MOTIVATIONAL ORIENTATIONS, SELF-EFFICACY, ANXIETY AND STRATEGY USE IN LEARNING HIGH SCHOOL MATHEMATICS IN MOROCCO

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Abstract - *A self-report questionnaire was administered to 289 high school students in order to explore their perceived motivational orientations, strength of self-efficacy, level of test anxiety and strategy use, in learning mathematics. A factor analysis of the motivational items produced one factor for intrinsic orientation, and three factors for extrinsic orientation which were labelled 'grades', 'social status' and 'pleasing others'. Students appeared to be predominantly oriented towards obtaining good grades and gaining more social status, and reported using passive trategies more frequently than active strategies. However, correlational analyses showed that students with a stronger intrinsic orientation reported stronger self-efficacy, lower test anxiety and more frequent use of active strategies. By contrast, those with a stronger orientation towards grades reported higher perceptions of test anxiety, and greater use of passive strategies. Interestingly test anxiety related negatively to self-efficacy and to use of active strategies.*

Introduction

In recent years researchers have explored various motivational aspects of learning such as goal orientations, self-efficacy and anxiety, and have sought to investigate how these factors related to performance or strategy use. Research on achievement motivation has identified different types of goal orientation among learners. For example, Dweck (Dweck, 1986; Dweck and Leggett, 1988) suggests that learners pursue two mutually exclusive goals: learning goals and performance goals. In a learning goal orientation, students are interested in gaining competence while students pursuing a performance goal seek to gain a favourable judgement of their competence. Nicholls (Duda and Nicholls, 1992; Nicholls, Patashnick and Nolen, 1985) has suggested that students pursue two contrasting goals: task orientation and ego orientation. Students who adopt a task orientation are interested in attaining mastery while an ego orientation involves striving to establish one's superiority over others. Finally, Pintrich (Pintrich, 1989; Pintrich and Garcia, 1991; 1992) has suggested that goals may be characterised by: a) an intrinsic desire to learn out of pure interest/curiosity, and b) an extrinsic reason such as good grades or teacher approval.

Subsequent research has suggested that students pursuing different goals exhibit different learning or achievement patterns. Nolen (1988) found that deep processing but not surface-level processing was associated with task but not ego orientation. Ames and Archer (1988) showed that students who perceived an emphasis on mastery goals in the classroom reported using more effective strategies. Similarly, Pintrich and De Groot (1990) found that higher levels of intrinsic motivation were associated with higher levels of students' achievement across various types of tasks.

Self-efficacy - an individual's judgements of his/her capabilities to perform given actions - is a concept that is closely related to motivation. Bandura (1977) hypothesised that self-efficacy affects an individual's choice of activities, effort, and persistence. This suggests that people who believe they are capable, will work harder, and persist longer at a task when they encounter difficulties than those who do not believe that they can perform the task. Various studies support the View that perceived self-efficacy in a certain field influences people's performance and strategy use. Wood and Locke (1987) showed that perceived self-efficacy influences students' course grades. Pintrich and De Groot (1990) found that self-efficacy was positively related to cognitive and metacognitive strategies use.

Anxiety is considered by Pintrich (1989) as a motivational component which concerns students' affective or emotional reactions to the task. In a school learning context, test anxiety seems to be an important aspect of anxiety. The undesirable effects of test anxiety on memory, attention, and performance have been well documented (e.g., Tobias, 1985; Wigfield and Eccles, 1989). Researchers invoke two different interpretations to account for the poor performance of highly test anxious students: the interference and the skills deficit explanations (e.g., Tobias, 1985). The interference interpretation assumes that test anxious students tend to do less well because the threat posed by the evaluative situation interferes with students' ability to retrieve what is learnt. It is argued that test anxious students tend to do less well because their attention is divided between the task at hand and negative self-preoccupations. They typically engage in self-absorbing thoughts such as thinking of themselves as stupid, foolish and likely to fail, or considering themselves as likely to panic and hence unable to use whatever skill/knowledge they do have (e.g., Sieber, O'Neil and Tobias, 1977). The skills-deficit interpretation assumes that students' reduced performance is attributable to poor test taking skills, or inadequate study habits at the stage of encoding and storage of the material to be learnt.

