A cross-cultural comparison of the effects of self-schema on learning engagement

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Abstract

In an up-to-date review of motivational studies in education, Murphy and Alexander (2000) concluded that self-schema is an under-researched concept that deserves more attention from educational researchers. This paper reports the findings of a cross-cultural study that can be considered timely in light of their call. The effects of self-schemas on learning engagement among Australian and Chinese high school students were investigated. A total of 329 Hong Kong Chinese and 704 Australian year 10 students completed a questionnaire that assessed their self-schemas, goal orientations, learning approaches and perceived performance in studying mathematics. In a series of path analyses, it was found that an identical linear model that took self-schema as the most crucial independent variable explained the data in both samples well. Self-schemas predicted why and how Australian and Chinese students engaged in learning mathematics. The two path models, albeit with an identical structure, had subtle differences in the strength of individual paths, which could be attributed to the differential stress on performance and mastery in the respective education system of these two samples. This study advances our understanding of self-schema as a motivational construct in students' learning processes across different cultures.
Introduction

The effects of self-schemas on motivation and learning have, until recently, received little attention from educational researchers. Pintrich (1994) in his insightful review of the research in educational psychology pointed out that much work was required to utilize the self-schema concept to understand students' motivation and learning. Recently, Murphy and Alexander (2000) when reviewing the research of motivation in education resonated Pintrich's assertion and concluded that self-schema is an under-researched psychological concept in the field of education. While social psychologists have produced a plethora of research in investigating the differences between schematic and aschematic individuals since the seminal work of Markus (1977), the effects of self-schemas on motivation and learning remain elusive.

Research on Self-schema

Self-schemas, or cognitive structures about the self, are cognitive generalizations about the self, derived from past experiences in a specific domain (Markus, 1977). They represent a central depot of information related to the self in the long-term memory, which can be stored in form of episodic memories of the self (e.g. I stuttered during my presentation last week) or general abstractions of one's experiences in a specific domain in an organized manner (e.g. I am a poor presenter). These forms of declarative knowledge about the self may include physical characteristics, attitudes and preferences and behavioral regularities (Alexander, 1997). According to Alexander (1997), self-schemas also provide incentives, standards, plans, rules and scripts for behaviors. As such self-schemas should have important causal effects on students' motivation and learning.

The study of self-schemas began with Markus's originative work (1977) that assessed the different information-processing patterns between independent and dependent schematic individuals. Like Markus, most investigators in self-schemas were mostly concerned with contrasting the difference in information processing pattern between schematic and aschematic individuals in various personality traits (e.g. Bruch, Kaflowitz & Burger, 1988; and Fong & Markus, 1982), sex roles (e.g. Markus, Crane, Bertsien & Siladi, 1982; and Markus, Smith & Moore, 1985), and physical attributes (e.g. Altabe & Thompson, 1996; Andersen & Cyranowski, 1987). The general findings are that information that is congruent to the self-schemas will be processed faster and deeper. Self-schemas can facilitate the encoding and recall of self-referent stimuli. Stimuli that are incongruent to the self-schemas will be resisted. When there is an ambiguous situation where information is not supplied fully, self-schemas will function as a reference point to facilitate the interpretation and processing. This is called the "filling in" effect of self-schemas (Markus & Smith, 1981). In addition, these intra-individual differences in information processing as a result of the presence of a self-schema were also found during interpersonal information processing (Fong & Markus, 1982; Lewicki, 1983, 1984; Markus & Smith, 1981; and Markus & et al., 1985).

While the research on self-schemas has spreaded to other applied fields like sports psychology (e.g. Kendzierski, 1988, 1990; Kendzierski & Whitaker, 1997) and clinical psychology (e.g. Allen, Woolfolk, Gara & Apter, 1996; Foa & Riggs, 1994; and Stein, 1996), limited work has been done among educational psychologists to understand the potential and the applicability of the self-schema concept into the research of learning and motivation in education.
Among educational researchers, Lips (1984, 1985, 1995) is among the few studied self-schema. Using an undergraduate sample of female students, Lips studied the maths/science ability self-schema. She found that the relatively low participation rate of female students in mathematics and science was not resulted from their lack of ability. Instead it was their negative self-schemas in math/science ability that drove them away from these subjects. Consistent with the findings in social psychological research, a self-schema in maths/science ability was associated with a difference in processing patterns of associated trait-adjectives pertaining to the learning of mathematics and science. A self-schema in math/science ability also predicted female students’ subject choice and reasons for taking or not taking maths/science courses.

