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WHAT FACTORS AFFECT SECONDARY SCHOOL STUDENTS' PERFORMANCE IN SCIENCE IN THE DEVELOPING COUNTRIES? A CONCEPTUAL MODEL FOR AN EXPLORATION

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Abstract:
This paper develops a conceptual framework to explore the factors affecting secondary school students' performance in science in the developing countries. While the various factors are related to the increased academic performance, the specific mechanisms through which those factors exert their influence on a child's academic performance are not yet fully understood. Based on both sociological and psychological theories and empirical studies, socioeconomic status, parental involvement, school resources and teacher quality as independent variables and motivation towards learning science as a mediating variable were incorporated into the proposed framework. Appropriate instruments for the exploration are suggested. While the conceptual framework developed in the present study lessening the knowledge gap pertaining to the factors affecting students' performance in science, especially in the developing countries, it paves a path to explore the effect of those factors on students' performance.

Keywords: students' performance, socioeconomic status, parental involvement, school resources, teacher quality, motivation

1. Introduction

In this era of information and technology, science education plays a crucial role in preparing the younger generation for the future to act as productive employees as well as members of technology-rich societies. Because everyday aspects of personal, social and professional life are influenced by technology and its scientific basis, policy makers, researchers and educators are very much interested in acquiring a better understanding of what influences science achievement in school and consequently which aspects of

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science education could be improved in order to prepare students to better face the real world challenges (Alivernini, Palmerio, Vinci & Di Leo, 2010; Chang, Singh & Mo, 2007).

The literature provides numerous evidence that there are so many factors affecting students' performance. While those factors are appropriate and relevant for all the countries, the most immediately relevant factors for developing countries have not yet been captured (Gillies & Quijada, 2008). The failure to focus on these factors undermines all the investments on education in the developing countries, which they mainly receive as foreign loans. While the various factors are related to the increased academic performance, the specific mechanisms through which those factors exert their influence on a child's academic performance are not yet fully understood (Topor, Keane, Shelton, & Calkins, 2010). Nevertheless, science is of particular concern today due to the fact that there is a developmental decline in students' motivation towards learning science (Gottfried, Marcoulides, Gottfried, & Oliver 2009; Kiemer, Gröschner, Pehmer & Seidel, 2015; Vedder-Weiss & Fortus, 2011; Wigfield et al., 2006). Further, exploring the factors affecting academic performance at the secondary school level is particularly important, because it is the period of life in which students contemplate and negotiate their future trajectories (Gottfried et al., 2009; Singh, Granville & Dika, 2002). This paper explores the factors affecting students' performance in science by referring to the appropriate theories and empirical studies with a particular focus on the studies conducted in the developing countries in order to explore the parameters affecting performance in secondary school science.

First, this article classifies the factors affecting students' performance in order to facilitate exploring them, then build a theoretical basis for the exploration and review empirical studies on the causal relationships between factors affecting students' performance with a particular focus on science. Finally, a conceptual model is presented and implications are discussed.

2. Academic Performance

Though the term academic performance is one of the most abundant terms used in educational research, it is amorphous in nature. Authors use the term academic performance interchangeably with academic achievement and academic success (Ali, Haider, Munir, Khan & Ahmed, 2013; Mushtaq & Khan, 2012; York, Gibson & Rankin, 2015). In general, academic performance refers to a student's success in achieving educational goals and reflects how well students achieve the standards set by an academic institution or by the local educational authorities (Steinmayr, Meißner, Weidinger, & Wirthwein, 2014).

2.1 Factors Affecting Students' Academic Performance

There are numerous studies to support the view that students' academic performance is affected by so many factors. In order to limit the scope of this conceptual paper, it is vital to classify those factors into sub categories.

Earlier research on science achievement had focused on cognitive factors such as IQ ability and other measures of innate aptitude. But recent research has found that IQ only explained about 25% of the variance in achievement (Jensen, 1998). There are many studies that have focused on student's background and family factors. Among them, socioeconomic status and other demographic variables such as gender and ethnicity are predominant. Hence, exploration of the student's background and family factors are crucial to elaborate the understanding of factors affecting academic performance. Recent research on science achievement has also investigated factors that relate to schooling (Duschl, Schweingruber & Shouse, 2007; Martin, Mullis, Foy & Stanco, 2012). Schools play a critical role in all aspects of child development. Many educational reformers hold the view that the key to developing students' performance lies in improving the schools (Borg, Borg & Stranahan, 2012; Meece, Anderman & Anderman, 2006). Therefore, investigation of internal school factors is also essential to understand how to enhance students' academic performance. There are individual level factors such as students' self-efficacy, motivation, and engagement that have direct effects as well as mediating effects on the relationships exist between the other predictors and students' performance. Thus, investigation of individual level variables also leads to a better understanding of students' academic achievements (Mo, 2008).

While a large number of factors are affecting students' performance, there is no widely accepted classification of those factors in the existing literature. In association with the scientific subjects several researchers have paid attention to the effect of contextual variables as well as emotional and motivational factors on academic performance (e.g. Alivernini et al., 2010; Chang, Singh, & Mo, 2007; Lau & Roeser, 2002; Shen, 2001).

Contextual factors are subdivided as inside school factors and outside school factors (Farooq, Chaudhry, Shafiq, & Berhanu, 2011). A similar categorization is presented by Mushtaq and Khan (2012) as internal and external classroom factors. According to Seashore, Dretzke, and Wahlstrom (2010) school and classroom conditions, teacher quality and student/family background conditions are directly responsible for the learning of students. These factors are also under the shade of classification put forward by Farooq et al. (2012). In line with these researchers, for the purpose of the current study, contextual factors at the school level will be split into two categories, namely school resources and teacher quality. Contextual factors at the pupil level, which include family background, will be grouped as socioeconomic status and parental involvement.

