Motivational Strategy Guidelines
Based On
Self-Efficacy

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Purpose of this paper

The purpose of this paper is three-fold: First, to examine briefly Social Cognitive Theory’s view on the contribution of self-efficacy to learning and motivation; Then, to offer some guidelines for motivational strategies reflecting self-efficacy concepts that have been supported by research; Finally, to provide some possible ways to implement these guidelines in a mathematics class.

Introduction

Within us all is a desire to achieve. The need exists to show, to ourselves and to others, that we are capable in some area; that we are able to perform difficult tasks, acquire knowledge that no one else knows, run faster, jump higher, and live up to some perceived potential unique to us as individuals.

This goal to achieve is evident in young children, manifesting itself early and continuing at some level throughout the school years and on into adulthood. Of particular interest and importance to me as a teacher are contributing factors to students’ motivation to achieve, and motivational strategies that can increase the likelihood of student achievement.

At this point, let me state the obvious: Studying motivation is somewhat difficult, because motivation is subjective. Motivation is not directly observable. It must be inferred from student behavior. Also, behavior patterns exhibited by students may have similar surface attributes, but could arise from entirely different motivations (Good, Brophy, 1995).

Student motivation is affected by many variables including past experience, peers, home life, classroom and school expectations, and teacher behavior. This adds to the complexity of studying motivation, and adds to the difficulty teachers face when addressing issues relevant to promoting student motivation in the classroom setting.

Background

Motivation can be defined as a need or desire that energizes and directs behavior (Myers, 2001). The study of motivation has been influenced by various psychological theories. Each of these theories state different sources of motivational needs, and each have certain drawbacks. Let us examine some of these theories that have developed over the years.
Behavioral views

Behavioral views of motivation concentrate on extrinsic factors (external rewards or punishments) and reinforcement of desired behaviors (based on John Watson’s mechanistic concept that behaviors could be totally described in terms of observable responses to certain stimuli). An extrinsically motivated student performs "in order to obtain some reward (good grades, teacher approval, etc.) or avoid some punishment external to the activity itself," as opposed to a student who is intrinsically motivated and undertakes an activity "for its own sake, for the enjoyment it provides, the learning it permits, or the feelings of accomplishment it evokes" (Lepper, 1988).

B.F. Skinner’s operant conditioning theory proposes that the voluntary responses of people are strengthened when reinforced by rewards and weakened when they are ignored or punished. Related to students, Skinner developed programmed instruction, in which students were given positive reinforcement for correct responses, motivating the student to proceed with desired consequences.

The behavioral approach is limited, however, in that it stresses external motivating factors (praise, good grades, rewards, etc.), which may lead to certain drawbacks. For example, students motivated in such a manner may be less likely to learn if no tangible reward is given. In certain instances, extrinsic rewards actually decrease intrinsic motivation factors that may have been present (Cameron & Pierce, 1994; Eisenberger & Cameron, 1996; Ryan & Deci, 1996).

Cognitive views

Cognitive views on motivation propose that behavior is influenced by the environment and self-perception. Compared to the behavioral view of external stimulus/response, cognitive views tend to be more internal and information processing based.

Based on Jean Piaget’s equilibration, assimilation, accommodation, and schema formation, cognitive views stress an innate desire on the part of people to keep balance and organization in their perceptions of the world around them. When imbalance occurs, schema are modified to regain desired balance and organization. In terms of motivation, students may become motivated to learn in order to achieve desired equilibrium, and obtain a feeling of
mastery over their environment. *Cognitive dissonance theory*, developed by Leon Festinger, and based on Piaget’s views on disequilibrium, states that people will act in such a way as to resolve discrepancies between different beliefs or actions.

Cognitive views have certain limitations. These include difficulty in achieving the lack of balance (or disequilibrium) needed to motivate students to modify schema, and the difficulty in measuring the need for achievement in individuals.

*Humanistic views*

*Humanistic views* of motivation can be attributed to Abraham Maslow. Maslow described (1970) a *hierarchy of needs* that drove motivations. Maslow was a very influential person in regards to the study of motivation, and his writings have led to many subsequent studies and attempts to develop grand theories of motivation.

First, at the lowest level of Maslow’s hierarchy, are physiological needs (need to satisfy hunger and thirst), second are safety needs (need for safety, security, organization and predictability), third comes belongingness and love needs, fourth comes esteem needs (self-esteem, achievement, competence, recognition, respect), and fifth, at the highest level, are self-actualization needs (living up to one’s fullest potential).

