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The Contribution of Abacus to Mathematic Learning through Teachers' Motivation in Elementary Schools of Iran

Elhameh Rouhbakhsh Sarvari, Norihan Abu Hassan, Shadiya Mohamed Saleh
Universiti Teknologi Malaysia

Abstract

The objective of this paper is to focus on the contribution of the use of abacus towards mathematic learning through teachers' motivation. The use of abacus is defined as the independent variable of this study and mathematic learning is considered as the dependent variable mediated by motivation. This paper attempts to review the last studies. This presents a conceptual framework for the importance of effective factors to improve mathematic learning in the elementary schools.

Key Words: Abacus, motivation, mathematic learning.

1. Introduction

The problem-solving experiences that children typically meet in schools are no longer adequate for today's world. Mathematical problem solving involves more than working out how to go from a given situation to an end situation where the "givens," the goal, and the "legal solution steps" are specified clearly. The most challenging aspect of problems encountered in many professions today involve developing useful ways of thinking mathematically about relevant relationships, patterns, and regularities (Lesh&Zawojewski, 2007). In this regard, this study investigates what how abacus can affect on elementary school students for learning mathematic through teachers' innovative behaviour, teachers' motivation, and also teachers' training. Nickson (1988) suggested that the investigation of mathematics teachers and their role in mathematics education would be a high priority subject for many studies. In Iran, the teachers have stronger agreement with traditional beliefs than with non-traditional beliefs about the nature of mathematics, students' learning and mathematics curriculum. On the other hand, relation between different variables shows that teachers' beliefs about the nature of mathematics, mathematics curriculum, students, students' learning and their own teaching, may affect one another (Shahvarani et al., 2007).

The National Council of Teachers of Mathematics (NCTM, 2000) states that "Effective teaching requires knowing and understanding mathematics, students as learners, and…a variety of assessment strategies" (p. 17). Today, mathematics teachers at all grade levels are expected to have a great deal of skills and content knowledge. Additionally, traditional methods for teaching mathematics are shifting to more reformed practices that have shown increases in students' mathematic learning performance (Jong, 2009). In addition, Teaching mathematics in a reformed practice can be challenging for teachers, because in most cases, they are learning to teach in a way that is completely different from the way in which they were taught mathematics (Jong, 2009).

This study concentrates on enhancing the student's mathematics learning in Iran. Accordingly, this study provides information for mathematics' teachers about the use of abacus. In relation to increasing student's mathematics learning, this study presents motivation for mediating the relationship between the use of abacus and student's mathematics learning. Therefore, this study is considered important because it brings about the general trend in elementary school toward more accountability and greater attention to student-learning outcomes and improvement in mathematics.

2. Literature Review

2.1 Abacus

They initially learn to perform a physical abacus with both hands simultaneously, and then practice to simulate abacus operation in mind with actual finger movements as if they could manipulate the imagined abacus beads. Eventually, they can manipulate numbers via an imagined abacus in mind without actual finger movements. Skilled abacus players demonstrate extraordinary ability of mental calculation. They can mentally calculate large numbers with more than 10 digits with unusual speed and accuracy (Stigler, 1984).

The abacus calculation methods help individuals in learning in number manipulation skills, decimal grasp and digit correlation among other skills. In this regard, students can use the abacus training to calculate arithmetical problems rapidly. Later on, the students can also perform the calculations without using the abacus, by just visualizing the abacus in their minds. Abacus education also helps them develop new and innovative methods of mastering arithmetic, rather than being dependent on just the orthodox methods of learning calculations otherwise taught by the conventional education system. Abacus answers the primary need of the students to make fast and accurate calculation. Hatano (1989) stated that paper and pencil calculations are never taught at abacus, and that children never use an abacus for calculations in regular school mathematics classes.