Motivation is recognized as probably the key factor that can be targeted to improve students' learning. Williams and Williams (2011) highlight the importance of motivation in relation to the occurrence of learning by stating that "*With regard to students, very little if any learning can occur unless students are motivated on a consistent basis.*" Research studies on students' motivation towards learning science have also documented that there is a correlation between students' motivation and their performance in science (Atta & Jamil, 2012; Glynn, Taasoobshirazi, & Brickman, 2009; Lau & Roeser, 2002; Glynn, Taasoobshirazi & Brickman, 2007). Motivation has been

reported in primary, secondary and college education to influence academic performance as a mediating variable (Kusurkar et al., 2013; Vansteenkiste et al., 2005). A study conducted by Lau and Roeser (2002) evidenced that inclusion of motivational variables added unique power to predict individual differences in students' performance in science. As they reported, psychological processes were more powerful predictors than the demographic variables in predicting students' performance in science. Therefore, taking motivation into consideration under emotional and motivational factors or in other words psychological factors will elaborate understanding of students' performance in science.

Snow et al. (1996) emphasize that the inclusion of the full spectrum of sociological and psychological variables is crucial in exploring the factors affecting academic performance. Most studies provide evidence that students' performance is affected by school factors, home environmental factors and students' traits (Dudaitė, 2016). Therefore, inclusion of SES, parental involvement, school resources, teacher quality and motivation toward science learning in a model predicting students' performance assures a comprehensive understanding of the complex phenomena of academic performance. Figure 1 provides a summary of the above discussion and the rest of the literature review will be in line with this classification.

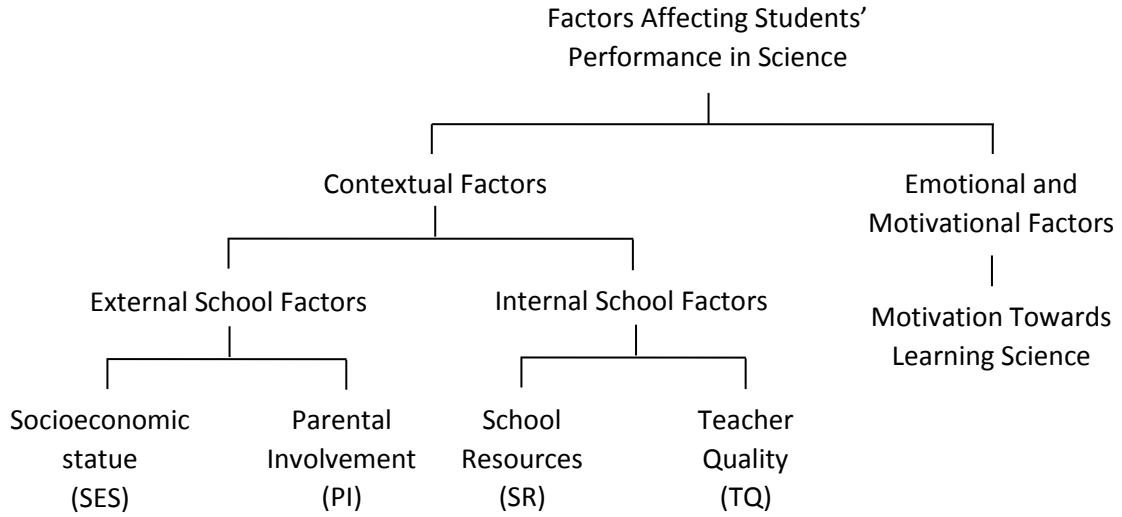

Figure 1: Factors Affecting Students' Performance in Science

2.2 Theoretical Perspectives on Factors Affecting Students' Performance

Because both sociological and psychological factors determine students' academic performance, it is vital to integrate the work of both educationists and psychologists. In his theory of educational productivity Walberg (1981, 1984) presents nine factors fall into three groups (aptitude, instruction and environment) that are required to optimize learning which leads to better academic performance. Student aptitude includes ability or prior achievement, development as indexed by the chronological age and motivation to learn. Instruction involves the amount of time engaged in learning and the quality of instructional experience. The home, social groups in the classroom, out of the school

peer groups and the use of after-school time are the environmental factors. As there is a huge overlap between three groups of factors described in the theory of educational productivity and student's internal school factors, external school factor and psychological factors, the coverage of these three domains in a framework which is designed to explore the factors affecting students' performance is appropriate.

In his theory of cognitive development, Vygotsky posited the argument that adults in a society encourage children's cognitive development in different manner by providing them with challenging and meaningful tasks. According to Vygotsky (1978), child's learning awakens only when he or she is having interactions with people in his environment. One critical concept of Vygotsky's theory includes the Zone of Proximal Development "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers (p. 86)". Scaffolding is another important concept which means the process of adjusting the amount of support as required by the child (Burkhalter, 1995). As per the theory of cognitive development, it is clear that parents at home and teachers at school play important roles to intervene the relationship between students' intellectual ability and achievement. Therefore, Vygotsky's theory provides a strong theoretical basis for the inclusion of TQ as an internal school factor and PI as an external school factor in an exploration of factors affecting academic performance.

Human functioning is the result of the interaction between personal, behavioral, and environmental factors, as embodied in his Triadic Reciprocal Determinism model (Bandura, 1989). Social Cognitive Theory (SCT) presented by Bandura emphasizes the importance of parents and teachers as role models who nourish desired behavior in children that leads to the development of better performance. Within the social-cognitive framework, each individual child is treated as possessing a self-regulating system, which affects his/her beliefs and supports the development of motivation that empowers behavior cognitively and affectively (Schunk & Pajares, 2001). As the current study attempts to examine the effects of SES, PI, TQ, SR and motivation to learn science on performance in science, SCT provides a strong theoretical basis to justify why and how those factors influence on each individual in a different manner.

2.3 Socioeconomic Status and Students' Performance in Science

Besides other factors, SES has become one of the most investigated and argued factor that contribute towards the students' academic performance (Farooq et al., 2011). The SES of a child is most commonly determined by combining parents' educational level, occupational status, and income level (Jeynes, 2003). In Turkey Atar and Atar (2012) examined the eighth grade students' survey data and science achievement scores on the Trends in International Mathematics and Science Study (TIMSS) 2007. As they reported socioeconomic status was a statistically and practically significant factor affecting science achievement. A research study carried out in Nigeria also provided evidence that parents' SES significantly influenced students' academic performance (Ushie, Emeka, Ononga, & Owolabi, 2012). They reported that 26% percent of the variance in

the students' performance was described by the variables, namely the father's occupation and parents' income. Udida, Ukwayi and Ogodo (2012) conducted another study in Nigeria to find out the effect of parental socioeconomic background on student performance in Biology and found only father's education happen to be significant. In relation to a group of Nigerian, Ogunshola and Adewale (2012) also found that the mean score of students with high socioeconomic status and high educational attainments was high in contrast to the students of parents with low socioeconomic status and poor educational attainments. A study on secondary school students' academic performance in Pakistan showed that parents' education has a significant effect on students' overall academic achievement (Farooq et al., 2011).