Pintrich and De Groot (1990) had seven graders judge test anxiety and use of various strategies, including effort management and persistence. Interestingly, they found that test anxiety was not significantly related to strategy use, but it was negatively related to performance on examinations and quizzes. The authors pointed

out that the effects of test anxiety are related to retrieval problems at the time of testing rather than to lack of effective cognitive strategies for encoding or organising.

Few studies have attempted to identify the general profile of students' motivational orientations, self-efficacy, and anxiety, in the special field of high school mathematics. To my knowledge, no such study has as yet been conducted in Moroccan schools. Yet, it is important to note that achievement in maths plays a crucial role in determining the future of Moroccan students. In the first place, achievement in maths is the principal criterion used to orient students towards science or mathematics sections at the start of high school. Second, mathematics is an important subject on the curriculum for students in both science and mathematics sections, and it is allocated a very high coefficient in the baccalaureate examinations. Third, many higher education institutions are highly selective and take only students who pass the baccalaureate in sciences or mathematics with distinction. Accordingly, many parents make great sacrifices to provide their children with coaching in maths, which could maximise their chances to have access to a prestigious school or faculty, and aspire to interesting job opportunities in the future.

Given the high pressure put on these students to perform well throughout their high school years, it was felt that aspects of their motivation and behaviour needed to be addressed. Accordingly, a major purpose of this study was to explore students' perceived motivational orientations, self-efficacy, test anxiety, and strategy use. Another purpose was to explore the potential relations among the variables involved.

Method

Subjects

The sample consisted of 289 students (134 female and 155 male) coming from five high schools in Rabat, the capital city of Morocco. They were all studying for the baccalaureate exams and were specialising in maths and sciences. The questionnaire was written in Arabic, which is the medium of instruction in high schools.

Measures

The students responded to a 36-item questionnaire which included scales for self-efficacy; anxiety; motivational orientations; and a list of 10 selected learning strategies. The scale for self-efficacy included 6 items assessing students' perceptions of their competence, and expectations of success in

mathematics (e.g., *'compared with other students in this class I think I am a good student in maths'*). Perceived test anxiety in maths was assessed using 6 items tapping students reported emotional reactions to taking tests in maths (e.g., *'I have an uneasy, upset feeling when I take a test in maths'*). The items for the self-efficacy and test anxiety scales were inspired by the literature and were also adapted to the students' educational context.

The scale for the motivational orientations comprised: 1) a 7-item sub-scale for measuring intrinsic orientation, concerned with a desire to study mathematics out of pure interest, enjoyment and preference for challenge, and 2) a 7-item sub-scale for assessing the students' extrinsic reasons for learning, such as a desire to obtain good grades, to gain social status and to please the teacher or parents (see Table 1 for actual items). All the items were extracted from data collected through an open-ended question which asked a group of 103 students, similar to the subjects in the present study, to give the reasons for which they were studying mathematics.

In addition to the scales, the questionnaire comprised a list of 10 leaning strategies selected from data collected through an open-ended question which asked 103 students, similar to the subjects in the present study, to give a list of the strategies they were using to study mathematics. Six strategies involved deep and elaborate cognitive engagement as well as greater deployment of effort, in studying (e.g., *'I try to solve difficult problems to test my ability'*). They were therefore referred to as active strategies. Four strategies involved shallow or passive cognitive engagement (e.g., *'I memorise the rules and properties'*), so they were labelled passive strategies (see Table 4 for actual items).

The students rated each item on the scales on a 5-point Likert scale ranging from 'very true of me' to 'not at all true of me'. They also rated the strategies on a 5-point Likert scale ranging from 'always' to 'never'.

Scores for the motivational orientations, self-efficacy and test anxiety scales were obtained by computing factor scores from the respective factor analyses. Scores for the passive and active strategies were computed by averaging item scores.

Results

Motivational orientations

Factor analysis procedures including a Principal Components Analysis and a varimax rotation were applied to the 14 motivational orientation items in order to delineate clusters that would indicate the students' orientations for learning mathematics. Four factors were extracted accounting for 33%, 16%, 10% and 8% of the variance, respectively. There were virtually no cross-loadings on the factors. Results are presented in Table 1.

