;
2) They must be convinced that their performance is under their control;
3) They must be convinced that their knowledge and use of strategies will facilitate their performance; and
4) They must perceive themselves as effective and successful strategy users, that is, they are capable and competent.

In other words, committed students, armed with a comprehensive repertoire of strategies, and who appreciate the relationship of their strategy use to good performance are more likely to be involved in purposeful strategy selection, monitoring and regulating. Recent research certainly supports such theorising. Effort and strategy attributions have been shown to positively relate to both knowledge and use of strategies, and subsequent learning outcomes (Borkowski, Weyhing, & Carr, 1988; Chan, 1994; Chan, in press).

Two questions, relevant to this paper, arise from the above research. One concerns the development of students' attributional beliefs and strategic knowledge across the years of schooling, the other concerns beliefs and
strategic knowledge in particular subject domains. In other words, as students become more metacognitively mature as they progress from primary through high school, do they change their attributions for their successes and failures? Do these patterns then vary dependent upon whether or not the student is using Mathematics, Social Sciences, English or general school learning as the framework? These are non-trivial questions, particularly given the literature on differences in classroom practices and teacher beliefs about their discipline in the different subject domains (eg Stodolsky & Grossman, 1995) and the effects such differences might have upon motivational beliefs (eg Ames & Archer, 1988; Wigfield, 1994). Some preliminary answers to these two questions can be found in the literature below.

The research of Clayton-Jones, Rodwell, Skehan, Archer, Chan and Moore (1992) certainly points to developmental differences in general school learning. Clayton-Jones et al. studied students in Years 4, 6, 7, 9, 11 and TAFE showing that for primary grade students, effort attributions for success were positively related to a combined mathematics/English score whereas at middle high school strategy attributions emerged as a positive predictor. A pervasive negative influence across the grades (except Year 4) was noted for attributing failure to lack of ability. Chan's (1994) study continued to examine developmental differences in attributions (Years 5, 7, and 9) but introduced measures of strategic learning in reading (a first attempt at examining domain-specific strategies) although the attribution scales were still phrased in general learning terms. Attributional variables were found to be more important than strategic variables in explaining achievement in reading in the younger students with strategic learning emerging as important, in concert with attributional variables, in explaining reading outcomes in Year 9.

Indications of motivational and strategic differences due to subject specificity can be seen in the early work of Marsh, Cairns, Relich, Barnes and Debus (1984), and the more recent research of Pintrich and De Groot
(1990), Young, Arbreton and Midgely (1992) and Pintrich, Wolters and De Groot (1995). For instance, Pintrich, Wolters and De Groot (1995) studied Year 7 students' motivation and self-regulation in mathematics, science, social sciences and English. They found science to have the most positive levels of both motivation and cognition, maths to have the least. For English, a gender by subject interaction was attributable to females showing a more adaptive style than males. However, while illuminating the question of motivation and strategies in subject disciplines, Pintrich et al's work leaves unanswered the question of such differences across years of schooling, hence the focus of this paper.

In sum, both motivational and strategic variables impact upon learning outcomes and the effects vary dependent upon the age of the student, and to some extent, gender. Discipline differences in motivation and strategies have also been identified but to date little attention has been paid to the development of motivation and strategic knowledge/use in different school subjects across the years of formal schooling. Consequently, this paper examines Year 5, 7 and 9 students' attributional beliefs and strategic knowledge (and use) in general school learning as well as in the specific disciplines of English, mathematics and social sciences.

METHOD

Subjects

The sample consisted of 391 Year 5 (183 boys and 208 girls), 804 Year 7 (420 boys and 384 girls), and 664 Year 9 (316 boys and 348 girls) students attending 16 government and non-government primary (12) and high (4) schools in the Hunter Region, NSW, Australia. Each gave their consent to be involved in the project.

Materials

Causal Attribution Scales. Four causal attribution scales were employed, each with a Junior (Primary School) version and a Senior (Secondary School) version: The Causal Attributions Scale (for general learning,
Chan, 1992, 1994); The Causal Attributions Scale - Mathematics (Fairbairn, Moore & Chan, 1994); the Causal Attributions Scale - Social Sciences (Rodwell & Moore, 1994); and the Causal Attributions Scale - English (Chan & Youlten, 1995). Reliability and validity data can be found in the above works. It should be noted that the discipline based scales were slight modifications of the original Chan scale.