2.4 Parental Involvement and Students' Performance in Science

Science by nature is a human activity that is concerned with the exploration and interpretation of the natural world, so science can be learned both inside and outside the school. The role of parents in providing extra tuition and necessary materials, motivating students to study science, and emphasizing applications of science in day-to-day life can enhance students' achievement in science.

Alrehaly (2011) emphasizes the fact that the parents are an important factor affecting their children's science learning and achievement. Although educators have highlighted the importance of PI if children are to do well in school, researchers have not yet clearly found the extent to which PI affects students' achievement and what kind of PI is most important (Hong & Ho, 2005; Jeynes, 2001). One important fact that derives from a meta analysis conducted by Hill and Tyson (2009) is that the effects of different forms of PI on student achievement are different. Further, the effect of one such factor also varies on the age level of the child. PI in school has been linked to both positive and negative influences on academic achievement (Domina, 2005; McNeal, 2001).

Topor et al. (2010) proved that increased PI was significantly related to increased academic performance, measured in terms of both a standardized achievement test and teacher ratings of the child's classroom academic performance. Ak and Sayil (2006) also identified perceived family support as significant predictors of the Turkish students' academic performance. Olatoye and Ogunkola (2008) investigated relative and combined influences of PI on junior secondary students' science achievement in Nigeria. The results showed that PI singularly accounted for 4.1% of the total variance in achievement. This percentage, though low, is shown to be statistically significant. Atta and Jamil (2012) studied the effects PI on the educational attainments in Pakistan. They reported a positive correlation between PI and achievement indicated by a correlation coefficient of 0.89.

Shute et al. (2011) examined the research literature on the relationship between PI and academic achievement, with particular focus on the middle and high school level. They revealed that authoritative (high responsive and high demanding) parental style, parents' aspirations/expectations for their children and discussions about school activities between parent and child had a positive association while authoritarian (high

demanding low responsive) and permissive (low demanding and high responsive) parental styles had a negative effect. Porumbu and Necşoi (2013) have also reported similar findings.

Nyarko (2011) analyzed the link between parental school involvement and the academic achievement of students between the ages of 15 and 20 in Ghana and found that mothers' school involvement was significantly and positively related to the students' achievement. Wei (2012) examined parental practices in facilitating children's educational outcomes within Chinese families from a social capital perspective. The researcher reported that higher level of support, lower level of pressure, and more frequent communication between parents and children were associated with higher achievement. Shah and Anwar (2014) found the same relationship in relation to the Pakistani context.

2.5 School Resources and Students' Performance in Science

The school plays a critical role in all aspects of children's development (Meece, Anderman & Anderman, 2006). Many educational reformers hold that the key to improving student performance lies in improving the schools. Therefore, provision of physical resources, improving access to textbooks, technology and support materials, applying equitable financial formulas are among the priorities of many education reforms. According to TIMSS 2011, students who faced inadequacies in general school resources such as materials, buildings and space, as well as resources specifically targeted to support science instruction such as computers, computer software, library materials, and audio-visual resources had lower average science achievement than their counterparts in well-resourced schools (Martin et al., 2012).

Fuller (1987) reviewed studies on school effect on students' performance conducted in developing countries and concluded that compared to the developed countries, for developing countries school factors described a large portion of the variance in academic performance, after controlling social class background of the parents. It is noteworthy that these findings are only applicable to performance in science achievement due to the fact that science is more independent from indigenous forms of language and knowledge in many developing countries. Out of the studies reviewed Fuller recorded that instructional materials such as textbooks, library size and science laboratories could be seen as more influential factors affecting academic achievements.

Musthaq and Khan (2012) carried out a research to explore the important factors that affect the academic performance of the private college students in Pakistan. They found SR as one of the factors that positively affected the student performance. SR determined 16% of the variation in students' performance. Graddy and Stevens (2003) conducted an empirical study on the impact of school inputs on pupils' performance in private (independent) schools in the UK. The results indicated a negative relationship between the pupil-teacher ratio and examination results. A 1% decrease in the ratio of pupils to teachers leads to an increase of 0.12 in the percentage of A-grades at A-level. Per pupil expenditure on plant and equipment positively impacted on achievement.

Atar and Atar (2012) conducted a study to examine the effects of some of the changes that the reform movement has brought about in Turkey on students' science achievements in TIMSS 2007. Eight grade Turkish students' survey data and science achievement scores on TIMSS have been used in this study. The results indicated that outfitting classrooms with the latest technology and computers positively influence students' science achievements.

2.6 Teacher Quality and Students' Performance in Science

Education researchers and policymakers agree that teachers differ in terms of quality and that quality matters for student achievement (Clotfelter, Ladd, & Vigdor, 2007). Education is a teacher driven business. Hence, TQ is a key instrument in improving student performance. Therefore, Rockoff (2004) points out that raising TQ may be a key instrument in improving student outcomes. In relation to the USA context, Soldat (2009) argues that the quality of American science education classrooms is first and foremost dependent on the quality of their science teachers.

TQ has three aspects: the teacher's classroom practices, the professional development that the teacher receives in support of these practices, and characteristics of the teacher external to the classroom, such as educational attainment. Years of education, certification status, years of teaching experience, measures of academic ability, measures of subject matter and teaching knowledge, and teaching behaviors in the classroom have been extensively investigated as dimensions of TQ which affect student performance (Darling-Hammond, 2000). Of the aspects of teacher quality, as Wenglinsky (2002) reported classroom practices had the greatest effect on students' performance. He revealed the effect sizes for the various classroom practices totaling 0.56; those for the professional development topics total 0.33; and the effect size for the teacher input found to have a statistically significant impact of 0.09.