TABLE 1: Factor loadings for the goal orientation scales

No.	Items	Intrinsic	Grades	Social status	Pleasing others
4	I am interesting in maths	.84			
2	I fing great satisfaction in learning maths	.82			
8	I derive satisfaction from solving problems	.81			
11	I prefer challenging lessons and problems	.79			
6	I want to discover new things in maths	.77			
14	I want to enhance my skills in maths and apply them to other disciplines	.67			
10	I want to please the teacher		.82		
7	I want to please my parents		.76		
12	I want to impress my peers		.60		
5	I want to pursue good university studies			.86	
9	I want to get important/lucrative jobs in the future			.81	
3	I want to pass exams				.85
1	I want to obtain good grades				.84

As can be seen, factor 1 receives quite heavy loadings from seven items mainly concerned with a strong desire to study mathematics out of interest, curiosity and enjoyment; and to seek challenge in order to Excel in this subject. This factor, therefore, corresponds to what is considered as an intrinsic orientation.

Factor 2 evidences substantial loadings from three items having to do with expending efforts in mathematics in order to please the teacher, the parents and to impress peers. So this factor can be given the label 'pleasing others'.

Factor 3 exhibits appreciable loadings from two items concerned with making efforts in mathematics to be able to pursue good university studies and to aspire to high and lucrative posts in the future. It can therefore be labelled 'social status'.

Factor 4 is defined by two items concerned with obtaining good grades and passing exams. It is then labelled 'grades' orientation.

The Cronbach's alphas for the 'intrinsic'(.90) 'grades'(.67), 'social status'(.63) and 'pleasing others'(.60) orientations were adequate for research purposes.

Given the mixture of orientations that emerged in this study, it was thought appropriate to evaluate the level of endorsement of each orientation by the students. This was computed by taking the average score (minimum = 1; maximum = 5) for those items shown to load on each factor. Results showed a strong endorsement of the 'grades' (M = 4.68, SD = ..61) and 'social status'(M =3.89, SD = 1.14) orientations, a moderate endorsement of the 'intrinsic' orientation (M = 3.50, SD = .98), and a weaker support for the 'pleasing others' (M = 2.78, SD = 1.10) dimension. These results suggest that the students' drive towards studying mathematics was primarily to obtain good grades in order to pass exams and gain social status later in life. Less value seemed to be attached to purely intrinsic reasons or to pleasing significant others.

Self-efficacy

Factor analysis procedures were applied to the 6 self-efficacy items, using principal components analysis, followed with a varimax rotation. As was expected, a one-factor solution was extracted, which gives support to the adequacy of the items. The factor matrix appears in Table 2. The reliability of the scale proved acceptable (Cronbach's alpha: .80).

Test anxiety

The 6 test anxiety items were subjected to factor analysis procedures, including a varimax rotation. As shown in Table 3, a one factor solution emerged. The alpha

TABLE 2: Factor loadings for the self-efficacy scale

No.	Item	Factor loading
8.	Compared with other students in this class I think I am a good student	.82
2.	I think I can understand the maths program taught in this class	.76
6.	Compared with other students in the class I think I know a great deal	.76
10.	My study skills are excellent compared with other students in this class	.71
12.	I am sure I can do an excellent job on the problems and tasks assigned for this class	.69
4.	Compared with other students in this class I expect to do well in maths	.51

TABLE 3: Factor loadings for the test anxiety scale

No.	Item	Factor loading
5.	I have an uneasy, upset feeling when I take a test in maths	.83
1.	I worry a great deal about exams in maths	.76
9.	When I take a test in maths I keep thinking about how poorly I am doing	.72
11.	I am so nervous during tests that I cannot remember things I have learnt	.69
3.	When I take a test I am afraid of making mistakes in solving problems	.64
7.	I feel nervous about going to the blackboard to solve exercises	.46

coefficient for the scale (.76) was acceptable. The mean scores for self-efficacy (M = 3.57, SD = .90) and test anxiety (M = 3.42, SD = .92) were approximately similar. However, test anxiety and self-efficacy were negatively correlated with each other ($r = -.28$), suggesting that some students who reported higher levels of self-efficacy also reported lower levels of test anxiety.