Each of the scales consisted of 10 parallel statements, five success and five failure. The statements describe success and failure incidents followed by four different reasons (ability, effort, strategies, luck) and students were required to rate each of the reasons on a four-point scale to indicate how true they considered the particular reason to be for them. Hence each scale consists of eight subscales, (ability, effort, strategies and luck for success and failure), each with five items. The order of items was randomised for each of the discipline scales to avoid order bias. An example from the mathematics scale is:

Suppose you were given an award for Maths, it was likely because:
   a) you are good at Maths
   b) you had useful methods for studying Maths
   c) you worked hard on Maths that term
   d) you were lucky that term

One-factor congeneric measurement models (Joreskog & Sorbom, 1989) were employed to obtain subscale scores for the eight success and failure attributions for each scale. Each subscale score represents a maximally weighted composite of the five items for the subscale.

Self-regulated Learning Strategy Scales. Four self-regulated learning strategy scales were employed to assess both knowledge and reported use of strategies in general school learning, English, mathematics and social sciences. As for the Causal Attributions scales, both Junior and Senior versions were used.
The global strategy (for general school learning) measure was developed from Youlden and Chan (1994) from which relevant reliability and validity data can be obtained. The English, mathematics, and social sciences items were based on the domain-specific literature in strategies for self-regulation and included re-worded items from the original Youlden and Chan scales. For details on the specific subject scales, see Chan & Youlden (1995), Fairbairn, Moore and Chan (1994) and Rodwell and Moore (1994), respectively.

Each of the 20 items in each of the scales described a student using a particular self-regulated learning strategy (e.g., predicting, monitoring, visualising) and students were required to rate the strategy on two separate four-point scales in terms of how helpful they consider the strategy to be, and how often they employ the strategy. Ratings on the two questions were then averaged separately, giving a "Knowledge" and a "Reported Usage" mean score, ranging from one to four. A typical item from the social studies scales is:

When studying for a test in Social Sciences, Logan thinks up questions that might be asked and tries to answer them.

and for the Mathematics scale:

After reading over a maths word problem, Allison restates the problem in her own words.

Procedure

During the end of Term 3 and the beginning of Term Four, 1994, the four Causal Attribution scales (General, English, Mathematics, Social Sciences) and the four Self-regulated Learning Strategy Questionnaires (General, English, Mathematics, Social Sciences) were administered to class and Year groups, dependent upon school facilities, over three or four days in a two week period. The order of presentation was randomised across school and class sites to reduce possible order effects. On each visit, students were read the instructions and then completed the practice items for the particular questionnaire. Then each item was read out in turn by the researchers as the students completed the scales.
RESULTS AND DISCUSSION

Attributional beliefs: Grade and gender differences

Grade and gender differences in students' attributional beliefs were first examined using separate Grade(3) x Gender(2) x Attribution Type(4) repeated measures MANOVAs for successes and failures in each subject domain. Significant effects are summarised in Table 1. Results for each subject domain reflect similar pattern. No significant three-way interactions were revealed in any subject-domain. The Grade x Attribution Type interactions and the grade and attribution type main effects were significant for all eight analyses. The effects where variations were observed all involved the gender factor.

Figures 1 and 2 illustrate the Grade x Attribution Type interactions for success and failure in the global domain. It can be seen that apart from the luck attributions, the mean ratings for ability, effort and strategy attributions were always higher for successes than for failures. Of the four attribution types, students in general were most likely to attribute success to effort, then to ability and strategy, and least likely to luck. The grade level differences depended on attribution type. The Grade 5 students were more likely than the older ones to attribute success to ability, effort and strategy; but there were no differences among grades on luck attribution and no differences between Grades 9 and 7 on effort and strategy attributions.

In the case of failures, students were most likely to attribute failures to insufficient effort than to the other reasons. Grade 9 students in particular were much more likely than the younger ones to attribute failures to insufficient effort. Again there were no differences among grades on the luck attribution, and on the others, Grade 9 students made higher ratings than Grade 7 students, who in turn made higher ratings than the Grade 5 students.
Further, the significant Gender x Attribution Type interaction for success (Figure 3) indicated that the gender difference was observed only on the ability attribution, with boys more likely than girls to attribute success to ability. The significant Grade x Gender interaction for failure (Figure 4) revealed that the gender difference was observed only among the Grade 9 students, with Grade 9 boys more likely than girls to attribute failures to lack of ability, insufficient effort and not using effective strategies.

Overall, these results suggest that younger (primary) students, particularly boys, are more likely to take personal credit for success, attributing their success to their own ability, effort and use of strategies. However, as they progress through to high school, they are more likely to recognise insufficient effort and to a lesser extent, ineffective strategies, as the most likely reason for school failures.

The results for the specific subject-domains (refer to Figures 5 to 10) follow a similar pattern in terms of the relative likelihood of attributing successes and failures to ability, effort, strategies and luck. Further comparison across subject-domains are reported in the next section.