An analysis of research reports on teacher preparation revealed a positive connection between teachers' subject matter preparation and student achievement in science (Wilson, Floden, & Ferrini-Mundy, 2002). Wenglinsky (2002) found that the more college-level science courses (or science pedagogy courses) teachers had taken, the better their students did on the science assessments. An extensive review of the literature by Caprara et al. (2006) reported that teachers with a strong sense of efficacy likely to exert a positive influence on students' achievements.

Darling-Hammond (2000) examined the ways in which teacher qualifications and other school inputs are related to student achievement and reported that TQ characteristics such as certification status and degree in the field to be taught were very significantly and positively correlated with student outcomes.

Out of the four categories of teacher quality indicators, namely teacher qualifications, characteristics, practices, and effectiveness presented by Goe (2007) a stronger correlation between the achievement of secondary school students and their teacher's subject-area expertise has been reported by Goe and Stickler (2008). However, they have posited several studies which showed that teachers with master's degrees and beyond may negatively influence their students' achievement. Professional

development courses aligned with the curriculum and instruction showed a positive influence on science achievement. However, they culled several studies which have not detected significant differences between more and less experienced teachers. Although educational policymakers are very much interested in knowing the characteristics of a teacher that are most likely to improve student performance, researchers have not yet been successful at identifying such characteristics. Some researchers posited the argument that past studies were unable to overcome the methodological challenges in estimating the effects on teacher quality (Geo, 2007; Harris & Sass, 2011).

2.7 Motivation and Students' Performance in Science

Motivation is an internal state that arouses, directs, and sustains individuals' goal-oriented behavior (Bandura, 2001; Bandura, 2006). With a particular focus on science, the SCT defines *motivation to learn science* as "an internal state that arouses, directs, and sustains science-learning behavior" (Glynn et al., 2009). It is almost certainly highly multivariate and is not susceptible to easy measurement in terms of a small range of supposed factors (Glynn & Koballa, 2006; Mubeen & Reid, 2014). Intrinsic motivation, extrinsic motivation, relevance to personal goals, self-efficacy, self-determination, and test or assessment anxiety are considered as key constructs within the self-regulatory system that strengthen a child's overall motivation to learn and, subsequently, achievement (Bandura, 2001; Schunk, 2001). These constructs have been treated in research studies as the key dimensions of students' overall motivation to learn science (Chow & Yong, 2013; Glynn & Koballa, 2006; Glynn et al., 2009). To comprehend the effect of students' motivation to learn science on performance with respect to the six key dimensions, literature evidence extracted from the empirical studies is reviewed below.

Walker, Greene and Mansell (2006) reported that intrinsically motivated students perform better academically. As reported by many authors, students' intrinsic motivation showed a positive correlation with their performance in science (Gottfried et al., 2009; Lin, McKeachie & Kim, 2001). By connecting dimensions of motivation to the performance in science, Garcia (1993) revealed that both intrinsic motivation and extrinsic motivation had a positive relationship with students' performance. The correlation between intrinsic motivation and extrinsic motivation with the achievement in science was 0.35 and 0.23 respectively with respect to a group of secondary school students in Brunei (Chow & Yong, 2013). However, some researchers (Hayenga & Corpus, 2010; Vansteenkiste et al., 2009) reported that students with high intrinsic motivation and low extrinsic motivation had a positive correlation with their GPA.

Students find the relevance of learning science through three facets, namely the importance of science in the society, personal interest towards learning science and significance of science in the course that they are following (Holbrook, Rannikmae, Yager & De Vreese, 2003). Holbrook et al. (2003) found that if the science content was understandable, relevant and interesting students were motivated to learn science. Chow and Yong (2013) reported a relationship between personal relevance and achievement in Science with the correlation coefficient of 0.21 for a group of Bruneian secondary school students.

As Self-Determination Theory advocates, individuals with higher autonomous or self-determined motivation show better academic performance (Soenens & Vansteenkiste, 2005; Boggiano et al., 1993). Kusurkar et al. (2013) developed a model to determine whether motivation affected student performance through good study strategy and higher study effort. As they reported students with high self-determined motivation showed a positive association with the use of a good study strategy which had a positive association with the GPA. Lavigne, Vallerand and Miquelon (2007) supported the view that self-determination plays an important role in children's motivation on learning science. Chow and Yong (2013) reported that level of self-determination was higher among the high ability students than that of the low ability students. They also determined the correlation coefficient of the relationship between self-determination and achievement in Science as 0.28. However, Obrentz (2012) pointed out that the direct relationship between self-determination and science achievement was less conclusive compared to the other motivational dimensions.

Self-efficacy is associated with students' science achievement at all levels (Britner & Pajares, 2006). As Bryan, Glynn and Kittleson (2011) investigated that self-efficacy exerted the highest impact on achievement compared to self-determination and intrinsic motivation. Glynn et al. (2011) reported a correlation coefficient of 0.58 between self-efficacy and GPA for a group of college students. In Brunei Darussalam, Chow and Yong (2013) found a significant and positive correlation between self-efficacy and secondary school students' achievement in science. The correlation coefficient was 0.37.

In contrast to the dimensions of motivation described so far, test anxiety is commonly reported to have a negative relationship with the academic performance. For instance, Cassady and Johnson (2002) investigated the relationships between test anxiety and student performance and observed that higher levels of test anxiety were connected with significantly lower test scores on both course examinations and scholastic aptitude test scores. Studies conducted with a large number of science undergraduate students also revealed a negative relationship between test anxiety and the GPA (Chapell et al., 2005; Lin et al., 2002; Rana & Mahmood, 2010). By examining the influences of test anxiety on science achievement among junior secondary school students in Nigeria, Olatoye (2009) found test anxiety as an important predictor which had a negative relationship with achievement in science. Further, the test anxiety alone gave an explanation for 5.2% of the total variance in those students' achievement. Chow and Yong (2013) reported that level of test anxiety was the highest among the dimensions of motivation for a group of Bruneian students and determined the correlation coefficient of the relationship between test anxiety and achievement in Science as 0.14.