Learning strategies

Table 4 displays the rank-order of the 10 learning strategies according to the percentage level of students who reported using these strategies 'always' or 'very frequently'. The figures indicate that the four passive strategies were the most widely used strategies, with an average percentage of 76%. By contrast the six active strategies appeared to be less frequently used, with an average percentage of 18%.

TABLE 4: Items comprising passive and active strategies

	Items	% level of response
Passive strategies	1. In class, I pay attention to teacher explanation	95%
	2. When studying maths, I read the lessons over and over to myself	84%
	3. In class, I follow all the steps of the lesson	75%
	4. I memorise the rules and properties	67%
Active strategies	5. When work is hard, I never give up or do simple things	60%
	6. I discuss ambiguous points with the teacher and peers	55%
	7. When studying, I try to simplify the material to help me understanding and remember	47%
	8. I try so solve difficult problems in order to test my ability	43%
	9. I look for extra information from various books in order to increase my understanking	34%
	10. When studying, I try to connect new information with things I already know	32%

Variation in students' motivational orientations, self-efficacy, test anxiety and strategy use across gender

The mean scores for the various variables were computed and a series of *t*-tests were applied to highlight significant differences between sexes. Results in Table 5 indicate that boys scored significantly higher on self-efficacy, and lower on test

anxiety, than girls. Thus boys appeared to think of themselves as being more capable and less test anxious than did girls.

As concerns motivational orientations, males scored significantly higher than females on two goals, 'intrinsic' and 'pleasing others'. However, there appeared to be no significant differences between the sexes on the 'grades' and 'social status' goals. Such results suggested that whereas boys and girls were both committed to getting good grades and gaining social status later in life, boys tended to be more passionate about maths and more keen on pleasing the teacher/ parents or impress their peers.

Differences between males and females in respect of strategy use reached significance only in the case of active strategies, where males indicated more frequent use of active strategies than did females. This may suggest that whereas both boys and girls engaged in using passive strategies, boys tended to make greater use of active strategies. So, in comparison with their female peers, male students tended to show more interest in mathematics, perceived themselves as more capable, less test anxious, and reported using a wider repertoire of strategies. Girls scored higher than boys only in perceived test anxiety.

TABLE 5: Results of t-tests for self-efficacy, test anciety, motivational orientations and strategy use across gender

	Means Females	Means males	t-value	df	2-Tail Sig.
Self-efficacy	3.37	3.73	-3.32	269	.001*
Test anxiety	3.62	3.26	3.39	277	.001*
Intrinsic orientation	3.19	3.76	-5.08	240	.001*
Grades	4.69	4.68	.11	283	.9
Social status	3.83	3.95	-.89	282	.3
Pleasing others	2.64	2.90	-1.99	282	.05*
Active strategies	3.13	3.33	2.41	278	.01*
Passive strategies	4.31	4.25	-.89	281	.3

* : significant differences at $p<.05$

Even though females in the Moroccan context have gone a long way towards breaking the barrier between the sexes, in terms of academic and job pursuits which require high standards in mathematics, they do not seem to derive as much enjoyment from studying this discipline as do their male counterparts. Interestingly, in a previous study (Benmansour, 1996) conducted on students' motivation towards studying English as a foreign language in Moroccan high schools, girls showed a significantly stronger desire to learn English for intrinsic purposes than did boys. This picture seems to match the commonly held stereotype according to which males favour mathematics, whereas females prefer languages.

Correlational analyses among the variables

Pearson correlations were computed between motivational orientations scores and self-efficacy, test anxiety, and strategy use measures. The results presented in Table 6 suggest that the intrinsic and extrinsic orientations showed different patterns of relations with perceived self-efficacy. Higher intrinsic scores were strongly associated with higher self-efficacy scores. By contrast, higher scores on 'grades' and 'social status' showed no relation with self-efficacy, whereas 'Pleasing others' exhibited a positive though weak correlation. These results suggested that intrinsically motivated students tended to exhibit higher perceptions of their abilities than did extrinsically motivated students.