Mental arithmetic requires the integration of multiple cognitive functions including number recognition, retrieval of arithmetic facts, temporary storage of intermediate results, and manipulation of mental representations. Behavioral studies suggested that visual strategy underlines AMC ability (Hatta and Ikeda, 1988), while linguistic processing plays an essential role in exact mental calculation in ordinary adults (Dehaene et al., 1999). To date, some functional neuroimaging studies have suggested that digit working memory and mental calculation of adult abacus experts were associated with enhanced involvement of neural resources for visuospatial information processing (Hanakawa et al., 2003). Moreover, our previous fMRI study revealed similar results in child abacus experts about 12- years old (Chen et al., 2006).

2.2 Teachers' Motivation

For many reasons, teacher motivation is a fundamental factor that must be considered for the successful implementation of any curriculum, whether it is focused on mathematics, reading, SEL, or any other educational objective (Lam, Cheng, & Choy, 2010). First, teacher motivation in the classroom is likely to impact student motivation to learn and participate at school (Jesus & Lens, 2005). Second, high teacher motivation has been linked to fewer absences from work and less burnout in the workplace (Fernet, Senecal, Guay, Marsh, & Dowson, 2008). Third, teachers who are motivated are more likely to advocate for educational reform (Jesus & Lens, 2005); this consideration is particularly noteworthy because asking teachers to implement SEL curricula is a relatively innovative educational effort and their willingness to participate in these efforts may be directly related to their degree of motivation.

Motivation is a complex construct that has been the subject of theoretical and empirical examination for decades. One of the leading theories on motivation is self-determination theory (Ryan & Deci, 2000). Self-determination refers to the degree to which behavior is determined from within, as opposed to being determined by external forces. A major focus of SDT has been to develop a differentiated understanding of human motivation, as well as the social-contextual conditions that foster self-determined motivation. The theory recognizes that it is the quality of motivation that truly impacts behavioral outcomes.

Ryan and Deci (2000) argue that motivation ranges from unwillingness to engage in a behavior (i.e., "amotivation"), to passive compliance (i.e., "externally-regulated" motivation), to active personal commitment (i.e., "internally-regulated" and "intrinsic" motivation; pp. 71). Thus, motivation occurs along a continuum of self-determination that spans from external to internal sources of regulation (see Figure 1). Intrinsic motivation is assumed to be the purest form of motivation, and refers to a "natural inclination" or "inherent propensity" toward activities that are spontaneously interesting or novel (Ryan & Deci, 2000, pp. 70). The authors of SDT argue that in a work environment, very few activities are truly intrinsically motivating (Deci & Ryan, 2000); this is because even when an individual possesses intrinsic motivation to complete an activity, contextual factors inevitably contaminate pure intrinsic motivation and can confound the inherent propensity to engage in the task (Deci & Ryan, 2008). Many activities in the workplace that are seemingly intrinsically motivating are actually internally-regulated forms of extrinsic motivation. The critical issue becomes how to promote internal regulation for extrinsically motivated behaviors, which is achieved through the process of internalization.

Gagne and Deci (2005) describe internalization as, "…people taking in values, attitudes, or regulatory structures, such that the external regulation of a behavior is transformed into internal regulation and thus no longer requires the presence of an external contingency (pp.334)." This is important to understand, because it is not pure intrinsic motivation that is of interest for workplace requirements, including teacher-implemented SEL programs, but rather it is the degree to which individuals internalize and integrate aspects of the task or activity into their own belief system that will determine their persistence and care in carrying out the task demands. Ryan and Deci (2000) aptly describe this process by saying, "To integrate a regulation, people must grasp its meaning and synthesize that meaning with respect to their other goals and values (p.74)." SDT is explicit in the assertion that it is more important to differentiate among the forms of extrinsic motivation than to rely solely on contrasting extrinsic and intrinsic motivation.

Broadly, extrinsic motivation refers to engaging in a behavior because it leads to a separable consequence (Deci & Ryan, 2008), but extrinsically motivated behaviors vary in the degree to which determination of the behavior is autonomous (Ryan & Deci, 2000). Specifically, the more an individual has internalized an external demand, the more likely the extrinsic motivation will emanate from the self. This is most likely true when considering teacher implementation of SEL curricula. Even those teachers who are naturally interested in or curious about their students' social and emotional development are typically unable to incorporate that interest into formal job roles due to a lack of autonomy. Decisions about curriculum implementation are usually reserved for administration, and teachers rarely have the freedom to begin implementing a curriculum they find interesting. Instead, extrinsic motivation would guide teacher behavior when implementing an SEL curriculum.