2.8 Effect of Internal and External School Factors on Students' Motivation

Gardner (2007) studied the factors affecting student motivation to learn and reported that PI as a significant factor impacting on student motivation. A range of PI practices, for instance, parenting, attending meetings, volunteering for school activities,

chaperoning field visits and educational tours, providing assistance and encouragement, communicating the value of school education are reported as potential behaviors that enhance students' motivational constructs such as such as intrinsic motivation, extrinsic motivation and goal orientation (Gonzalez-DeHass, Willems & Holbein, 2005).

Guay, Ratelle and Chanal (2008) conducted a meta analysis to examine the role that teachers and parents play in the development of student motivation. The provision of resources, keeping awareness about the child's education (communication), participating in meetings and volunteering at the school were the forms of PI, which enhanced students' motivation. The provision of resources, facilitating student learning in a meaningful manner, supporting students' autonomy, engagement, were the key aspects of teachers' involvement affecting motivation.

In a longitudinal study conducted by Gottfried et al. (2009) addressed a specific dimension of parental involvement on students' academic intrinsic motivation. They found that parents' task-intrinsic practices had a positive relationship with children's initial academic intrinsic motivation. In contrast, parents' use of task-extrinsic practices showed a negative relationship with initial levels of academic intrinsic motivation of their children. They also observed that parents' task-intrinsic motivational practices during childhood had a long-lasting positive effect on children's academic intrinsic motivation over the school career. Particularly, those practices acted as a buffer against worldwide motivational decline in both mathematics and science.

Williams and Williams (2011) suggest five key ingredients impacting students' motivation, namely student, teacher, content, method/process, and the environment. The student himself/herself is motivated due to many factors. The peer group, income level, the proper classrooms, the appropriateness of learning materials, and the number of brothers and sisters are the determinants associated with the student. Teacher as one of the key ingredients impacting students' motivation is governed by teacher's skills, subject knowledge, qualification and her/his internal factors such as motivation and self-efficacy. The way in which content is presented which they refer as method/process is also determined by the teacher. Especially the physical environment which is comprised of school and home resources and associated conditions affect motivation. In sum, these five types of ingredients of students' motivation are highly associated with their socioeconomic status, parental involvement, teacher quality and school resources.
Wen-Jin, Chia-ju, and Shi-an (2012) investigated the effect of hands-on activities on female students' motivation towards learning science. They reported hands-on activities enhanced female students' motivation towards learning science. Further, they revealed that hands-on activities associated with daily life issues motivated female students more than the other two types. Use of hands-on activities totally associated with the teacher quality and therefore, this research gives evidence for the impact of teacher quality on students' motivation towards learning science.

This subsection of the literature review provides empirical evidence for the effect of parental involvement, socioeconomic status, teacher quality and school resources on

students' motivation. However, it is important to note that such studies with a special focus on science are rare.

3. Proposed Conceptual Framework

Under the shade of the theories discussed and with support from empirical evidences given in the previous section in a conceptual framework SES, parental involvement, school resources and teacher quality can be taken as independent variables and students' performance can be treated as the dependent variable. As per the literature survey, commonly studied and significant construct of the independent variables can be taken into account in order to get an elaborated understanding of their effect on the dependent variable. Motivation towards learning science can be treated as an independent variable as well as a mediating variable, which affects the relationships between the other four independent variables and the dependent variable. Motivational dimensions reviewed in the previous section need to be surveyed for scrutinizing the effect of motivation on students' performance.

4. Discussion and Conclusion

An exploration based on the proposed framework will shed more light into the causal relationships among SES, PI, SR, TQ, students' motivation and performance in science. Olatoye (2009) points out the importance of investigating the factors affecting students' performance in science by referring its potential of proffering solution to the problem of underachievement in science. The outcomes of such studies give guidance for all the stakeholders who are particularly responsible for the secondary school education, to fashion out appropriate strategies that could enhance students' academic performance in science.

Many researchers (Gottfried et al., 2009; Middleton & Spanias, 1999; Wigfield et al., 2006) have emphasized the fact that there is a worldwide developmental decline in science motivation and attitudes amongst students. According to Alivernini et al. (2010), the analysis of factors related to academic success in school is particularly important in order to motivate students to be successful in learning science.

Science achievement at the secondary school level is critical because secondary school is the level in which general ideas change to specific concepts in terms of teaching science (Mo, 2008). Students' performance at this level determines whether to continue their further learning in the science stream or not. A concern for many countries, however, is the falling numbers of students choosing to pursue the study of science, in spite of the increasing recognition of the importance and economic utility of scientific knowledge (Barmby et al., 2008; Vedder-Weiss & Fortus, 2011). Therefore, it is essential to investigate how different factors exert their impact on students' performance in science in order to mitigate this prevailing issue.

It is obvious that there is an increasing diversity amongst the student population all over the world. Students from different social and cultural backgrounds, with

different experiences and varying levels of cognitive abilities bring with them different needs and academic potential. The challenge for policy makers, curriculum developers, school administrators, and teachers is to recognize this diversity of needs and cater for this changing and heterogeneous population of students. The stress is not only about catering to a wider range of students, but also on giving them the support to ensure a reasonable chance of success (McKenzie and Schweitzer, 2001).

Understanding the mechanisms in which different factors exert their effect on students' science performance would inform further research and policy initiatives and may lead to the development of more effective intervention programs designed to increase children's academic performance. For instance, knowledge of how and to what degree, parental involvement affects student achievement might inform parenting practices as well as school-based policies, practices, and interventions that involve working with parents.

While the conceptual framework proposed in this paper leads to lessening the knowledge gap pertaining to the factors affecting students' performance in science, especially in the developing countries, it provides a path to design researches to explore the effect of those factors. As science is strongly associated with many career opportunities all over the world and it is highly applicable to the social and economic development (Cavas, 2011; Chow & Yong, 2013; Güçlüer, & Kesercioğlu, 2012) such researches are particularly crucial for the betterment of developing nations.

This study has pondered the relationship between SES, PI, SR, TQ, students' motivation and performance in science. However, some other factors coming under internal and external school factors, for instance effects of peers, have not been considered. Especially, the other psychological and cognitive factors associated with student and teachers can be considered for further elaboration on the issue discussed in this paper.