Results also indicated that goal orientations exhibited different patterns of relations with test anxiety. Stronger intrinsic orientation showed a negative relation with test anxiety, whereas the extrinsic dimension of 'grades' exhibited a positive relation. No relationship was observed between scores on 'social status' or 'pleasing others' and perceived test anxiety. These results suggested that intrinsically motivated students were less likely to experience test anxiety than the extrinsically motivated students. Not surprisingly, students who were driven by grades appeared to be more prone to experience test anxiety.

On the other hand, motivational orientations appeared to relate differently to strategy use. The extrinsic dimensions all exhibited relatively weak associations with strategy use, but whereas 'grades' correlated with both types of strategies, 'social status' correlated with passive strategies, and 'pleasing others' correlated with active strategies. By contrast, the intrinsic orientation was related to both types of strategies, and it showed a particularly strong association with active strategies. This suggests that intrinsically motivated students tended to use both types of strategies, but they were more likely than extrinsically oriented students to make use of active strategies.

TABLE 6: Correlations between goal orientations self-efficacy, test anxiety and reported strategy use

	Active strategies	Passive strategies	Self-efficacy	Test anxiety
Intrinsic	.58***	.21***	.46***	-.23***
grades	.11*	.22***	.10	.13**
social status	.07	.20***	.08	.11
pleasing others	.14**	.10	.15**	.11
Test anxiety	-.22***	.00	-.28***	—
Self-efficacy	.38***	.09	—	-.28***

* $p<.05$ ** $p<.01$ *** $p<.001$

Thus, intrinsically motivated students appeared to be advantaged over extrinsically oriented students. They tended to perceive themselves as more capable, less test anxious, and appeared to be more sophisticated strategy users. By contrast, students driven by grades were more likely to exhibit higher levels of test anxiety and tended to be poor strategy users.

Finally, results in Table 6 revealed that higher levels of test anxiety were negatively associated with both self-efficacy and active strategies. In other words, students who exhibited higher levels of test anxiety tended to use less active strategies and perceived themselves as less capable.

Conclusion and discussion

A major aim of the present study was to delineate the profile of high school students' motivational orientations, self-efficacy, test anxiety, and strategy use in studying mathematics. The students generally seemed to pursue two types of goals: extrinsic and intrinsic. Contrary to what was expected, the extrinsic orientation was divided into three more precise sub-goals or reasons for learning mathematics: to obtain good grades, to gain social status and to please significant others. These three extrinsic dimensions represented distinct pursuits for the students, and as such they were given different weight by the students. The

'grades' orientation was the most strongly endorsed orientation, followed by the 'social status' orientation. 'Pleasing others' was given only a marginal role by the students. By contrast, the intrinsic orientation emerged as a global unitary goal. Intrinsic reasons for studying mathematics such as curiosity, enjoyment, preference for challenge, and the view that mathematics is an important discipline were perceived by the students as belonging to the same goal. Yet the intrinsic goal was not endorsed as strongly as the two extrinsic dimensions, 'grades' and 'social status', suggesting that students' primary goals were generally extrinsic in nature.

On the other hand, the majority of students (76%) tended to engage in passive strategies more frequently than in active strategies. Results revealed that only a minority of students (18%) reported using active strategies 'frequently' or 'always'.

Correlational analyses revealed that different motivational orientations were associated with different characteristics and behaviours in terms of strength of perceived self-efficacy, test anxiety and strategy use. Higher scores on intrinsic orientation were associated with stronger self-efficacy, a decrease in experiencing test anxiety and an increase in the use of both types of strategies and particularly the active ones. The intrinsic motive appeared to be a powerful predictor of higher perceptions of self-efficacy, lower perceived test anxiety and a larger repertoire of strategies, namely those involving deeper cognitive engagement, and greater deployment of effort .

By contrast, a stronger orientation towards 'grades' was related to higher levels of test anxiety and greater use of passive strategies. Unsurprisingly, students driven by grades appeared to be more prone to test anxiety and tended to exhibit a deficit in their study skills. This implies that working under the pressure of obtaining good grades may be anxiety provoking and detrimental to students' study skills and performance.

