

The Classroom Management Strategies for the Efficiency of Mathematics Teaching-Learning Process: Everything You Need

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“I believe all students can acquire basic mathematical skills when provided appropriate and safety (not only physically but also emotionally) learning environment”

Abstract: It is very well known that the main cause of the classroom management problems is the students' unwillingness to the subject that is taught. As long as students are actively engaged in the learning process the problems would be minimized and teacher would not spend too much energy for managing class. That is why the subject teacher's main role is inspiring willingness and trying to involve all the students into the learning process actively. Considering the importance of teaching mathematics, teachers have to develop pedagogical strategies (recognizing of obstacles that exist in the students' mathematics learning process) and help students to develop their mental faculties and reasoning abilities by improving mastery approach for learning mathematics. In order to boost mathematics-efficacy and outcome expectations choosing mastery-oriented classroom management strategies is very essential since these strategies influence the amount and the quality of students' engagement as well as mathematics learning and students' persistence to continue learning when tasks are challenging. Therefore the main purpose of this study is to present the importance of fostering mastery goal orientation in classroom management. Additionally in order to foster students' mastery goal adaptation, critical classroom management strategies based on modern motivational theories that are especially important for defining the success of teaching and learning mathematics will be offered.

Keywords: Mastery-Goal Orientation, Classroom Management Strategies, Implicit Theory of Intelligence, Self-Worth Theory, Social-Cognitive Theory, Modern Expectancy-Value Theory

1. Introduction

According to psychologist Parsonson (2012) students' inappropriate behavior problems in a classroom increase the stress levels for both the teacher and students, interrupt the flow of lessons, processes and prevent to acquire knowledge. Teachers have to take into consideration that students bring to school all patterns of behaviors, feelings (anxieties, distresses) and attitudes etc. A classroom is an environment with those established behaviors and feelings, including teacher, students and their interrelationships, the equipment, materials and daily activities which all interact to influence the students' future behavior acquisition as well as teaching-learning process.

Marzana and Marzana (2003) after a comprehensive review (44 handbook chapters, 20 government and commissioned reports, and 11 journal articles) have found that 228 variables affect student achievement. They also state that of all the variables, classroom management has the largest effect on student achievement. However the question is still going on. What is the key factor in classroom management? Is it the best equipment and material which is used in daily activities or teachers' actions in their classrooms? Despite of all the bad conditions (e.g. teacher's school/university is highly ineffective, and class size and levels of heterogeneity are too big) teacher's actions and his/her successful implementation of relevant and meaningful classroom management techniques in their classrooms can produce powerful gains in student learning (Marzano, Marzano, & Pickering, 2003; Wong & Wong, 2001; Wright, Horn, & Sanders, 1997). Wright, Horn and Sanders (1997) indicate in their study that the primary importance for determining students' success is teacher's performance. They also assert that "more can be done to improve education by improving the effectiveness of teachers than by any other single factor" (p. 63). It is clear that at the heart of all these inquiries the core belief is teachers make a difference in their students' success.

Students' judgments about their ability to complete a task (efficacy expectations + outcomes expectations = self-efficacy) play a major role in predicting the academic achievement at different levels of education and in different subject matters, specifically, mathematics (Bandura, 1997). Learners with high mathematics-efficacy and outcome expectations are motivated, as they are confident about tasks, and persist when tasks are difficult. Therefore, they are more willing to produce mastery-oriented behaviour, such as taking more effort, engaging actively to the learning process and gradually improve mathematics skills. In order to provide effective classroom management strategies the clarification of the interaction between self-efficacy belief and mastery-oriented goals (as motivational variables and learning strategies) is very vital. This clarification is also beneficial in predicting student mathematics achievement beliefs and expectations about their capabilities to perform successfully in math subject.

It is reasonable to say that students as long as participate in well-structured activities that awake their curiosity and interest, they work on tasks and engage on activities even they are difficult, thus rarely cause any serious problems. Considering the importance of teaching mathematics, teachers have to develop pedagogical strategies (recognizing of obstacles that exist in the students' mathematics learning process), help students to develop their mental faculties and reason abilities by improving mastery approach for learning mathematics. Mastery learning model for mathematics proposes that all students can acquire basic mathematical skills when provided appropriate learning strategies and safety environment in the classroom. In this respect mastery-oriented classroom management strategies effectively influence the amount and the quality of students' engagement and mathematics learning, as well as students' persistence to continue learning when tasks are challenging.