References

1. Ali, S., Haider, Z., Munir, F., Khan, H., & Ahmed, A. (2013). Factors contributing to the students' academic performance: A case study of Islamia University Sub-Campus. *American journal of educational research*, *1*(8), 283-289.
2. Alivernini, F., Palmerio, L., Vinci, E., & Di Leo, I. (2010). An analysis of factors affecting pupils' science achievement in Italy. 4th IEA International Research Conference, Gothenburg, Germany.
3. Alrehaly, E.D. (2011). Parental Attitudes and the Effects of Ethnicity: How they Influence Children's Attitudes toward Science Education. The University of Arkansas.
4. Ak, L., & Sayil, M. (2006). Three different types of elementary school students' school achievements, perceived social support, school attitudes and behavior-adjustment problems. *Educational Sciences: Theory & Practice*, *6*(2), 293-300.

5. Atta, M. A., & Jamil, A. (2012). Effects of motivation and parental influence on the educational attainments of students at secondary level. *Academic Research International*, *2*(3), 427-431.
6. Atar, H. Y., & Atar, B. (2012). Examining the Effects of Turkish Education Reform on Students' TIMSS 2007 Science Achievements. *Educational Sciences: Theory and Practice*, *12*(4), 2632-2636.
7. Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), *Annals of child development. Vol.6. Six theories of child development* (pp. 1-60). Greenwich, CT: JAI Press.
8. Bandura, A. (2001). Social cognitive theory: An agentive perspective. Annual Review of Psychology, 52, 1-26.
9. Bandura, A. (2006). Going global with social cognitive theory: From prospect to paydirt. In S. I. Donaldson, D. E. Berger, & K. Pezdek (Eds.), The rise of applied psychology: New frontiers and rewarding careers (pp. 53-70). Mahwah, NJ: Erlbaum.
10. Barmby, P., Kind, P. M., & Jones, K. (2008). Examining changing attitudes in secondary school science. *International journal of science education*, *30*(8), 1075-1093.
11. Boggiano, A. K., Flink, C., Shields, A., Seelbach, A., & Barrett, M. (1993). Use of techniques promoting students' self-determination: Effects on students' analytic problem-solving skills. *Motivation and Emotion, 17*(4), 319–336.
12. Borg, J. R., Borg, M. O., & Stranahan, H. A. (2012). Closing the achievement gap between high-poverty schools and low-poverty schools. *Research in Business and Economics Journal*, *5*,*1*.
13. Britner, S. L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of research in science teaching*, *43*(5), 485-499.
14. Bryan, R. R., Glynn, S. M., & Kittleson, J. M. (2011). Motivation, achievement, and advanced placement intent of high school students learning science. *Science Education*, *95*(6), 1049-1065.
15. Burkhalter, N. (1995). A Vygotsky-based curriculum for teaching persuasive writing in the elementary grades. *Language Arts*, *72*(3), 192-199.
16. Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of school psychology*, *44*(6), 473-490.
17. Cassady, J. C., & Johnson, R. E. (2002). Cognitive test anxiety and academic performance. *Contemporary Educational Psychology, 27,* 270-295. doi:10.1006/ceps.2001.1094
18. Cavas, P. (2011). Factors Affecting the Motivation of Turkish Primary Students for Science Learning. *Science Education International*, *22*(1), 31-42.
19. Chang, M., Singh, K., & Mo, Y. (2007). Science engagement and science achievement: Longitudinal models using NELS data. *Educational Research and Evaluation. 13*(4), 349-371.

20. Chapell, M. S., Blanding, Z. B, Silverstein, M. E., Takahashi, M., Newman, B., Gubi, A., & Mccann, N. (2005). Test anxiety and academic performance in undergraduate and graduate students. *Journal of Educational Psychology, 97*, 268-274. doi:10.1037/0022-0663.97.2.268
21. Chow, S. J., & Yong, B. C. S. (2013). Secondary School Students' Motivation and Achievement in Combined Science. *Online Submission*, *3*(4), 213-228.
22. Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education Review*, *26*(6), 673-682.
23. Darling-Hammond, L. (2000). Teacher quality and student achievement. *Education policy analysis archives*, *8*, 1.
24. Domina, T. (2005). Leveling the home advantage: Assessing the effectiveness of parental involvement in elementary school. *Sociology of education*, *78*(3), 233-249.
25. Dudaitė, J. (2016). Impact of socio-economic home environment on student learning achievement. *Independent Journal of Management & Production*, *7*(3), 854-871.
26. Duschl, R. A., Schweingruber, H. A., & Shouse, A. W. (2007). Taking science to school. *Learning and teaching science in grades K-8. Washington, DC: National Academies Press*.
27. Farooq, M. S., Chaudhry, A. H., Shafiq, M., & Berhanu, G. (2011). Factors affecting students' quality of academic performance: a case of secondary school level. *Journal of quality and technology management*, *7*(2), 1-14.
28. Fuller, B. (1987). What school factors raise achievement in the Third World?. Review of educational research, 57(3), 255-292.
29. Gardner, R. C. (2007). Motivation and second language acquisition. *Porta Linguarum*, *8*, 9–20.
30. Gillies, J., & Quijada, J. (2008). Opportunity to learn: A high impact strategy for improving educational outcomes in developing countries. USAID Educational Quality Improvement Program (EQUIP2).
31. Glynn, S. M., Brickman, P., Armstrong, N., & Taasoobshirazi, G. (2011). Science motivation questionnaire II: Validation with science majors and nonscience majors. *Journal of research in science teaching*, *48*(10), 1159-1176.
32. Glynn, S. M., Taasoobshirazi, G., & Brickman, P. (2007). Nonscience majors learning science: A theoretical model of motivation. *Journal of Research in Science Teaching*, *44*(8), 1088-1107.
33. Glynn, S. M., Taasoobshirazi, G., & Brickman, P. (2009). Science motivation questionnaire: Construct validation with nonscience majors. *Journal of Research in Science Teaching, 46*(2), 127-146.
34. Glynn, S.M., & Koballa, T.R., Jr. (2006). Motivation to learn in college science. In J. Mintzes & W.H. Leonard (Eds.), Handbook of college science teaching (pp. 25–32). Arlington, VA: National Science Teachers Association Press.
35. Goe, L. (2007). *The link between teacher quality and student outcomes: A research synthesis*. Washington, DC: National Comprehensive Center for Teacher Quality.