To adhere to Maslow’s hierarchy of needs, it becomes the teachers’ duty to ensure that all lower hierarchical needs are met before achievement, competence, and fulfilling potential are accomplished. This is one of the drawbacks of Maslow’s theory that arises in practical application, due in part to limited resources including money and time.

*Social Cognitive Theory*

More recent developments include *Social Cognitive Theory* (SCT), proposed by Albert Bandura, and arising out of previous notions espoused in *Social Learning Theory*, which has been in existence for some time (since the 1890’s, in one form or another). SCT emphasizes social origins of behavior, and proposes that cognitive factors play a central role. SCT also takes the stance that learning can occur from observation of people and the world around us, as well as from reading books and other materials.

Central to SCT is the concept of self-efficacy, and the major contribution it makes towards cognitive development. This will be further investigated later in this paper.
Précis

Part of the obligation I feel towards my students is the need to find some general
guidelines for motivating them that will give the greatest number of students the greatest
chance for success. This desire to know motivational strategies necessarily includes a
desire to know what drives the students to behave as they do. In this aspect, SCT goes
further in explaining student behavior (in my opinion) than other theories that lean towards
being overly behavioral or overly cognitive in their approach.

What makes SCT stand out to me is the self-efficacy aspect, which fits what I have
experienced and observed as a teacher. Self-efficacy, according to Bandura, is a person’s
belief that they have behavioral competence in various situations or areas. Decisions by
students based on self-efficacy dictate their involvement in activities, as well as the time
and effort they put into achieving goals (I addressed these factors of time and effort in my
previous synthesis paper (Shirkey, 2003), in which I proposed that development of
mathematical understanding was affected by factors including time and effort). Self-
efficacy, then, acts as a guide for student behavior.

It is my belief that self-efficacy can, and should, be addressed in the development
of strategies for motivating students, as it plays a major role in student learning and
achievement. In light of this, let us look further into SCT and self-efficacy, and then view
some guidelines I would suggest for motivational strategies based on the self-efficacy
concept.

Development

An overview of SCT

SCT views behavior as a “triadic, dynamic, and reciprocal interaction of personal
factors, behavior, and the environment (Bandura, 1977; 1986; 1989; Pajares, 2002).
Interaction of these three factors is complex, and differs between individuals. It is this
characteristic of “reciprocal determinism” (the interaction of personal and cognitive factors
with the environment), colored by perceptions of control, which drives behavior. SCT
proposes that people are both products and architects of their environments, and “at every
moment, our behavior is determined by our genes, our experiences, and our personalities (Myers, 2001).

For example, personal-behavior interactions involve personal expectations, beliefs, and goals (to name just a few factors), and these in turn give energy and direction (back to that definition of motivation mentioned earlier) to student behavior.

Personal-environment interactions involve social and physical attributes found in the surrounding environment contributing to the development of expectations, beliefs, and competencies.

Behavior-environment interaction involves behavior modifying the surrounding environment, as well as the environment directing and modifying behavior. People, according to Bandura, will select what part of the environment they pay attention to, and, based on personal preferences and competencies, choose activities to participate in as well as people to interact with.

Bandura’s SCT differs from previous theories in the belief that humans are self-organizing, self-regulating, proactive organisms that do more than merely react to external or internal forces. Bandura believes that self-perceptions of capability are critical, and, in fact, offer better explanations for behavior than what people are actually capable of achieving.

Bandura found through investigation that, through observation of models and modeling behavior, people learn how particular behaviors are best suited for achieving particular goals. Furthermore, this observational learning does not require the levels of reinforcement or punishment called for in other theories of motivation.

According to SCT, the students act in ways to contribute to their own motivation and cognitive development, based on the previously mentioned interactions of personal factors, behavior, and environment. There are five basic capabilities students (and people in general) possess which help determine behavior, and these areas should be addressed when attempting to develop motivation within the student (Pajares, 2002):

- Symbolizing Capability: giving meaning to experiences through the formation of symbols (words, images, etc.).
- Vicarious Capability: learning from the observation of others or from reading, without having to perform
● Forethought Capability: self-motivation and anticipation of outcomes guide behavior.

● Self-Regulatory Capability: internal control mechanisms regulate behavior and bring about self-imposed consequences for behavior.

● Self-Reflective Capability: analysis of and reflection on past experiences, and thought processes.