Garica and Pintrich (1994) proposed a detailed theoretical model for studying the effects of self-schemas on learning. In their model, a self-schema is a composite concept consisting of four complementing dimensions, namely, affect, temporality, importance and efficacy. The affect dimension denotes that people's affective state will be influenced by their current self-understanding. The temporal dimension distinguishes between the past, present and future selves. The value dimension taps on the centrality and importance of a self-schema in defining one's identity or core conception. The efficacy dimension refers to the belief that one has the ability to attain, maintain or avoid a particular self-conception. Garcia & Pintrich (1993) utilized this model to study a 'good student' self-schema versus a 'bad student' self-schema. Their findings showed that students who embraced a 'good student' self-schema were more likely to exert volitional control on their learning and usually had better school results. The reverse was true for the students having a 'bad student' self-schema.

The author continued along this line of investigation and utilized Garcia and Pintrich’s model to investigate the effects of self-schemas on learning and motivation of high school students studying mathematics. Self-schemas in learning mathematics predicted the use of achievement goals among Australian high school students (Ng, 1998). In a survey study using a Chinese sample from Hong Kong, a linear model depicting the relationships between self-schemas, achievement goals, learning approaches and anticipated performance was verified (Ng, 2000). In this model, self-schemas were afforded the commanding position, predicting the use of various achievement goals, learning approaches and anticipated performance. This paper reported a cross-cultural study comparing the path models of an Australian sample with this previously found Chinese model.

The Hypothesis Model

Direct-Mediation links

The hypothesized model tested the direct effects simultaneously with the mediational effects of self-schemas on various important learning related variables. The hypothesized model proposed that self-schemas predicted the use of various achievement goals. In particular, self-schema would be related positively to mastery, functional, performance and social solidarity goals, with the strongest relationship expected to be found with a mastery goal and a relatively weak link with a performance goal.

In addition, self-schema would have direct effects on how students learn mathematics and what their performance level would be. In particular, the model proposed that self-schema would be related positively to a deep approach, an achieving approach and the levels of performance but related negatively to the use of a surface approach.
Interlinks among achievement goals, learning approaches and performance

The hypothesized model would accommodate interrelationships among achievement goals and among learning approaches, as the Chinese final model (Ng, 2000) indicated that achievement goals could predict each other and there were significant links among learning approaches. In particular, the current model made several assumptions about the interrelationships among achievement goals and among learning approaches.

Among achievement goals, it was assumed that the link between performance and mastery goals would be significant in the Chinese model but nonsignificant in the Australian model. The rationale is that given the competitive nature of the Hong Kong education system (Biggs, 1996), Chinese students would perceive that having to strive for a comparatively high performance adds extra motivation for them to master the subject matter. In other words, a desire for achievement may drive them towards a mastery orientation. However, Australian students would have a more discrete conceptualization of performance and mastery by which these two goals are perceived as unrelated. This contention is supported by the past research findings involving Caucasian samples (c.f. Ames, 1992). In addition, it was assumed that a functional goal would have an impact on the relative ability and mastery goals while a social solidarity goal would be linked positively with a mastery goal.

A mastery goal would be related positively to a deep approach and an achieving approach but related negatively to a surface approach. Similar assumptions were held among functional goals and learning approaches. A social solidarity goal was assumed to link with a deep approach positively, and with a surface approach negatively; but no significant relationship was expected between a social solidarity goal and an achieving approach. As for a performance goal, it was expected that it would be related positively with an achieving approach as both focus on achievement and performance. Due to the widely documented maladaptive nature of performance goals in the studies of achievement goals using Caucasian samples (e.g. Ames, 1992; Ames & Archer, 1988), a performance goal was assumed to have a negative or a nonsignificant relationship with a deep approach, but a positive relationship with a surface approach.

As for the relationships among learning approaches and performance, it was expected that the deep and achieving approaches would lead to a high performance, and the reverse would be the case for a surface approach.

Concerning the links among learning approaches, a deep approach should link negatively with a surface approach as these two approaches are orthogonal (Biggs, 1987, 1989). Also a link would be added from a deep approach to an achieving approach to test the positive relationship between them (Biggs, 1987; Wong et al., 1996).