36. Goe, L., & Stickler, L. M. (2008). Teacher quality and student achievement: Making the most of recent research (TQ Research and Policy Brief). Washington, DC: National Comprehensive Center for Teacher Quality. Retrieved from http://www.tqsource.org/publications/March 2008Brief.pdf
37. Gonzalez-DeHass, A. R., Willems, P. P., & Holbein, M. F. D. (2005). Examining the relationship between parental involvement and student motivation. *Educational psychology review*, *17*(2), 99-123.
38. Gottfried, A. E., Marcoulides, G. A., Gottfried, A. W., & Oliver, P. H. (2009). A latent curve model of parental motivational practices and developmental decline in math and science academic intrinsic motivation. *Journal of educational psychology*, *101*(3), 729.
39. Graddy, K., & Stevens, M. (2003). The Impact of School Inputs on Student Performance: An Empirical Study of Private Schools in the United Kingdom, *Industrial and Labor Relations Review, 58*, 435-51.
40. Guay, F., Ratelle, C. F., & Chanal, J. (2008). Optimal learning in optimal contexts: the role of self-determination in education. *Canadian Psychology/Psychologie canadienne*, *49*(3), 233.
41. Güçlüer, E., & Kesercioğlu, T. (2012). The effect of using activities improving scientific literacy on students' achievement in science and technology lesson. *International Online Journal of Primary Education (IOJPE) ISSN: 1300-915X*, *1*(1).
42. Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of public economics*, *95*(7), 798-812.
43. Hayenga, A. O., & Corpus, J. H. (2010). Profiles of intrinsic and extrinsic motivations: A person-centered approach to motivation and achievement in middle school. *Motivation and Emotion*, *34*(4), 371-383.
44. Hill, N. E., & Tyson, D. F. (2009). Parental involvement in middle school: a meta-analytic assessment of the strategies that promote achievement. *Developmental psychology*, *45*(3), 740.
45. Holbrook, J., Rannikmäe, M., Yager, R., & De Vreese, P. (2003, March). Increasing the relevance of science education. In *NARST 2003 Annual International Conference. Conference Paper*.
46. Hong, S., & Ho, H. Z. (2005). Direct and Indirect Longitudinal Effects of Parental Involvement on Student Achievement: Second-Order Latent Growth Modeling Across Ethnic Groups. *Journal of Educational Psychology*, *97*(1), 32.
47. Jensen, A.R. (1998). The g factor and the design of education. In R.J. Sternberg & W.M. Williams (Eds.) Intelligence, Instruction, and Assessment, (pp. 111- 131). New Jersey: Lawrence Erlbaum Associates.
48. Kiemer, K., Gröschner, A., Pehmer, A. K., & Seidel, T. (2015). Effects of a classroom discourse intervention on teachers' practice and students' motivation to learn mathematics and science. *Learning and instruction*, *35*, 94-103.
49. Kusurkar, R. A., Ten Cate, T. J., Vos, C. M. P., Westers, P., & Croiset, G. (2013). How motivation affects academic performance: a structural equation modeling analysis. *Advances in Health Sciences Education*, *18*(1), 57-69.

50. Lau, S., & Roeser, R. W. (2002). Cognitive abilities and motivational processes in high school students' situational engagement and achievement in science. *Educational Assessment*, *8*(2), 139-162.
51. Lavigne, G. L., Vallerand, R. J., & Miquelon, P. (2007). A motivational model of persistence in education: A self-determination theory approach. *European Journal of Psychology of Education, 22,* 351-369.
52. Lin, Y. G., McKeachie, W. J., & Kim, Y. C. (2002). College student intrinsic and/or extrinsic motivation and learning. *Learning and individual differences*, *13* (3), 251-258.
53. Martin, M. O., Mullis, I. V., Foy, P., & Stanco, G. M. (2012). TIMSS 2011 International Results in Science. International Association for the Evaluation of Educational Achievement. Herengracht 487, Amsterdam, 1017 BT, The Netherlands.
54. McKenzie, K., & Schweitzer, R. (2001). Who succeeds at university? Factors predicting academic performance in first year Australian university students. *Higher education research and development*, *20*(1), 21-33.
55. McNeal, R. B. (2001). Differential effects of parental involvement on cognitive and behavioral outcomes by socioeconomic status. *The Journal of Socio-Economics*, *30*(2), 171-179.
56. Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annu. Rev. Psychol.*, *57*, 487-503.
57. Middleton, J. A., & Spanias, P. A. (1999). Motivation for achievement in mathematics: Findings, generalizations, and criticisms of the research. *Journal for research in Mathematics Education*, 65-88.
58. Mo, Y. (2008). *Opportunity to Learn, Engagement, and Science Achievement: Evidence from TIMSS 2003 Data* (Doctoral dissertation, Virginia Polytechnic Institute and State University).
59. Mubeen, S., & Reid, N. (2014). The Measurement of Motivation with Science Students. *European Journal of Educational Research*, *3*(3), 129-144.
60. Mushtaq, I. & Khan, S. N. (2012). Factors Affecting Students' Academic Performance, *Journal of Management and Business Research, 12*(9), 16-22.
61. Nyarko, K. (2011). Parental school involvement: The case of Ghana. *Journal of Emerging Trends in Educational Research and Policy Studies, 2*(5), 378-381.
62. Obrentz, S. B. (2012). Predictors of science success: The impact of motivation and learning strategies on college chemistry performance. Educational Psychology and Special Education Dissertations. Paper 77. Retrieved from http://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1078&context=epse_diss
63. Ogunshola, F., & Adewale, A. M. (2012). The Effects of Parental Socio-Economic Status on Academic Performance of Students in Selected Schools in Edu Lga of Kwara State Nigeria'. *International Journal of Academic Research and Social Sciences*, *2*(7), 230-239.