The two extrinsic orientations, 'social status' and 'pleasing others' behaved differently from one another. The social status orientation was, like the orientation towards grades, primarily associated with use of passive strategies. This suggests that some students who studied mathematics in order to gain social status also tended to expend the minimum of effort to achieve their goal. By contrast a stronger orientation towards 'pleasing others' was associated with a weak, though positive relation with self-efficacy and active strategies. In this respect, an orientation towards 'pleasing others' exhibited more similarity to intrinsic than to extrinsic learning goals.

Of the four motivational goals that emerged in this study, the intrinsic motive appeared to be the most desirable goal, as it seemed to be conducive to greater use of active and potentially effective strategies. This finding parallels the work of Meece *et al.* (1988), who found that a mastery orientation was positively

correlated with perceived competence, and active strategy use, while a performance orientation was not related to strategy use.

Results in this study further indicated that self-efficacy was related to higher intrinsic orientation, lower test anxiety and use of a wider repertoire of strategies, namely the active ones. Thus, perceived self-efficacy appeared to be a powerful predictor of stronger motivation, positive affect and use of effective strategies. These findings are to a large extent consistent with findings from previous research which suggested that self-efficacy was positively related to student cognitive engagement and performance (e.g., Pintrich and De Groot, 1990).

However, in contrast with Pintrich and De Groot's (1990) finding that no significant relation was observed between test anxiety and strategy use, the present study revealed that test anxiety was negatively related to active strategies but showed no significant relation with passive strategies. In other words, test anxious students appeared to be less likely to use the active strategies which are presumably more effective than the passive ones. This finding suggests that, for this sample of students, elevations in test anxiety during evaluative situations may be accounted for by a deficit in their study skills. As was observed by Tobias (1985), increase in test anxiety during evaluative situations may be due to students' awareness that they are poorly prepared.

Within the body of motivational research, goals are typically thought of as being fostered by the environmental context in which the learner is placed (e.g., Ames, 1992; Boggiano and Katz, 1991). For example, research has shown that students who find themselves in competitive, performance oriented learning environments tend to be less likely to use learning strategies, have a less positive attitudes towards class, and less likely to prefer challenging tasks (Ames and Archer, 1988). Consistent with previous research, the present study suggests that students' strong extrinsic orientation towards grades and 'social status' may have been shaped by an education system which puts great emphasis on evaluation and selectivity.

The results from this paper all point to the conclusion that an emphasis on evaluation may promote extrinsic goals in students, induce higher levels of test anxiety in them, decreases their strength of self-efficacy and inhibit their use of effective strategies. Therefore, a host of implications suggest themselves for high school educators. In order to counterbalance the emphasis placed on grades, teachers need to cultivate in students more intrinsic interest and self-efficacy, which are potentially conducive to the use of effective strategies and better performance. If the teacher establishes a positive relationship with the students and creates an enjoyable atmosphere in the classroom, students are more likely to develop a spontaneous interest in the subject and engage in more effective strategies. In particular, care should be taken to arouse students' curiosity, and create in them the need to learn.

There may also be room for mathematics teachers to use a teaching style aimed at demystifying and humanising the subject, for example, by emphasising its applicability in various domains and making the contributions of the great mathematicians more salient to the students. The personal enthusiasm teachers show about the subject they teach often translate into more student interest and motivation.

Additionally, making students feel good about themselves is at the very heart of education. Seifert (1997) observed that 'improvement in education may rest not on technology or curriculum developments or administrative reform, but on finding ways of making students feel good about themselves by helping students feel capable and independent.' (p. 336). Feelings of self-assuredness come primarily from contact with teachers who treat their students with respect, help them understand the material and give them opportunities to experience success. One way of giving students a sense of satisfaction and success is by setting them proximal and attainable goals. An empirical study conducted by Bandura and Schunk (1981) demonstrated that children who set themselves attainable sub-goals progressed rapidly in self-directed learning, achieved substantial mastery of mathematical operations, heightened their perceived self-efficacy and interests in activities that initially held little attraction for them.

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