2. Literature Review

2.1 Mastery Goals: Determined Effort

Individuals with mastery goals emphasize mastering tasks and boosting their competence. Mastery goals are based on the wish to develop one's competence and deep learning strategies during a learning activity for the future use in real-life situations. This is correlated with prevailing intrinsic motivation.

Saxena and Singh (2014) discovered in their research that mastery goal orientation yields higher intrinsic motivation among participants compared to the performance goal orientation, also girls scored higher than boys on mastery goal orientation and anticipated a more positive effect (the reason is that girls are normally more diligent). As intrinsic motivation does not need any external rewards, such a learner becomes more and more autonomous (Zimmerman, 2004), which is an indispensable condition for effective classroom management. Because autonomous learners are able to regulate their activities (plan, maintain, monitor and observe them) in or outside of the classroom and makes teacher instructional skills more effective. Additionally individuals with a strong mastery goal orientation see the effort as the means to success (development of knowledge and skills). It is important to indicate that students with mastery learning orientations are more likely to be persistent in the face of difficulties and obstacles on their way to achievement (Dweck & Leggett, 1988).

Also Lin, Hung and Lin (2006) studied the relationships between student achievement in mathematics, student's social-economic status (SES) and goal orientation. Their results revealed that successful performance in mathematics was connected with higher SES and more mastery-oriented goal orientation. According to their results, SES factor is responsible for 3.3% of the variance, and student goal orientation - for 11% more of the variance. The major implication obtained from their study is that goal orientation is much more significant than SES in predicting student performance in mathematics (Lin, Hung, & Lin, 2006).

Based on the significant findings of expectancy value theory and achievement goal theory it is obvious that there is a strong relationship between them. If students are confident in achieving an academic task (self-efficacy) and they believe that the academic task is worth pursuing (task-value), they will work harder, choose challenging goals, apply much effort in direction of the identified goals, and keep trying longer in the face of difficulties.

When we examine the characteristics of mastery-oriented learners, several qualities seem to stand out:

Table 1: The summary of positive impacts of Mastery Learning Strategies on students' beliefs and actions

Qualities of Mastery Goal Oriented Students
<ul style="list-style-type: none"> • Effort is the key to success. Students have vital belief for the success that competence increases due to hard work (very essential belief especially when they face difficulties)
<ul style="list-style-type: none"> • They seek for help when necessary.
<ul style="list-style-type: none"> • They willingly take risks and learn from their mistakes and change strategies that don't work.

<ul style="list-style-type: none">• They are not afraid of making mistakes because they accept that mistakes are part of learning.
<ul style="list-style-type: none">• Desire to become proficient for the sake of knowledge intentionally.
<ul style="list-style-type: none">• Student's sense of satisfaction with the work is not tied up with external performance indicators such as earning high grades
<ul style="list-style-type: none">• It is associated with more effective learning strategies and deeper engagement with the task
<ul style="list-style-type: none">• Students perform the task to develop knowledge and skills competence and to be able to solve the real-life problem

3. Mathematics Classroom Where Learning is Important / Not Performing

As we mentioned before teachers perform many functions in a typical classroom, which is considered to affect student learning significantly, such as:

- Making wise choices about the most effective instructional strategies to teach for lesson mastery,
- Designing syllabus to facilitate student learning, and
- Making effective use of classroom management techniques in order to provide an environment in which teaching and learning can build successfully (Marzano, Marzano, & Pickering, 2003)

On the other hand students' beliefs about their intelligence and capabilities in studying mathematics are additional factors that teachers need to take into consideration. Unfortunately, most of the students come to math classes having some beliefs and thoughts such as:

- They are not skillful in this area and weak.
- They also believe that mathematics is one of the most difficult courses and a small number of them perform well in mathematics.
- If someone performs well in mathematics, she/he is genetically talented in mathematics, which contradicts human efforts in learning mathematics.

In contemporary education students' beliefs are also considered as important motivational factor. So, it is mathematics teacher's duty to affect their beliefs positively to engage all the students into the learning process actively. In this respect, in order to foster mastery goals I'm going to mention the contributions of modern motivational theories to classroom management strategies.

Contributions of Self-Worth Theory:

All those negative beliefs and thoughts that are mentioned in the previous section are the cause of vicious circle. In order to break down this vicious circle, teachers need to find ways of helping students feel (emotionally) safe so that they are willing to take risks. If we emphasize on working for the sake of learning, not for the sake of a grade by the structure of the classroom strategies we obviously can minimize fear of failure and maximize risk-taking. Teacher need to emphasize that if they are not skillful in mathematics now, this is due to wrong teaching and learning and insufficient effort; if they try hard and use efficient learning methods, their skills will reach standards.