SDT theorists have outlined four types of extrinsic motivation which vary according to how much they are controlled by the environment to how much they become autonomous, and therefore become consistent with self-selected goals (Ryan & Deci, 2000). External regulation is the type of extrinsic motivation believed to reflect the lowest degree of self-determination. Behaviors that are externally regulated are performed in order to gain an external reward or satisfy an external demand. A teacher who implemented an SEL curriculum into his or her classroom because it would lead to a bonus paycheck would be externally regulated to perform the behavior. Next on the continuum is introjected regulation, which refers to behaviors that occur in order to avoid feelings of guilt or anxiety. Although introjected regulation is a slightly more internalized form of motivation than external regulation, the force driving the individual to engage in the behavior is primarily to demonstrate worth to others. This can be related to teachers who implement an SEL program to minimize feelings of guilt that may be associated with failing to complete an activity that their administration desired or that would benefit their students. Both external and introjected regulations are referred to as "controlled motivation" or "externally-regulated motivation," suggesting that they are low in self-determination and an individual engages in the behavior primarily due to external forces.

2.3 History of Mathematic Learning

Societal requirements motivated the development of the Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989); a document of major importance in improving the quality of mathematics education in Grades K-12. This document contained a set of standards for judging mathematics curricula and for evaluating the quality of curricula and student achievement. Five general goals were outlined for all students by NCTM's 1989 standards: (a) students learn to value mathematics, (b) students become confident in their ability to do mathematics, (c) students become mathematical problem solvers, (d) students learn to communicate mathematically, and (e) students learn to reason mathematically. In many respects, the 1989 NCTM standards promoted the views of An Agenda for Action. The NCTM Standards also advocated student-centered, discovery learning. Basic skills and general mathematical concepts were to be learned through real world problems. Constructivism in learning mathematics was promoted by NCTM through this and successive publications (NCTM, 1989).

In 1991, NCTM published the second standards document, Professional Standards for Teaching Mathematics. These standards were published to help improve the quality of school mathematics and helped NCTM state what its members value in curriculum, teaching, and assessment. These standards address professional mathematics teaching on the basis of two assumptions: first, teachers are the primary figures in changing the way mathematics is taught and learned in schools; and second, change requires that teachers have long-term support and adequate resources (NCTM, 1991). In 1992, the National Science Foundation (NSF) started funding the development of standards-aligned curricula. Consequently, many states developed and adopted curricula aligned with the standards (Woodward, 2004).

Following this, the third document, Assessment Standards for School Mathematics, was published in 1995 by NCTM as a means to help improve the quality of school mathematics. It was based on research and development related to national efforts to reform the teaching and learning of mathematics and included six assessment standards addressing mathematics, learning, equity, openness, inferences, and coherence (NCTM, 1995).

The NCTM publications faced criticism that there was no mention in the standards about how the proposed curriculum would affect special education students who were mostly receiving instruction in the general education classrooms. In addition, the standards were difficult to implement in classrooms due to limited resources (Woodward, 2004). Consequently, the NCTM standards were criticized as elitist, too difficult to implement, devoid of research foundation, and representative of discovery-oriented constructivism (Carnine et al., 1994).

The varied criticisms of the NCTM standards paved the way for revising the standards to include more balance and clarity. In 2000, NCTM used a consensus process that involved mathematicians, teachers, and researchers to revise the initial standards. Thus, Principles and Standards for School Mathematics (NCTM, 2000) was published as a revision of the three previous documents.

The new standards were organized around six principles that help in rendering highquality mathematics education; equity, curriculum, teaching, learning, assessment, and technology. The standards also include five content and process standards. The content standards are number and operations, geometry, measurement, data analysis, and probability. The content standards address the content all students should learn and be able to utilize. The process standards are problem solving, reasoning and proof, communication, connections, and representation. The content standards and process standards together aim to provide the mathematical skills and conceptual knowledge students will need in the 21st century (NCTM, 2000).