Attributional beliefs: comparison across subject-domains

To examine differences across subject-domains as a function of grade and gender, separate Grade(3) x Gender(2) x Subject-domain(4) repeated measures MANOVAs were run on each of the eight attribution types. Significant effects are summarised in Table 2. No significant three-way interactions were revealed on any of the eight measures. The grade and subject-domain main effects were significant for all ability, effort and strategy attributions. Significant Grade x Subject-domain and Gender x Subject-domain interactions were observed for the success-ability and failure-ability attributions. The Grade x Subject-domain interaction was significant for the success-effort and failure-effort attributions, while the
Gender x Subject-domain interaction was significant for the success-strategy and failure-strategy attributions. For the success-luck attribution, only the subject-domain main effect was significant, while for failure-luck attribution, only the gender main effect was significant. These results are elaborated in the following.

Ability attributions. The significant interaction effects are depicted in Figures 11 to 14. Results indicate that the Grade 5 students were more likely than the older students to attribute success to ability, particularly so in English. Then the Grade 7 students were less likely to make ability attributions for their success in Social Studies, relative to the other subject-domains; while the Grade 9 students were less likely than the younger students to attribute their success to ability, with similar likelihood of making ability attributions across all four subject-domains. Further, boys were more likely than girls to attribute their success to ability, particularly so in Maths and Social Studies. Or from a different perspective, girls were less likely to make ability attributions for success in Maths and Social Studies than in the other subject-domains whereas for boys similar likelihood of making ability attributions for success was observed across all four subject-domains.

As for ability attributions for failure, results indicate that Grade 9 students were more likely than the younger ones to attribute their failure in Maths and the global domain to lack of ability, while in English and Social Studies both the Grades 9 and 7 students were more likely to do so than the fifth graders. Then while both the Grades 9 and 5 students were more likely to make ability attributions for failure in Maths and Social Studies than in the global domain, the Grade 7 students were more likely to do so in English and Social studies than in the global domain. Further, while boys were more likely than girls to make ability attributions for failure in English, the reverse was observed for failure in Maths. From the perspective of
subject-domain comparisons, boys were found to be more likely to make ability attributions for failure in English and Social Studies than in the other subject-domains while girls were more likely to do so in Maths and Social Studies than in the others.

Overall, results on ability attributions suggest that relative to the older students, Grade 5 students were more likely to attribute success to ability but less likely to attribute failure to lack of ability, particularly in English/Reading. Also students were more likely to make ability attributions for failures in specific subject-domains (particularly Maths) than in the global domain and the younger students were also more likely to make ability attributions for successes in English/Reading than in the other domains. Further, compared to boys, girls were less likely to attribute success to ability, but were more likely to attribute failure in Maths to lack of ability.

Effort attributions. The significant Grade x Subject-domain interactions are depicted in Figures 15 and 16. It can be observed that Grade 5 students were more likely than the older students to attribute success to effort, particularly in English and Social Studies, and that the mean likelihood of making effort attributions for success was virtually identical for students in Grades 7 and 9, with higher likelihood in Maths and the global domain than in the other areas. In other words, whereas the younger students were more likely to make effort attributions for successes in English/Reading and Social Studies than in Maths and the global domain, the subject-domain differences observed among the older students were in the reverse direction: they were more likely to make effort attributions for successes in Maths and the global domain than in English and Social Studies.

Results on effort attributions for failure indicate that Grade 9 students were much more likely, and Grade 5 students were less likely, than the Grade 7 students to attribute failure to insufficient effort. Further,
both
the Grades 9 and 5 students were less likely to make effort
attributions for
failure in English than in the other subject-domains while such
subject-
domain differences were not observed among the Grade 7 students.

Strategy attributions. The significant Gender x Subject-domain
interactions are illustrated in Figures 17 and 18. Results indicate
that while
boys were more likely than girls to attribute their success to use of
effective strategies, the gender difference was greatest in Maths.
Further,
regardless of gender and subject-domain, Grade 5 students were more
likely than the older ones to attribute success to strategy use while
there
were no differences between the students in Grades 7 and 9.

Results on the failure-strategy attributions reveal that the gender
difference was observed only in English, favouring boys, and that
students
were more likely to make strategy attributions for failure in Maths and
English than in the global domain. Further, then regardless of gender
and
subject-domain, Grade 9 students were more likely than the Grade 7
students, who were also more likely than the grade 5 students, to
attribute
failure to not using effective strategies.

Overall, comparison strategy attributions across subject-domains
suggests
that students were more likely to attribute failures in specific
subject
domains rather than the global domain to not using effective
strategies,
whereas the reverse was observed for successes.