Method

Participants

The participants were 704 Year 10 students from four Government-run State high schools in Brisbane. Year 10 students were selected as they had long years of experiences in learning mathematics and would therefore have developed a clear understanding of their self-schema in this domain. In addition, Year 10 is the last year at which mathematics is still compulsory for all students in Brisbane. After data screening, 582 valid cases consisting of students from schools situated in varied socio-economic suburbs in Brisbane were recorded. Among the valid cases, 14.3% (N=83) identified themselves as low achievers in
mathematics, 62.7% (365) as average achievers and 18.4% (N=107) as high achievers. 4.6% (N=27) did not volunteer any self-assessed information regarding their achievement level. These figures indicate that the sample was composed of students of varying achievement levels. The age of students ranged from 13.0 to 16.5 years with a mean at 14.66 years.

The participants of the Chinese sample were nine secondary 4 classes (equivalent to year 10 in Australia and the States) from five secondary schools in Hong Kong. In total, 329 students completed the survey. Two cases were invalid, which were deleted subsequently. These students constituted a mixed-achievement sample. They came from schools of varying achievement bands. Secondary schools in Hong Kong are classified according to students’ collective performance into five different achievement bands. Band 1 schools are mainly made up of high achievers while band 5 schools are populated mainly by low achieving students. The participants in this study came from two band 2, one band 3, one band 4 and one band 5 secondary schools. The age of the students ranged between 14 and 18 with a mean of 15.36.

Measures

This section describes the questionnaire items of the major constructs of the study. Please refer to the Appendix for the details of sample items and the corresponding reliability statistics for each construct. Students rated items measuring these variables on a 5-point Likert scale, ranging from strongly disagree(1) to strongly agree (5), or in the case of measuring learning approaches, very untrue of me (1) to very true of me (5).

Self-schema

The self-schema concept in this study is a composite variable formed by collapsing four variables together, affect, efficacy, importance and future self, which are the four dimensions of self-schema Garcia and Pintrich (1993, 1994) suggested. Factor analysis extracted one factor from these four variables. With an eigenvalue of 3.04 for the Chinese sample and 2.92 for the Australian sample, this extracted factor explained 76 percent and 72.95 percent of the total variance for Chinese and Australian sample respectively. The high communality values among the four variables forming this factor (ranged between .69 and .81 for the Chinese sample and between .67 and .81 for the Australian sample) indicated that 'affect', 'efficacy', 'importance' and 'future self' were highly related. Given the support of this statistical evidence and the theorisation of Garcia and Pintrich (1994), the scores of these four variables were then collapsed together forming a composite variable called "self-schema in mathematics learning". This composite variable had a Cronbach alpha value of 0.89 for both samples. A high score in this composite variable indicated that students in this study held positive self-schemas in learning mathematics, and in reverse, a low score signified that students had negative self-schemas.

Achievement goals

Achievement goals in this study were composed of mastery goals, functional goals, social solidarity goals and performance goals. Mastery goals are characterized by a strong orientation towards understanding and comprehension. Students learning with these goals focus on how well but not on how much they have learnt. Mastery goals were measured by three items.
Social solidarity goals are pro-social behaviors that students will engage in during their learning processes. The pro-social behaviors tested in this construct are confined to helping their friends to learn, working with friends in a group and in general trying to be useful to the society. Students' social solidarity goals were measured by three items and one of them was dropped in order to improve the reliability of the construct.

Students with functional goals engage in learning because they understand that a particular subject or a task will have utility values for them. The utility values can be defined in terms of an academic promotion like getting into a university program they want; or a career prospect like getting a desired job or very broadly, the relevance of the knowledge to everyday life. This construct was measured by three items, of which one was deleted in order to raise the reliability of the construct.

Students' performance goals were measured by six items in the Chinese sample and three items in the Australian sample. Performance goals are characterized by a strong orientation towards achievement.

Learning approaches

Mathematics Learning Process Questionnaire--MLPQ (Liu, 1997) was used to gauge students' approaches to learning mathematics. Three factors were produced with a forced factor analysis using varimax rotation of the MLPQ items. Items with loadings less than .40 were not interpreted. Factor 1 was labeled as the "Deep Approach". It was formed predominantly by items about students' interest in the subject, their willingness to expend time and effort in learning the subject and their use of strategies that build understanding and mastery. The second factor was labeled "Achieving Approach" as it was concerned mainly with a desire for high achievement, the satisfaction derived for solving difficult problems, an anxiety about poor performance and following teachers' instructions in order to secure a high achievement. The third factor was labeled "Surface Approach". It was characterized by a reluctance to expend effort and time on learning mathematics, and the employment of strategies that lead to a superficial understanding.