The purpose of PSSM is to establish a comprehensive and coherent set of goals for mathematics in Grades K-12. This vision assumes that students engage in complex learning tasks that draw on knowledge from a wide variety of mathematics topics; represent mathematics in a variety of ways; develop, refine, and test conjectures on the basis of evidence; develop flexible and resourceful problem-solving skills; work productively and reflectively alone or in groups, using the latest technology; and effectively communicate their ideas and results in a variety of ways (NCTM, 2000).

These goals will orient mathematics curricula, teaching, and assessment to the future. Moreover, PSSM will serve as a resource for teachers, education leaders, and policymakers. Also, PSSM will assist in the development of curriculum frameworks and instructional materials. Finally, PSSM will stimulate ideas and ongoing conversations at national, state, and local levels about how best to help students gain a deeper understanding of mathematics (NCTM, 2000).

In 2006, NCTM released Curriculum Focal Points for preK-8. In the focal points, NCTM identified the most important mathematical topics for each grade level, including related ideas, concepts, skills, and procedures that form the foundation for learning. Further, NCTM stated that organizing the curriculum around the focal points with an emphasis on the PSSM process standards can provide students with a connected, coherent, expanded body of mathematical knowledge and ways of thinking (NCTM, 2006).

The NCTM publications, overall, have suggested curricula that require a shift in content and pedagogy from the traditional method of teaching to exploring concepts that promote mathematical thinking. They also recommended that students actively participate in the learning process. Additionally, PSSM advocates mathematical thinking through exploration, conjectures, and problem solving. Thus, NCTM highlighted and recommended a standards-based classroom that aligns with NCTM principles, content, and process standards (NCTM, 2000).

3. Conceptual Framework

3.1 Teacher’s Attitude towards Mathematic

Research has shown that pre-service and in-service teachers bring their own beliefs and attitudes toward math to the institutions of higher learning and to the classrooms where they have been hired as teaching professionals. These beliefs and attitudes have been impacted by student achievement, quality of teacher instruction, social mores, etc. The challenge of education institutions is to address the negative beliefs pre-service and in-service students bring to coursework. Many preservice K-8 teachers are required to take a minimum amount of mathematics in college; yet, they are assigned mathematics-teaching positions in schools. They bring negative beliefs with them and therefore are not successful in preparing and inspiring future mathematicians.

Research indicates that teachers' beliefs about mathematics and the teaching and learning of mathematics have powerful impact on their teaching, related their all knowledge structures (Ernest, 1989). Research on teacher knowledge contains numerous examples of mismatch between the aims of teacher education programs and pre-service teachers' knowledge and beliefs. Increasingly teacher educators/researchers report that the subject-matter understanding pre-service teachers bring to teacher education coursework is not the sort of conceptual understanding that they will need to develop in their future students (Fuller, 1996). In addition, Baki (1997) notes that prospective mathematics teachers do not come to the faculty of education as empty vessels; they have beliefs about mathematics and its teaching which have been constructed throughout their school years in which they have learned that mathematics is a fixed body of rules and procedures, an uninteresting subject best taught through memorization and repetition. It is well documented in literature that the procedural understanding of mathematics that pre-service teachers typically exhibit in university mathematics courses, mathematics methods courses, and other teacher education coursework is not adequate to teach the reform mathematics curricula (NCTM, 2000). Ball (1990) contended that mathematics methods courses could change pre-service teachers' knowledge, assumptions, and feelings about mathematics, as well as their beliefs concerning their roles as teachers in the classroom.

Haser (2006) who investigated pre-service and in-service teachers' mathematics related beliefs and perceived effect of middle school mathematics education program on these beliefs, mentioned that cross-sectional data of the sophomore, junior, and senior pre-service teachers' beliefs about the nature of teaching and learning of mathematics did not differ due to the grade level in the program. She added that courses in elementary mathematics education program were not specifically designed to challenge pre-service teachers beliefs and did not have strong or long-lasting impact on pre-service teachers' belief.