Self-Efficacy falls under the last category of Self-Reflective Capability, as it is considered a type of self-reflection. Bandura believes that self-efficacy plays a major role in developing self-regulation. Self-efficacy is developed through the influence of four sources: performance/mastery experience (indicative of capability); vicarious experience (competencies and attainments achieved by others, gleaned from observing and reading); verbal persuasion (from teachers, parents, and other models); and physiological and affective states (emotions, anxiety, stress, etc.).

Studies have supported these sources for self-efficacy, and have also shown that some sources are more likely than others to influence performance based on age of students (Phan and Walker, 2000; Lopez and Lent, 1992; Lent, Lopez, & Bieschke, 1991; Matsui, Matsui, & Ohnishi, 1990). For example, 9th graders were shown in a study to be more influenced by performance accomplishment and emotional arousal, but not vicarious learning or verbal persuasion.

_How self-efficacy affects motivation and learning_

There are at least three ways that self-efficacy affects motivation and learning. (Snowman, Biehler, 2000). First, the _learning goals_ students choose based on their levels of self-efficacy are affected. Students with high levels of self-efficacy tend to select _task mastery_ goals, where meaningful learning of material is desired, and see their tasks as challenges, not threats. Students with lower levels of self-efficacy tend to select _ego/social_ goals, in which pleasing authority figures (teacher, parents, etc.) is of prime importance.
Finally, students with low levels of self-efficacy tend to select work-avoidant goals (trying to get by with the minimal effort possible).

Outcome expectations are a second area influenced by self-efficacy. Students with high levels of self-efficacy have high expectations, and tend to have a positive outlook. Research shows that these students use varieties of learning techniques, study longer and more productively, review frequently, and self-monitor their progress (Brown, Lent & Larkin, 1989; Hackett & Betz, 1981; Muton, Brown & Lent, 1991; Schunk, 1987). They practice, to a higher degree, what Dubinsky (1991) refers to as “reflective abstraction”, which I believe is necessary for developing understanding in mathematics. In reference to my previous synthesis paper, these students put in the time and effort necessary to move towards a deeper level of mathematical understanding on the learning continuum that I suggested.

Studies of self-handicapping behavior (students unconsciously handicapping their achievement) have been done and link it with low levels of self-efficacy (Urdan, Midgley, & Anderman, 1998). Apparently, students display this behavior so that they can blame poor performance on circumstances beyond their control. They do things such as putting off work until the last minute, losing assignments, and filling their schedule with activities (athletics, clubs, jobs) that reduce study and work time. Their unconscious actions protect their egos from the possibility of damage that could occur if they try hard and perhaps fail. (Arkin & Baumgardner, 1985; Berglas, 1985). This self-handicapping behavior can be particularly widespread in females and minorities (Gutbezahl, 1995).

Attributions (factors seen by students as sources of success or failure) are the third area in which self-efficacy plays a role. Students with high levels of self-efficacy attribute failure to their own insufficient effort or ineffective strategies, and they are motivated to work harder the next time. They display a high degree of personal control, and look to internal factors for reasons explaining their failure or success in a subject (an internal locus of control). Students with low levels blame their own inability in a subject, outside influences (teacher, illness, etc.), or some other external uncontrollable factor (an external locus of control).
Some research on mathematics and self-efficacy

Various studies carried out since the 1980’s have showed that self-efficacy does indeed play a role in mathematics performance. Norwich (1987) found a moderate correlation between self-efficacy and previous math performance in subsequent performance (he did not, however, find that self-efficacy by itself had a significant effect). Pajares and Miller (1994) found in a study on first year university students that there was a direct relation between math self-efficacy and motivational variables such as high school experience, math performance, and self-concept.

A later study by Pajares and Graham (1999) determined that a students’ mathematics self-efficacy was, in fact, more predictive of math performance than other motivational variables. Pajares and Kranzler (1995) found that the direct effect of mathematics self-efficacy on performance in mathematics was as strong as general mental ability.

Collins (1982) linked low or high mathematics self-efficacy with levels of mathematics ability and found that children with high math self-efficacy completed more problems correctly and reworked more of the problems they missed than those with low math self-efficacy. Relationships have also been found between self-efficacy, cognitive strategy usage, and self-regulation through metacognition (Pintrich & DeGroot, 1990).