Performance

Performance was measured in terms of students' anticipated performance. Students were asked to rate their possible mark at the end of the academic year using a 6-point scale (A, B, C, D, E and No target grade). As no student chose the 'No Target Grade' response, the scale was transformed to a 5-point scale. (A=5, E=1).

Analysis

After deleting nonrandomly and systematic missing values, 327 and 582 cases remained in the Chinese and Australian sample respectively. Path analyses using EQS 5 were conducted with these valid cases. The raw data was transformed into a covariance matrix. The Maximum Likelihood method (ML) was chosen as the estimation procedure as it was shown to perform reasonably well with multivariate normally distributed data and a large sample size (e.g. Chou & Bentler, 1995). The Wald test was consulted to exclude non-significant paths and the Lagrange Multiplier test for including paths that contributed significantly to the model.

The Chi-square value ($c^2$) was chosen to gauge the overall goodness of fit. However, as $c^2$ is based on restrictive assumptions and is sensitive to sample size, it may not be a good estimate of overall model fit (Tabachnick & Fidell, 1996). Therefore, other fit indices, the Comparative Fit Index (CFI), the Bentler-Bonett Normed Fit Index (NFI), the Lisrel GFI
Index and the Root Mean Squared Residual (RMR) were also examined as indicators of the goodness of fit. The CFI, NFI and GFI indices can range between 0 and 1. Values of .90 or above in these indices indicate a good model fit to the sample data. A small RMR value (.05 or below) is taken as a corroboration of model fit (Bentler, 1990; Bentler & Bonett, 1980).

Results

Nonsignificant links were deleted. In addition, functional and social solidarity goals were deleted. The presence of these two goals created modeling difficulties, which might have due to the fact that when compared with mastery and performance goals, these two goals might represent background goals providing support to learning and motivation but might not have immediate relevance to the learning process as the other two achievement goals would.

The resulting Australian model showed an adequate data fit ($\chi^2=16.20; d.f.=8; p=.04; \text{CFI}=.99; \text{NFI}=.99; \text{GFI}=.99; \text{RMR}=.02$), which was comparable to the final model of the Chinese study ($\chi^2=20.20; d.f.=8; p=.01; \text{CFI}=.99; \text{NFI}=.98; \text{GFI}=.98; \text{RMR}=.02$). Figure 1 shows the Australian model alongside with the Chinese model.
Note: All paths shown were significant, $p<.001$ (except the path linking relative ability goal and mastery goal in the Australian model); * indicates path coefficients were significantly different in the two models. Self= self-schema; mastery= mastery goal; relative ability= performance goal; deep= deep approach; achieve= achieving approach; surface= surface approach; grade= anticipated grade. Bracketed values represent path coefficients from the Chinese model. Values without a bracket represent path coefficients from the Australian model. Error terms were removed for a clear presentation.

Figure 1: A Comparison of Australian and Chinese Models

On the surface, these two models looked exactly the same, with an identical path structure and congruent causal links. However, subtle discrepancies were present in strength of individual paths. To test if the path coefficients of these two models were different from each other, path coefficients were transformed into Fisher's Z scores, which were then subjected to a test of significant difference, $p<.05$. The result of this set of statistical tests is shown in Figure 1. Path coefficients marked (*) were significantly different from each other. Most of the path coefficients survived this testing, indicating that there was a difference between the two corresponding path coefficients in these two models. Nevertheless, several pairs of path coefficients failed the test:

a. self-schema and deep approach;
b. self-schema and anticipated performance; and

deep approach and surface approach.

These paths, showing no significant difference from each other, can also be taken as the commonality found between the Chinese and the Australian models. In other words, the effect magnitude of self-schema on anticipated performance, deep approach and surface approach were similar in both the Chinese and Australian samples.