Further research indicates many pre-service and practicing teachers of primary students struggle with their own dispositions toward mathematics and what it means to help children learn mathematics. Often, teachers make use of narrow vision of mathematics that focuses on developing concepts and skills in isolation from related ideas, personal experiences, or real world situations. The superficiality can be due, in part, to mathematics instruction that seeks to cover large quantities of fragmented ideas and bits of information that are unconnected to other knowledge and conceptual systems.

Evidence of shallow understanding by students exists when they do not or cannot use knowledge to make clear distinctions, build arguments, solve problems, or develop more complex understandings of other related phenomena. With specific reference to teachers, research on pre-service teachers' attitudes towards teaching mathematics shows that elementary teachers' lack of knowledge and understanding of mathematics results in negative attitudes toward the subject (Hill et al., 2005). The combination of insufficient experiences with mathematics and related anxiety about teaching it leads to concerns about elementary teachers' potential effectiveness in teaching mathematics to children particularly those from traditionally marginalized populations such as students with learning disabilities (Bursal and Panzpkas, 2006).

There is also evidence that teacher content knowledge and teacher pedagogical content knowledge affect teacher beliefs with respect to method of delivery of lessons. Teacher pedagogical content knowledge is dependent on content knowledge (Vacc & Bright, 1999), and teacher pedagogical content knowledge is important in its own right (Ball, Bluienski and Mewborn, 2001). Some studies report that teacher content knowledge affects teacher success for mathematics in general (Hill et al., 2005). Examples of this need are the teachers' ability to respond to surprise questions, unanticipated responses, and unintended outcomes during investigations (Mikleson and Heaton, 2004).

Further research gives an example of a study that investigated beliefs about and attitudes toward mathematics and mathematics teaching. Results showed that a typical 19-year-old Caucasian woman had a fairly high GPA and who reported having positive attitudes towards mathematics in general. She expressed confidence in her ability to learn, do, and teach mathematics. She did, however, tend to be somewhat math-anxious and to report negative feelings about teaching mathematics. If given a choice, she would prefer to teach language arts or social studies in grades K-3. She did not have a clearly defined system of beliefs about mathematics teaching and tended to agree with statements that represented traditional methods of teaching and at the same time with statements congruent with the current vision of reform in mathematics teaching. Both mathematics performance and mathematics problem-solving self-efficacy beliefs were significantly correlated with attitudes toward mathematics and mathematics teaching. Subjects' selfefficacy beliefs about their ability to perform mathematical tasks, however, were related more strongly to their attitudes toward mathematics and mathematics teaching than were actual performance results. No relationship was found between self-efficacy problem solving beliefs and beliefs about mathematics and teaching mathematics in elementary school (Fisher, 1992).

"One of the curious aspects of our society is that it is socially acceptable to take pride in not being good in mathematics" (National Council of Teachers of Mathematics (NCTM), 1991). Where do these attitudes and beliefs come from? Can they be changed? Through reviewing literature, one main idea surfaced as a possible reason students dislike math: a negative attitude toward mathematics. "Attitude toward mathematics is defined as a general emotional disposition toward the school subject of mathematics' (Haladnya et al., 1983). Maple and Stage (Schiefele and Scikszentmihalyi, 1995) found that "attitude toward mathematics significantly influenced choice of mathematics major. "One of the most important reasons for nurturing a positive attitude in mathematics is that it may increase one's tendency to elect mathematics courses in high school and college and possibly to elect careers in a math related field" (Schiefele & Scikszentmihalyi, 1995). One of the most important factors in students' attitudes toward mathematics is the teacher and classroom environment.

Haladnya et al. (1983) conducted a study designed to examine teacher and learning environment variables that were believed to be the most powerful causal determinants of attitude toward mathematics. Over 2,000 students in grades 4, 7, and 9 participated in the study. The students were given the Inventory of Affective Aspects of Schooling (IAAS) that addressed student motivation, teacher quality, social psychological class climate, management-organization class climate and attitude toward math. The correlations of each independent variable with attitude and motivation were all significant ($p<.05$) using a one-tailed test. A path analysis was also conducted to determine causal relationships. The findings suggest that teacher quality (enthusiasm, respect, commitment to help students learn, fairness, praise and reinforcement) seems to be consistently related to attitude toward mathematics.