Luck attributions. No significant interactions nor grade level
differences
were observed for luck attributions. For the success-luck attribution,
only
the subject-domain main effect was significant. Results indicate that
students were slightly more likely to make luck attributions for
success in
Social studies than in the other subject-domains.

For failure-luck attribution, only the gender main effect was
significant,
revealing that boys were more likely than girls to attribute failures to bad luck.

Knowledge and reported use of strategies: Grade and gender differences

Separate Grade(3) x Gender(2) ANOVAs were conducted on knowledge and reported use of strategies in the four subject-domains. Means and standard deviations are reported in Table 3. Significant effects are summarised in Table 4. No significant Grade x Gender interactions were revealed in any of the eight analyses. Significant grade and gender main effects are described in the following:

Global domain. Significant grade differences were observed in reported use of general self-regulated learning strategies only, but not in the knowledge measure. Examination of the means indicated that the Grade 5 students reported greater use of strategies than the older students, but there was no difference between the Grades 7 and 9 students. Significant gender main effects were observed for both knowledge and usage measures, favouring the girls in both cases.

Mathematics. Only a significant gender main effect, favouring girls, for knowledge of Mathematics strategies was revealed.

English. Significant grade differences were observed in reported use of English/Reading strategies only, but not in the knowledge measure. Examination of the means revealed that the Grade 5 students reported greater use of strategies than the Grade 7 students who also reported greater use of strategies than the Grade 9 students. Further, significant gender differences, again favouring girls, were obtained on both the knowledge and usage measures.

Social Studies. Significant grade differences were observed on both knowledge and reported use of Social Studies strategies. Examination of the means revealed that the grade 5 students reported greater knowledge and greater use of strategies than the older students, but there were no differences between the Grades 7 and 9 students. Significant gender
differences were obtained only on the knowledge measure, again favouring girls, but not the usage measure.

Overall, results on knowledge and reported use of strategies indicated that the fifth grader reported greater use of strategies than their older counterparts in English, Social Studies and the global domain, and had greater knowledge of strategies in Social Studies. The seventh graders scored higher than the ninth graders only in reported use of English/Reading strategies. Girls were found to have greater knowledge of strategies than boys in all four subject-domains and to report greater use of strategies in English and the global domain.

General discussion of overall findings and implications
This research aimed at addressing a number of issues dealing with the development of students' reasoning about their successes and failures in both general learning and learning in the subject disciplines of English, mathematics, and social studies. Also of interest were students' reported knowledge and use of strategies in these areas. From the results reported here several themes emerge. In terms of success and failure attributions, effort is seen to be important by students in all grades and in all disciplines. This is perhaps best exemplified in the Year 9 students. However, while there appear to be different attributions for successes and failures in the different subject domains, these were often tempered by gender interactions. In English, younger students see ability and effort as important reasons for their successes more than older students whereas in maths, older students see effort as important. Girls report ability as important in maths and in social studies while boys report strategies as important in their maths successes. Interestingly, luck as a reason for success permeates all grades in the social studies domain. Attributing failures to lack of ability occurred for boys in English, for girls in maths. For boys, a lack of strategies was also seen as a reason for failure in English.

A consistent finding in the knowledge and use of strategies section of
the paper was that girls reported for English, maths and social studies,

more strategy knowledge, and tended to use this knowledge more than boys. In both English and social studies, there was a tendency for the younger students to report greater knowledge and use of those strategies.

Many questions arise from these findings, not the least of which is related to the effects of classroom practice on students' developing beliefs about their own learning. As indicated in the introduction to this paper, classroom practices do differ in discipline based classrooms (eg Stodolsky & Grossman, 1995) and it is likely that such practices impact upon students' understanding of that context, and their subsequent reasoning about their successes and failures. Perhaps, the general finding of higher scores for effort attributions reflects the oft heard comment, "Come on, try harder". We would argue that while such attributions might be useful, they do not satisfy the four points made by Borkowski, Chan and Muthukrishna (in press) for the understanding of the role of strategies, so critical for making effort useful. Basically, it is no good trying harder, if you do not know how to try, that is you do not have the strategies or if you do you do not know how to use them effectively. Classroom practices incorporating combined strategy/attributional training in the disciplines may provide some answers to many of the questions raised in this paper.

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REFERENCES

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Table 1

Significant F-ratios for the Grade (3) x Gender (2) x Attribution Type (4) repeated measures MANOVAs for successes and failures in the four subject-domains

Table 2

Significant F-ratios for the Grade (3) x Gender (2) x Subject-domain (4) repeated measures MANOVAs on the eight attribution types

Table 3

Means and Standard Deviations of the Strategies Scores in the four subject-domains
Table 4

Significant F-ratios for the Grade (3) x Gender (2) ANOVAs for knowledge and reported use of strategies in the four subject-domains