The path coefficients that were significantly different from each other revealed the disparate properties integral to each model. Notably, the Chinese model against the Australian model manifested stronger path coefficients in the following links:

a. from self-schema to performance goal;
b. from self-schema to achieving approach;
c. from self-schema to surface approach;
d. from performance goal to achieving approach;
e. from performance goal to mastery approach;
f. from performance goal to surface approach; and
g. from mastery goal to surface approach.

In contrast, the Australian model exhibited relatively higher scores on the following paths:

a. from self-schema to mastery;
b. from mastery goal to deep approach; and

c. from deep approach to achieving approach.

The nature of the difference in path strength can be revealed clearly by looking at the direct and indirect effects of the paths. The Chinese model ($b = .43$) revealed a stronger self-schema effect on performance goal than did the Australian model ($b = .14$), which in turn, had a stronger bearing on achieving approach ($b = .30$) than did the Australian model ($b = .21$). In addition, performance goals in the Chinese model predicted the use of mastery goals in a positive fashion ($b = .18$), whereas in the Australian models this link was not significant.
As for learning approaches, the Chinese model showed a stronger total effect of self-schema on an achieving approach \((b = .67)\), which was caused partly by the strong direct effect of self-schema itself \((b = .38)\), and partly by the indirect effect mediated through performance goals and a deep approach \((b = .29)\). Of particular interest is that performance goals in the Chinese model \((b = .29)\) linked more closely with a surface approach than in the Australian model \((b = .15)\).

Regarding the Australian model, it demonstrated a greater total effect \((b = .67)\) from self-schema to a deep approach, which was due not only to the direct effect of self-schema \((b = .35)\) but also to the mediational effect through mastery goals \((b = .32)\). In addition, the Australian model showed a stronger effect of a deep approach on an achieving approach than did the Chinese model. Although self-schema had an equally strong direct effect on a deep approach \((b = .35)\) in the Chinese model, its indirect effect mediated through mastery goals was relatively moderate \((b = .13)\) compared with the Australian model. It is then not surprising to find that mastery goals had a far greater effect on a deep approach in the Australian model \((b = .46)\) than in the Chinese model \((b = .18)\).

**Discussion**

**Cross-cultural differences**

These results revealed subtle differences between the Australian and Chinese models. In particular, Australian students were distinguished by their strong mastery focus characterized by a strong orientation towards mastery goals and a deep learning approach. Whereas, Chinese students held a distinct achievement focus through which they oriented more towards performance goals and an achieving learning approach. In other words, the effect of self-schemas on a performance goal and an achieving approach orientation was more apparent among the Chinese than the Australian high school students. Conversely, the effect of self-schemas was more evident on a mastery goal and a deep approach orientation among the Australian students.

That said, it is vital to reinstate that despite these crucial differences between the Chinese and Australian students, the two models revealed consistently that self-schemas had a stronger effect on the adoption of mastery goals than performance goals. In other words, students with a positive self-schema would often adopt a mastery goal rather than a performance goal. Nevertheless, the relatively stronger link between self-schemas and performance goals found among the Chinese when compared with the Australians needed further exploration.

This pattern of differences may be related to the differential level of emphasis on achievement, performance and competition in the respective educational system. The Hong Kong system has been notorious for its examination orientation, selective nature and keen competition (c.f. Biggs, 1996; Hamp-Lyons, 1999). An examination or performance-oriented schooling system coupled with high parental expectations for performance and intense social comparison pressure from peers inevitably drives the Chinese students to focus on performance and achievement. Therefore Chinese students when learning mathematics focus not just on understanding and learning but also on performance and achievement in order to survive the intense competition and fulfill high parental expectation for academic achievement. Further research effort is required to test if this tentative explanation holds for students in these two different cultures. In other words, future investigation on the formation of self-schemas and their effect should take the characteristics of the learning environment into consideration.
Cross cultural Similarities

In addition to the differences discussed above, the two final models had some important similar attributes. These similarities allude to

1. the importance of self-schema on learning and motivation
2. contrasting paths to learning
3. filling-in effects of self-schema on future performance