Wilkins and Ma (2003) conducted a study to answer questions about how student attitudes changed from middle school to high school. Data came from Longitudinal Study of American Youth (LSAY), a national study, which tracked over 3, 000 seven grade students for six years. Information about student affect was collected (via questionnaires) and three measures created: attitude toward mathematics, social importance of mathematics (usefulness of math in daily lives and on the job), and nature of mathematics (whether changes in science theory over time cause more good than harm). The findings show that mathematical beliefs and attitudes change gradually.

"However, the important trend highlighted in this study is that students in secondary school becomes increasingly less positive with regard to their attitude toward mathematics and their beliefs in the social importance on mathematics" (Wilkins & Ma, 2003). Students' notions ofthe nature of science showed little change. In regard to middle school changes, attitude and social importance of mathematics declined at a significantly slower rate ($p<.001$) for students with positive teacher push and positive peer influence. Parental push was also a significant ($p<-05$) influence. In high school, positive peer influence ($p<.001$), positive teacher push ($p<.05$), and curriculum (students taking higher math) ($p<.001$) were related to slower rates of decline in attitude and social importance. Wilkins and Ma (3003) make several observations and suggestions such as:

"If teachers hold high expectations and present students with challenging mathematics, then students may be more likely to enjoy mathematics and recognize its usefulness" and "teachers' choice of activities and mathematics problems can have a strong impact on the values that are portrayed in the classroom and on how students view mathematics and its usefulness" (Wilkins and Ma, 2003). Supporting positive peer networks and involving parents in school activities involving mathematics can help slow decline of students' negative attitude toward mathematics (Wilkins and Ma, 2003).

Ma and Kishor (1997) conducted a meta-analysis of 1 13 studies to examine the relationship between attitude toward math and achievement in math. Although the study produced no significant results, there was an indication that junior high may be the most important period for students to understand and shape their attitude as it relates to their achievement in math. Therefore, the junior high years may provide teachers an opportunity to treat negative attitudes toward math and foster high achievement- It has become an accepted idea that teachers' beliefs play an important role in shaping teachers' characteristic patterns of instructional behavior (Thompson, 1992).

However, teachers who persevere in the profession and "change the world of the classroom" must add "knowledge-in-practice" and "knowledge-of-practice" (Cochran- Smith & Lytle, 1999). Additional they must add this to formal knowledge and theory gained in their professional preparation programs, in order for this necessary, ongoing learning to occur (Cochran-Smith and Lytle,1999; Darling-Hammond, 2001). This is not a new or recent acknowledgment within the teaching environment. We must support and encourage teacher learning. In fact, leaders in education reform, in addition to declaring that teacher learning is critical for student learning, are also suggesting that schools must be places where both teachers and students learn (Hargreaves, 1995). Schools must provide the environments that enable teachers to develop and improve as they practice the art and craft ofteaching. Conditions that are associated with professional growth and the ongoing learning ofteachers include: opportunities for collaboration (Smylie & Hart, 1999); autonomy and choice in teachers' work (Smylie, 1995;bZeichner, 2003); reflection (Schon, 1995).

Perhaps you have seen a similar headline: "Skilled Workforce Shortage Could Cripple U.S. Economy." It sounds serious - and it is, given the importance of mathematical and scientific skills in our increasingly technological society and the United States' lackluster performance on the Trends in International Mathematics and Science Study (TIMSS) and National Assessment of Educational Progress (NAEP) scores. While NAEP assessments overall show an improvement in mathematics achievement betweenl990 and 1999, computation scores actually dropped during that time. In 1999, only about half of eighth and twelfth graders could compute accurately with fractions.