Guidelines for motivational strategies

Based on the information that has been gathered through research on SCT and self-efficacy since the 1980’s, and my own teaching experience, I would like to offer the following ten guidelines for consideration when deciding on any motivational strategies (including lessons and classroom activities):

1. Teachers should pay attention not only to students’ competence, but also to their perception of competence. Self-efficacy should be assessed through questionnaires, surveys (examples of which may be found on the internet. You can go to www.emory.edu/EDUCATION/mfp/PajaresSE1996.html for some sample questions.), portfolios, journals, or any other method deemed useful. Teachers must be aware of where the student is at in terms of self-efficacy. They must also remain current and up-to-date with that knowledge for the duration of the course.
2. Teachers should teach in a way that builds confidence as well as competence. This requires, in part, a teacher that is knowledgeable and enthusiastic about the subject, and has appropriate pedagogical knowledge. It should be noted that the ability to create a classroom environment conducive to the fostering of self-efficacy and cognitive development depends very much on the self-efficacy of the teacher. For example, low levels of teacher self-efficacy tend to contribute to an overly controlled environment dependent on negative sanctions to get students to do work. This is not an environment ideal to developing higher levels of self-efficacy or cognitive development, yet it is an environment present in many classes today.

3. According to Bandura, mastery experience provides the greatest influence on self-efficacy. This would indicate that sufficient chance to obtain this experience, and the competence and confidence arising from it, should be offered. Students should be given appropriate time to explore, discover, do work assignments, and revise that work after initial feedback. The revision factor allows for greater student self-reflection, and this helps address the need for the necessary reflective abstraction required to develop deeper understanding. This can be a time-consuming process, and would indicate the need for greater depth and less breadth of material covered (admittedly a major concern of educators in times where standardized test scores are given such high emphasis). Work should be challenging and require time and effort, but not to the point of being frustrating.

4. Students should be encouraged to compare their progress to their own personal standards, not to the performance of others (again, a concern in the standardized-test-driven educational environment). In light of this, instruction should be as individualized as possible, and teachers should give individualized feedback on a regular basis, apprising students of their performance. This individualized approach should take into account gender, ethnic, and age differences, and tailor instructional methods accordingly.

5. Competitive classroom environments tend to be less successful in promoting higher self-efficacy than cooperative learning environments. Cooperative learning should therefore be incorporated when possible, and should be carefully planned and monitored to ensure meaningful participation and learning on the part of all students.
6. Teachers should help students set achievement goals (this allows students to work towards anticipated outcomes), then help lay out steps to achieve those goals.

7. Continuous support and encouragement of students should come from the teacher as well as other students. The entire classroom environment should be structured as to provide maximum support and encouragement for all students. I would also add that the structure of the *entire school* should be such that maximum support and encouragement is provided for all students.

8. Allow students as much control over the grade they earn as possible (this could include making things like attendance and participation part of the grade, perhaps even a sizeable percentage of the grade, depending on the class). Students should be encouraged to take personal ownership of their own educational outcomes.

9. Teachers should be aware when self-handicapping behavior (withholding effort, procrastinating, etc.) is occurring and take steps to try and correct it through modeling, socialization, and practice exercises. Brophy (1986) refers to this as *attribution retraining*, with goals of helping students to concentrate on the task at hand, to avoid distractions from worrying about failure, and to attribute failures to insufficient effort, ineffective strategies, or lack or information (not to inherent lack of ability, or some other uncontrollable external factor).

10. To provide for *observational learning*, the teacher should be a model of appropriate behavior, including use of problem-solving strategies, persistence, and positive expectation. Reading materials related to the subject (magazines, journals, biographies of famous mathematicians or other subject specific personages) should be provided.

*Applying these guidelines to a mathematics class*

I will now offer some suggestions on how these guidelines could be implemented in a mathematics class. The following table gives the guideline number and a possible method of implementation:

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Implementation</th>
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<tbody>
<tr>
<td>1</td>
<td>Give a math self-efficacy survey sometime during the first week of class (ideally,</td>
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<td><strong>2</strong></td>
<td>Continue professional development by taking math and math education courses. Address both math content and pedagogy. Attend math and education conferences. Become a member in both educational and mathematics professional organizations. Read a lot on the subject, and on how to teach it. Foster and maintain a love for mathematics and for teaching.</td>
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<td><strong>3</strong></td>
<td>Plan lessons to allow for exploration and discovery on the part of the student. Challenge students with problems beyond the easiest ones in the textbook. In Geometry, for example, let students explore and develop proofs through their own efforts to as great an extent as possible. Software such as “Geometer’s Sketchpad” can help in this area of exploration and discovery. Allow students opportunity to revise homework before a final grade is given. Make the revision process part of their grade. For example, the first 10 or 15 minutes of class (on occasion) might be planned for groups to compare homework answers. They discuss, make any necessary corrections, write reasons for changes, and turn in the homework as a group. Randomly select a paper to grade, and let the group share the grade.</td>
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<td><strong>4</strong></td>
<td>Maintain consistent and constant feedback with students. Meet one-on-one when possible. Take into account motivational factors that should be addressed based on gender and ethnicity. For example, in a math class display posters of prominent minority or female mathematicians and scientists. Perhaps have a guest speaker (female or minority) who is a career scientist or mathematician. Create or select word problems involving minorities or females in practical applications of math.</td>
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<td><strong>5</strong></td>
<td>Make cooperative learning a part of the class. For example, form student review groups before a math test. If everyone in the group gets above a certain grade, the group gets bonus points. Another example: form student groups for board work such as solving a system of equations. Let one student act as writer, one suggest answers, and another check with others in the class. Another thing to consider, stressing the vicarious learning aspect, is to assign a group to research a famous mathematician, and explain a major discovery of that person. Each group member...</td>
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should take a certain amount of notes (2 pages each, for example), and then write the report together.

6 Help students set goals (long and short-term) for the class. Do this the first week. Modify them as needed during the duration of the course. Help students lay out steps to achieve the goal. For example, if the goal is to perform well on a test on how to solve systems of equations in Algebra I, steps might include reading the appropriate sections in the text, going over example problems, taking notes in class, practicing homework problems (then checking and revising), and turning in homework on time. Setting deadlines for the different tasks may be helpful.

7 Encouragement should come from the entire math class (this should be modeled consistently by the teacher). When support and encouragement is shown between students, it should be praised and acknowledged. Let the students know that it is not only acceptable to support each other in learning math, but that it is also highly desirable.

8 Participation should be included in the grade. In a math class, answering questions in class, asking questions in class, doing problems on the board, and volunteering to help other students should count for enough of the grade to encourage students to do this. Attendance could be checked by short quizzes, so that performance is developed in addition to just checking for a student’s presence or absence.

9 Put an end to procrastination (teachers should consistently model this themselves). This may be addressed in student goals and steps to meet them, and followed-up by periodic checks on an individual basis with students. Perhaps some assignments would lend themselves well to being broken up into separate parts, with different due dates, so that procrastination could be addressed as early as possible.

10 Keep handy a supply of old texts (from math, science, business, or any other area with math applications), magazines such as *Chance* and *Mathematics Teacher*, math and science journals, books on math history, biographies of famous mathematicians and other scientists, etc. Encourage reading of these supplementary materials (perhaps by including it in graded activity, such as the biographical report mentioned earlier).
Conclusion

The guidelines I offer reflect my current understanding of self-efficacy. I may modify them at some later date, as I gain more knowledge and experience. My feeling is that they do a good job of addressing some key areas brought out in studies of self-efficacy. Also, they are not so subject-area specific that they can’t be used by teachers in any subject.

Much remains to be researched in the area of self-efficacy and the contributions it makes to the areas of motivation and learning. It’s a fairly new field, ripe for research. Further studies into gender and ethnic factors, their effects on self-efficacy and performance, and possible classroom strategies to help students develop self-efficacy, should be encouraged. Development of supplementary curricular materials (even textbooks) promoting higher levels of self-efficacy should occur.

Studies into creating classroom/school environments conducive to learning through the achievement of optimal interactions of environment with behavior and personal factors should take place (this might prove interesting considering the difference in influence of sources of self-efficacy on learning over age, as was mentioned earlier in this paper). This means studies into factors that promote optimal levels of interaction, and how to identify those optimum levels, should be carried out.

Finally, the importance of teachers providing appropriate modeling behavior cannot be over-stressed. If SCT and the self-efficacy concept prove to have future impact on education (as I feel they will), then this must be taken into account in teacher training and education.
Bibliography


Online sources and suggestions:
- www.cartwright.k12.az.us/Math/Resources/cooperat.html (Cooperative Learning Suggestions).
- www.emory.edu/EDUCATION/mfp/BanEncy.html (Self-Efficacy by Albert Bandura).
- www.emory.edu/EDUCATION/mfp/effpage.html (An excellent resource for information and links on SCT and self-efficacy).