In a safety math classroom environment students accept themselves as a part of learning community where all of the members perceive each other as resources and supporters rather than competitors. In such environment students can work together in groups effectively and encourages each other to show more effort and progress in the failure situations. During this collaborative learning, students see strategies that involve successfully coping with failure so they can have a way to cope with their own failures. Once they know how to handle failure successfully, they are less likely to fear it. If they cannot cope with failure situation it is indisputable that they will produce failure avoiding strategies in order to maintain their sense of self-worth. Covington (1984) defined the motive for self-worth as the tendency of students to establish and maintain a positive self-image or “protect their sense of worth = personal value” (p. 4). The need to protect self-worth arises primarily from fear of failure. Therefore, if failure seems likely, some students will not try, precisely, because trying and failing threatens their ability self-concepts. Covington (1992) indicated, a key way to maintain one’s self-worth is to protect one’s sense of academic competence. According to him, even high-achieving students can be failure-avoidant. That is, students need to believe that they are academically competent in order to think that they have personal worth in the educational context. However, school and university evaluation, competition, and social comparison make it difficult for many learners to maintain the belief that they are competent academically and to concentrate on mastery goals. If this fear of failure is strong, student rather than responding to a challenging task with a greater effort, they avoid certain tasks in order not to look bad or receive negative assessments from others to protect their self-worth. Based on the previous implications it is reasonable to say that using mastery goal oriented classroom strategies can prevent students from failure avoiding strategies because mastery goals lead to a focus on the process of learning rather than the outcome. Therefore teachers should focus on more quality of engagement and the perseverance to learning in the face of difficulties rather than gained results in mathematics (Ames & Archer, 1988). In this respect Bloom (2009) indicates that, “mastery goals may be optimal for academic engagement, especially in mathematics” (p. 179).

Contributions of Implicit Theory of Intelligence:

According to Dweck and her colleagues (1988) children can hold one of two beliefs of intelligence about the nature of their intelligence: incremental and entity. Students who have an incremental view of intelligence believe that competence grows due to hard work (this idea is positively correlated with Mastery goals). On the other hand, students with entity view of intelligence believe that achievement depends on inborn talents and does not grow as results of hard work. We all know that mathematics is a

course requiring skills, and skill formation requires practice and time, so the entity view is not fruitful at all for mathematics students, while incremental view is definitely beneficial. Incremental view, in turn, is tightly linked with mastery goals.

Contributions of Social-Cognitive Theory:

According to the perspective of Albert Bandura's Social Cognitive Theory, behavioral, personal, and environmental factors interact to motivate learners and improve (or decrease) their academic performance. If we want to apply this theory for learning mathematics, we can describe this interaction as teacher's performances during teaching-learning process (behavioral factors), which are influenced by how the students themselves are affected (cognitive factors) by all instructional strategies and conditions (environmental factors).

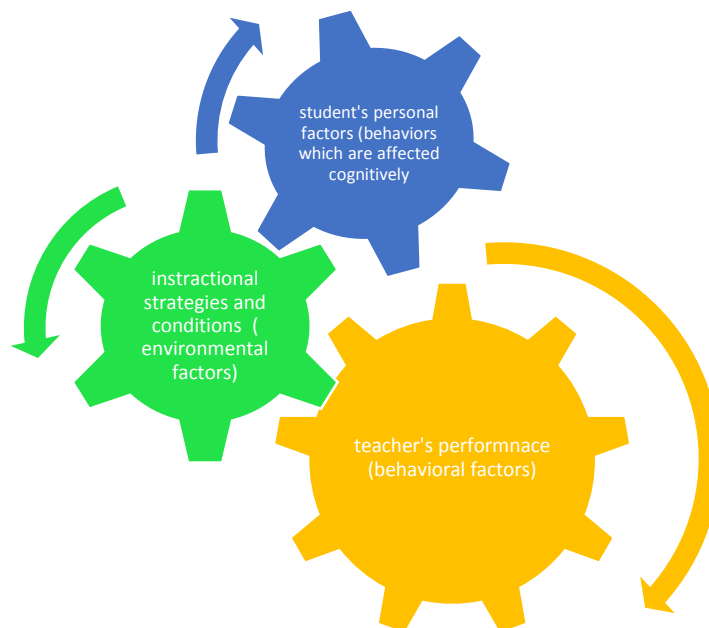


Figure 1: Interactions of behavioral, personal, and environmental factors to motivate students and improve mathematical performance (developed by the researcher)

This social-cognitive perspective also indicates that students' goal orientations and beliefs are formed by their perceptions of the learning environments and conditions. Therefore, it is essential to examine how students' goals and beliefs are formed and maintained in different learning environments. For instance, verbal encouragement (e.g. 'You're really good at mathematics' or 'This is a doable task, just be attentive and thoughtful') and the usage of authentic assessment tasks in units is more likely to emphasize a mastery goal orientation. Consequently, this influence promotes individual growth and mastery of mathematical skills (Phan, 2012).