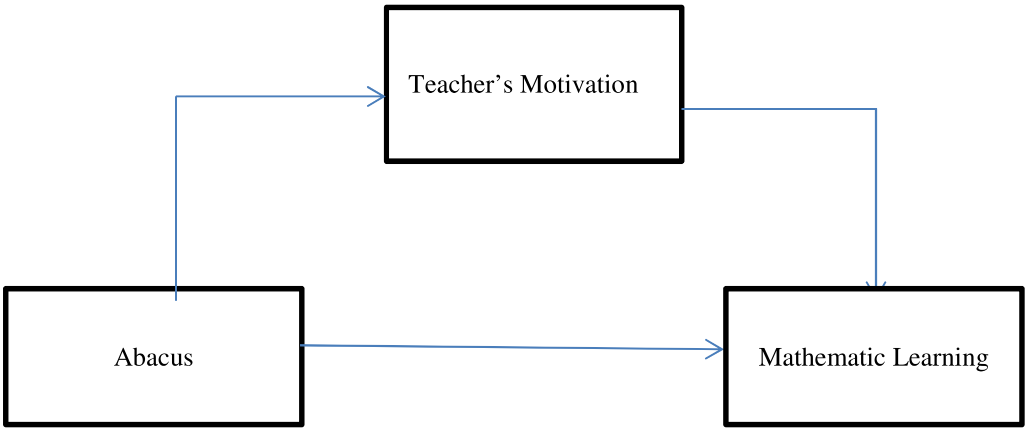
3.2 Teacher’s Motivation

Identified regulation follows on the continuum, and it is motivation that is somewhat internal, because an individual learns to value a goal and it becomes personally important. However, it is not wholly self-determined, because the interest in the activity was prompted by external forces. For example, identified regulation may occur when a principal values SEL, and in turn a teacher begins to value efforts toward the goal of implementing an SEL curriculum. The final type of extrinsic motivation is integrated regulation, and it is closest to intrinsic motivation on the continuum. Integrated regulation also refers to a value becoming internalized, but to such a degree that it becomes fully integrated with one’s other values and needs. A teacher who demonstrates integrated regulation would implement an SEL curriculum in his or her classroom because it is believed to be a truly worthwhile and helpful process to improve student functioning, which is assumed to be valued by teachers. Identified and integrated regulations are referred to as “autonomous motivation” or “internally-regulated motivation,” suggesting that they are high in self-determination, because the individual pursues an activity due to external forces that become internalized.

There is a subtle distinction between integrated regulation and intrinsic motivation; Ryan and Deci (2000) explain that integrated regulation is still considered extrinsic because the activity is “done to attain separable outcomes rather than for (the individual’s) inherent enjoyment (pp. 73).” For instance, while an intrinsically motivated teacher would choose to implement an SEL curriculum independently because he or she found it to be interesting, this is not a realistic expectation given the extent of influence from external variables. A more important consideration is a teacher who integrates the value of SEL into his or her own belief system, regardless of whether it originated as part of that belief system. The distinction is based on the instrumentality of the motivation; because intrinsic motivation is not plausible in the case of curricular decision making, internally-regulated extrinsic motivation is the goal for teachers implementing SEL curricula. As noted, the real questions concerning workplace demand becomes, how do you promote internal regulation for extrinsically motivated behaviors?

An integral part of SDT is the assumption that there are several needs that must be met to facilitate the development of internally-regulated motivation. Deci and Ryan (2008) assert that the three core needs include autonomy (i.e., perceived choice to engage in the activity and freedom from external pressure), competence (i.e., feelings of usefulness and value in their skills), and relatedness (i.e., feeling one belongs and is connected to others engaged in similar behaviors). Specifically, it has been concluded that the presence of autonomy, competence, and relatedness will lead to internally-regulated forms of motivation.

Conceptual Framework



The conceptual frame work of this study suggests that abacus can influence on mathematic learning; in this regard, teachers' motivation can mediate the relationship between the use of abacus and students' mathematic learning.

4. Discussion

Teachers need to have sources for increasing their competence once SEL programming is underway. The "train and hope" model that is so common to psychological innovations is not conducive to internally-regulated motivation. Instead, teachers are more likely to become increasingly confident in their skills to teach material focusing on social and emotional development if they have access to information about it (Langley, Nadeem, Kataoka, Stein, & Jaycox, 2010). Therefore, competence also likely depends upon the presence of a trusted individual with whom a teacher could consult if he or she had questions about implementation of an SEL curriculum.