64. Olatoye, R. A. (2009). Students' test anxiety, motivation for examinations and science achievement in junior secondary schools in Ogun State, Nigeria. *International Journal of Psychology and Counselling, 1*(10), 194-198.
65. Olatoye, R. A., & Ogunkola, B. J. (2008). Parental involvement, interest in schooling and science achievement of junior secondary school students in Ogun State, Nigeria. *College Teaching Methods & Styles Journal*, *4*(8), 33-40.
66. Porumbu, D., & Necşoi, D. V. (2013). Relationship between Parental Involvement/Attitude and Children's School Achievements. *Procedia-Social and Behavioral Sciences*, *76*, 706-710.
67. Rana, R. A., & Mahmood, N. (2010). The relationship between test anxiety and academic achievement. *Bull. Educ. Res. 32*, 63–74.
68. Rockoff, J. E. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *The American Economic Review*, *94*(2), 247-252.
69. Schunk, D.H. (2001). Social cognitive theory and self-regulated learning. In B.J. Zimmerman & D.H. Schunk (Eds.), Self-regulated learning and academic achievement: Theoretical perspectives (2nd ed., pp. 125–151). Mahwah, NJ: Erlbaum.
70. Schunk, D.H., & Pajares, F. (2001). The development of academic self-efficacy. In A. Wigfield & J. Eccles (Eds.), Development of achievement motivation (pp. 15–31). San Diego: American Press.
71. Seashore L. K., Dretzke, B., & Wahlstrom, K. (2010). How does leadership affect student achievement? Results from a national US survey. *School effectiveness and school improvement*, *21*(3), 315-336.
72. Shah, M. A. A., & Anwar, M. (2014). Impact of Parent's Education and Involvement on Children Performance in Southern Punjab Pakistan. *International Journal of Research, 1*(5), 173-180.
73. Shen, C. (2001) Social values associated with cross-national differences in mathematics and science achievement: a cross-national analysis. *Assessment in Education, 8* (2), 193 - 223.
74. Shute, V., Hansen, E., Underwood, J., & Razzouk, R. (2011). A review of the relationship between parental involvement and secondary school students' academic achievement. *Educational Research International*. http://dx.doi.org/10.1155/2011/915326
75. Singh, K., Granville, M., & Dika, S. (2002). Mathematics and science achievement: Effects of motivation, interest, and academic engagement. *The Journal of Educational Research*, *95*(6), 323-332.
76. Snow, R. E., Corno, L., & Jackson III, D. (1996). Individual differences in affective and conative functions. InD. C. Berliner& RC Calfee (Eds.), Handbook of educational psychology (pp. 243-310).
77. Soenens, B., & Vansteenkiste, M. (2005). Antecedents and outcomes of self-determination in 3 life domains: The role of parents' and teachers' autonomy support. Journal of Youth and Adolescence, 34(6), 589–604.

78. Soldat, S. C. (2009). Investigating the impact of a pre-service programme on beliefs about science teaching and learning. Retrieved from http://ir.uiowa.edu/etd/438
79. Steinmayr, R., Meißner, A., Weidinger, A. F., & Wirthwein, L. (2014). Academic achievement. *Oxford Bibliographies. doi*, *10*, 9780199756810-0108.
80. Topor, D. R., Keane, S. P., Shelton, T. L., & Calkins, S. D. (2010). Parent involvement and student academic performance: A multiple mediational analysis. *Journal of prevention & intervention in the community*, *38*(3), 183-197.
81. Udida, L. A., Ukwayi, J., & Ogodo, F. A. (2012). Parental socioeconomic background as a determinant of student's academic performance in selected public secondary schools in Calabar Municipal Local Government Area, Cross River State, Nigeria. *Journal of Education and Practice*, *3*(16), 129-135.
82. Ushie, M. A., Emeka, J. O., Ononga, G. I., & Owolabi, E. O. (2012). Influence of family structure on students' academic performance in Agege local government area, Lagos state, Nigeria. *European Journal of Educational Studies*, *4*(2), 177-187.
83. Vansteenkiste, M., Sierens, E., Soenens, B., Luyckx, K., & Lens, W. (2009). Motivational profiles from a self-determination perspective: The quality of motivation matters. *Journal of educational psychology*, *101*(3), 671-688.
84. Vedder-Weiss, D., & Fortus, D. (2011). Adolescents' declining motivation to learn science: Inevitable or not?. *Journal of Research in Science Teaching*,*48*(2), 199-216.
85. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
86. Walberg, H. J. (1981). A psychological theory of educational productivity. In F. H. Farley & N. U. Gordon (Eds.), *Psychology and education.* Berkeley, CA: McCutchan.
87. Walberg, H. J. (1984). Improving the productivity of America's schools. *Educational leadership*, *41*(8), 19-27.
88. Walker, C. O., Greene, B. A., & Mansell, R. A. (2006). Identification with academics, intrinsic/extrinsic motivation, and self-efficacy as predictors of cognitive engagement. *Learning and individual differences*, *16*(1), 1-12.
89. Wei, D. (2012). Parental influence on Chinese students' achievement: a social capital perspective. *Asia Pacific Journal of Education*, *32*(2), 153-166.
90. Wenglinsky, H. (2002). The link between teacher classroom practices and student academic performance. *Education policy analysis archives*, *10*, 12.
91. Wen-jin, K.; Chia-ju, L; Shi-an, L. (2012). Promoting Female Students' Learning Motivation towards Science by Exercising Hands-on Activities. *US-China Education Review, 6*, 572-577.
92. Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R. W., & Davis-Kean, P. (2006). Development of achievement motivation. In N. Eisenberg (Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (6th ed., pp. 933–1002). New York: Wiley.
93. Williams, K. C., & Williams, C. C. (2011). Five key ingredients for improving student motivation. *Research in Higher Education Journal*, *12*(1), 1-23.

94. Wilson, S. M., Floden, R. E., & Ferrini-Mundy, J. (2002). Teacher Preparation Research an Insider's View from the Outside. *Journal of teacher education*, *53*(3), 190-204.
95. York, T. T., Gibson, C., & Rankin, S. (2015). Defining and measuring academic success. *Practical Assessment, Research & Evaluation*, *20*(5), 2.