1. Strong Effects of Self-schema on Learning Engagement

The final models demonstrated the significant influence of self-schemas on motivation and learning. It was clear that a direct mediational model fitted the data better than a pure mediational model. In other words, self-schemas had both strong direct and indirect effects on students' engagement behaviors for learning mathematics. The direct effects of self-schemas demonstrated that domain specific self-knowledge predicted students' employment of achievement goals, learning approaches, and more importantly, how students anticipated their achievement levels. The indirect effects of self-schemas were mediated through various achievement goals and learning approaches onto performance. The mediational links among these variables signify an integrative perspective on learning, which maintains that motivation to learn and the processes of learning are causally related. In short, this study showed the important motivational properties of self-schemas. It demonstrated how self-schemas could influence why and how Australian and Chinese students engaged in learning mathematics. In addition, it also revealed that self-schemas are on their own a motivational sources providing goals, plans and scripts associated with students' learning cognitions, behaviors and outcomes in the domain of high school mathematics. In essence, the self conceptualized as a constellation of networked knowledge is found to have important motivational influence on cognitions and behaviors with cross-cultural evidence.

2. Two Paths to Learning and Performance

Two sets of learning paths could be identified from the final models: a mastery-focused path and a performance-focused path.

The mastery-focused path: This learning path originates from self-schema through a mastery goal, a deep approach and an achieving approach and performance. This path is characterized by a strong focus on understanding and mastery, which leads to a high level of anticipated performance.

The performance-focused path: The performance focused path can be divided into two streams: an adaptive stream and a maladaptive stream. The adaptive performance path starts from self-schema, move through a performance goal and leads to an achieving approach. This adaptive path is concerned overtly with high achievement and out-performing others. Therefore, it can be concluded that a performance goal is not maladaptive on its own.

The maladaptive path goes from self-schema through a performance goal, a surface approach and ends with a low performance level. This path is characterized by a strong
focus on achievement without understanding or effort and of course, a low performance expectation.

3. Anticipated Performance and the Self

The highly significant link and the strong path coefficient between self-schema and anticipated performance suggested that students were using their own schematic view of learning mathematics to anticipate their year-end grade as no other information such as the details about the examination was given in the questionnaire.

This "filling-in" effects of self-schema on future performance will have important practical implications, as a low expectation of future success would lead normally to refraining from expending effort and time in an endeavor. In other words, a low expectation of future success will result in a low motivation and effort retreat. In other words, the future self has implications for the current self and the related behaviors within a specific domain.

Limitation

In the main, the significance of this study lies in applying the self-schema concept to understand motivational and learning behaviors. It demonstrated the overriding impact of self-schemas on students' motivation, learning and achievement with cross-cultural evidence. Nevertheless, self-schemas as a motivational construct still need conceptual and empirical elaboration and verification. Investigating students of different biographical characteristics (age, gender, and ethnic backgrounds), studying at different educational levels and doing different subjects will help to elaborate and verify the validity of this important psychological construct and its effects on motivation and learning.
References


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### Appendix: Sample items and Reliability scores of Major Constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Sample item</th>
<th>(a )</th>
<th>(a )</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Chinese Sample</td>
<td>Australian sample</td>
</tr>
<tr>
<td><strong>Self-schema</strong></td>
<td>• <em>Affect:</em> I enjoy learning mathematics</td>
<td>.89</td>
<td>.89</td>
</tr>
<tr>
<td></td>
<td>• <em>Efficacy:</em> I'm as smart as other in doing mathematics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <em>Importance:</em> It is important for me to do well in mathematics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <em>Future selves:</em> I'll choose to study mathematics or other related subjects in my future studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastery goal</td>
<td>I want to master different mathematical skills</td>
<td>.82</td>
<td>.66</td>
</tr>
<tr>
<td>Functional goal</td>
<td>I need to do well in mathematics in order to get into the university program that I want</td>
<td>.66</td>
<td>.77</td>
</tr>
<tr>
<td>Performance goal</td>
<td>I want to get better results</td>
<td>.82</td>
<td>.78</td>
</tr>
<tr>
<td>Social solidarity goal</td>
<td>I want to help my friends to learn mathematics</td>
<td>.67</td>
<td>.77</td>
</tr>
<tr>
<td>Deep approach</td>
<td>In studying a new topic in maths, I often recall materials I have learned and see if there is a relationship between them</td>
<td>.73</td>
<td>.82</td>
</tr>
<tr>
<td>Achieving approach</td>
<td>I'll work for top mark in maths whether or not I like the subject</td>
<td>.86</td>
<td>.86</td>
</tr>
<tr>
<td>Surface approach</td>
<td>In maths, I only do enough to get a pass and no more</td>
<td>.70</td>
<td>.55</td>
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