Contributions of Modern Expectancy-Value Theory:

Motivation theorists always ask in order to understand how motivation affects choice, persistence, and effort. Some of them argue that individuals' activity choice, persistence, and effort can be explained by their judgments about their ability (efficacy-expectations) how well they will complete the activity (outcome-expectations) and the extent to which they value the activity (task-value) (Wigfield, 1994).

According to expectancy-value theory, there are two key components for understanding students' achievement behaviors and academic outcomes. The first component is students' beliefs dealing with the degree of confidence in the ability to fulfil a task (self-efficacy) and the second one is the degree of belief that the task is worth doing (task value). Individuals' self-efficacy beliefs may influence the goals which they adopt for learning. Researchers (e.g. Elliot & Harackiewicz, 1996) describe goal orientation as students' reasons for engagement in an activity for learning. However, it is important for educators to consider the fact that learning experiences may influence students' beliefs about learning, and this influence may result in the adoption of different goal orientation (Phan, 2012). In terms of expectancy-value theory, an effective way to motivate learners is to increase their expectancies by consciously organizing the conditions in which they will have more positive beliefs about their ability or competence. Decreasing their task difficulty beliefs is also important.

Over the years, educational researchers also articulated that mastery goals positively impact:

- The attitude towards mathematics as a learnable and useful course;
- The decrease of mathematics anxiety, in particular, test anxiety;
- The increase of effort based on self-efficacy;
- The increase of intrinsic motivation;
- The ability of students to objectively and realistically assess their knowledge and skills.

In order to help to develop and maintain mastery goals in students, teacher's main role is to produce positive attitudes towards learning mathematics through mastery-oriented classroom management strategies in their lesson activities. Ames's (1992) offers the following structure and instructional strategies that may be useful as a guide for creating mastery-oriented classrooms (Figure 2).

Table 2: Classroom structure and instructional strategies supporting mastery goals (Source: Ames, 1992, p. 267).

Structure	Instructional Strategies	Motivational Patterns
Task	<ul style="list-style-type: none"> · Focus on the meaningful aspects of learning activities · Design tasks for novelty, variety, diversity, and student interest · Design tasks that offer reasonable challenge to students · Help students establish short-term, self-referenced goals · Support the development and use of effective learning strategies 	<ul style="list-style-type: none"> · Focus on effort and learning · High intrinsic interest in activity · Attributions to effort · Attributions to effort-based strategies · Use of effective learning and other self-regulatory strategies · Active engagement · Positive affect on high effort tasks · Feelings of belongingness · ‘Failure-tolerance’
Authority	<ul style="list-style-type: none"> · Focus on helping students participate in the decision making · Provide ‘real’ choices where decisions are based on effort, not ability evaluations · Give opportunities to develop responsibility and independence · Support the development and the use of self-management and monitoring skill 	<ul style="list-style-type: none"> · Focus on effort and learning · High intrinsic interest in activity · Attributions to effort · Attributions to effort-based strategies · Use of effective learning and other self-regulatory strategies · Active engagement · Positive affect on high effort tasks · Feelings of belongingness · ‘Failure-tolerance’
Evaluation/Recognition	<ul style="list-style-type: none"> · Focus on individual improvement, progress, and mastery · Make evaluation private, not publicly · Recognize students' effort · Provide opportunities for improvement · Encourage view of mistakes as part of learning 	<ul style="list-style-type: none"> · Focus on effort and learning · High intrinsic interest in activity · Attributions to effort · Attributions to effort-based strategies · Use of effective learning and other self-regulatory strategies · Active engagement · Positive affect on high effort tasks · Feelings of belongingness · ‘Failure-tolerance’

As I mentioned before in its nature mathematics is always seen as a hard subject in comparison with other subjects. Teachers, while planning lesson activities and classroom management strategies, have to take into consideration that every failure experience debilitates students' commitment and decreases mathematics-efficacy beliefs, task value and self-worth. Consequently it also may lead to other undesirable outcomes and behaviors. The reason is that when students perceive their capabilities are not enough to accomplish the task, they will develop low mathematics efficacy and have little expectations for success that may in turn lead to increased anxiety, lower productivity, and decreased commitment (Winne, 1997) as well as undesirable behaviors.