Relatedness. The third need that contributes to the development of internally-regulated motivation is relatedness, which refers to feelings of belongingness and connectedness with others. At the most basic level, relatedness must exist in the form of a school and community that values educational innovations in general, and social and emotional development specifically, in order to promote internally-regulated motivation for SEL implementation. Within a given school or district, teachers' internally-regulated motivation would also be enhanced by the presence of caring and supportive administrators, parents, and community members. Further, relatedness would be present when teachers feel connected to their colleagues and believe they belong to a group with members who support one another.

Contextual Factors Related to Motivation. SDT is transparent in the assertion that in order to increase internally-regulated motivation, the needs of autonomy, competence, and relatedness must be met. However, less is known about the contextual factors that may influence motivation. To understand characteristics of the demand or of the context that are likely to contribute to one's motivation to implement an SEL curriculum, it is helpful to turn to literature examining barriers to and facilitators of successful SEL program implementation.

Two issues are consistently identified in the literature as being either barriers or facilitators to SEL, and each represents a characteristic of the SEL implementation demand that may influence teacher motivation to be engaged in the task. The first issue is related to having sufficient time to carry out SEL curriculum task demands. Teachers often report feeling burdened by their existing duties related to academic instruction (Greenberg et al., 2003), and thus indicate a lack of time to engage in additional responsibilities. In an era of high-stakes tests and performance-based pay, there is little flexibility or excess time in classroom schedules for programs that address other student needs besides core academics. In fact, educators commonly report feeling that SEL programs conflict with, rather than complement, the outcomes educators are supposed to be producing (Weissberg & O'Brien, 2004).

A second issue that is commonly noted in the SEL literature is the importance of administrative support (Committee for Children, 2011). Especially because the implementation of SEL programs is not a demand that teachers can realistically be expected to initiate and carry out independently, administrative support is crucial. It is not surprising that teachers rely on administrators to initiate SEL efforts, demonstrate an investment in SEL, and place realistic and consistent demands on teachers once the program is underway. In most contexts, administrators are also the gatekeepers for allocating funding and resources for SEL. Administrators may also set the tone for the school or district approach to SEL by providing encouragement regarding SEL efforts and offering support to teachers to implement the curriculum.

As noted, the development of internally-regulated motivation is dependent upon satisfaction of the three core needs (i.e., autonomy, competence, and relatedness). It is less clear whether contextual factors are contributing to teacher motivation to implement SEL curricula, because these factors are not explicitly outlined in SDT theory and are likely to vary based on the specific task demands. An examination of SEL literature reveals two primary issues, including time and administrative support, which appear to be related to motivation. However, in addition to time and administrative support, there are likely to be other factors identified by teachers that would be important to consider.

5. Conclusion

This study focused on the children mathematic learning in schools, in this regard, this study put a high importance for the role of using abacus for children at schools for the purpose of learning mathematics. However, this study presented teachers' motivation for mediating the relationship between the use of abacus and students' mathematic learning. Teaching techniques in Iran, for example, have remained somewhat stagnant. This reality, coupled with the lack of employment opportunities for many educated Iranians, has resulted in a restive youth population and emigration of some of the best minds in the country (Torbat, 2002). The Ministry of Education also admits to a teaching shortage, particularly in secondary education, caused by a lack of interest in the profession. Other indications of liberalization in the educational system included a slight opening of opportunities for students to study abroad and the reinstitution of a private school system. By the year 2010, enrolment in private schools rose from 5 percent to 10 percent. The future of education in Iran is difficult to assess because the country continues to undergo cultural changes, although the Ministry's stated commitment to decentralization is promising. In this regard, this study considered the effects of using abacus on learning mathematic through innovative behavior in the elementary schools of Iran. In addition, this study presented innovative behavior as to realize problems, create ideas, provide support for the ideas, and implement the ideas (Bruce, 1994).

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