4. Conclusion

In this study well-managed classroom is emphasized over a well-disciplined classroom, because effective teachers have effective management skills, not just discipline technics. Based on the findings of comprehensive research we can conclude that:

1. Students' beliefs about their intelligence and capabilities in studying mathematics are additional factors that need to be taken into consideration in daily activities. Math teacher should be role model that students' mathematics achievement mostly depends on effort and persistence (beliefs of mastery-learning goals) more than genetic ability. So students will have more chances to be better learners and to achieve their goals successfully in learning mathematics.
2. The benefits of adopting mastery-learning management in the classroom environment can be listed as follows:
 - Establishing positive relations with teachers and students,
 - Increasing mathematics-efficacy beliefs that lead to successful academic outcomes eventually,
 - Helping students become more self-motivated,
 - Encouraging students to accept challenging tasks,
 - Providing students to use adaptive learning strategies,
 - Helping students to adopt intrinsic motivation and show greater effort,
 - Helping students to persist in the face of difficulties. When they face challenging tasks, they try harder and work longer to accomplish the task.
3. Mastery goals are crucial during the process of development of mathematical skills. Teachers should build classroom management strategies on the mastery goals. For this, teachers themselves should have positive views on the utility of the subject, its relatedness with various life problems, and spheres of human activity. Teachers cannot help students develop mastery goals unless they believe in the ability of all their students to tackle with the challenges of the course.
4. Teachers need to inspire students' curiosity about mathematics and its applications to solve authentic (i.e., real-life) problems. Teachers should stimulate students' cooperation versus competition. Pair and group work both in class and as homework (preparing projects) helps them share knowledge, skills and strategies and thus raise students' self-efficacy in mathematics. The experience of successfully done tasks motivates students, while often experienced failure may lead students to learned helplessness, which has a strong demotivating effect.
5. Mathematics teachers, to contribute to the development of his/her students' mastery goals should provide students with:

- a (emotionally) safe, student-friendly learning environment, applying a smile and humor, entertaining activities alongside the serious ones;
- clear explanations;
- abundant variable activities, sufficient practice, doable (using the known to teach the unknown, from the easy to the difficult,) and supplementary work for the skills that students are having difficulty acquiring;
- direct support and additional instruction in mathematics, especially for the students who are struggling;
- positive, constructive and diagnostic feedback: emphasize success against failure and recommend the ways to overcome weaknesses and challenges;
- positive views on their ability to learn mathematics;
- whole-class, pair, small group and individual work, to take into consideration learners' individual peculiarities and to enable them to share the knowledge and strategies;
- authentic activities, which link mathematics with real-life problems and increase students' feeling of the usefulness of the academic course.

Teachers should serve as problem-solving models, by thinking-aloud techniques revealing their strategies, and choose effective models among students. However, weaker students should often represent the work fulfilled by the group, to motivate the stronger students help them, also to let weaker students experience the pleasure of being successful.

6. The teacher has to improve the classroom management via changing him/herself, students' beliefs and instructional strategies as well as assessment process. She/he should first of all change one's own views on students' abilities (believe that they all can do the tasks given and study mathematics), she/he should serve as an effective model while presenting the new materials and solving the problems, she should also choose effective models among students and ask them to be first to solve the problems after him/her, she/he should even use 'weak' students as role models (as people who managed to overcome problems). The teacher should choose learnable materials or turn them into learnable ones, should explain very clearly, and find new viewpoints if the ones she/he used haven't worked.
7. The most important thing in classroom management is to provide a safe atmosphere, where no students are judges as devoid of talent either by the teacher or by the students. The teacher should combine theory with practice and good authentic examples of application of mathematics in real life. Some funny and entertaining activities should also find place, especially at the moments when the teacher sees that the class is tired. The assessment should be formative which is include comparisons student's current level of progress with previous performance not with other students. As it is said before effectively managed math class also involve positive, diagnostic, constructive feedback, the class should involve peer and self-assessment. The discipline should be responsibility-based and not obedience-based discipline. All these measures have to boost students' self-efficiency, self-confidence and self-worth, thus contributing to their mastery goals development and improved competence.
8. Mastery learning model for mathematics proposes that all students can acquire basic mathematical skills when provided appropriate learning strategies and (emotionally) safety environment in the classroom. Therefore, choosing mastery-oriented classroom management strategies influence the amount and the quality of student learning, as well as the students' persistence to continue learning.

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