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## STUDENT LEARNING, CHILDHOOD & VOICES | RESEARCH ARTICLE

# Can parental involvement mitigate “swing away from science”? Sri Lankan perspectives

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**Abstract:** “Swing away from science” is a dilemma that researchers are seeking solutions over 50 years. The dilemma is becoming more complicated due to the developmental decline in students’ motivation toward learning science around the world, particularly at the secondary level. While the parental involvement becomes more vital in the secondary school years, it also dramatically declines in this period. The study investigated the level of parental involvement in terms of parents’ socioeconomic factors and students’ demographic factors. The association between parental involvement measured in terms of four dimensions and Sri Lankan secondary public school students’ motivation toward learning science measured in terms of six dimensions was also studied. A random sample of 689 students and their parents participated in this quantitative survey. While the parental involvement showed significant differences in relation to the parents’ income level and the school category that the child attends, the same showed no significant difference in relation to parents’ ethnicity and child’s gender. Parental involvement showed a strong association with students’ intrinsically and extrinsically motivated science learning and self-efficacy. Home-based parental involvements had a stronger impact on students’ motivation compared to the school-based involvements. Measures that can be taken by the stakeholders to strengthen the parental involvement activities, which enhance students’ motivation to learn science and mitigate swing away from science were discussed.

### ABOUT THE AUTHORS

Anthoni Durage Asoka De Silva is a senior lecturer attached to the National Institute of Education, Sri Lanka. He is reading for a PhD under the supervision of Ali Khatibi, a senior vice-president—postgraduate, Business and Social Science and the dean—Graduate School of Management and S.M. Ferdous Azam a senior lecturer in Management and Science University, Malaysia. Based on a series of national-level surveys, National Educational Research and Evaluation Center, University of Colombo reports that Sri Lankan students’ performance in science is weak and there are disparities in performance in relation to demographic and socioeconomic factors. Under his PhD research study, the author attempts to fulfill the recommendation made by the World Bank to collect research evidence on the disparities associated with the Sri Lankan students’ performance in science. The present article is written based on this research as a partial fulfillment of PhD program.

### PUBLIC INTEREST STATEMENT

“Swing away from science”, which is a decline in students’ attitudes toward studying science, has become a global concern. Of the factors, which determine swing away from science, students’ motivation toward learning science is crucial due to its developmental decline, especially during the secondary school career. While the parental involvement in children’s education becomes more vital in the secondary level, it also dramatically declines during this period. The present study investigated whether parental involvement can mitigate this dilemma and uncovered a stronger association of parents’ home-based involvements with students’ motivation toward learning science compared to parents’ school-based involvements. Especially, children’s motivational stimuli to learn science coming from within and from outside as well as the relevance of learning science are more affected by parental involvement. The level of parental involvement showed significant differences with respect to their income level and school category that their children attend.

**Subjects: Physical Sciences; Social Sciences; Education**

**Keywords: science; motivation; parental involvement; secondary students; performance**

### 1. Introduction

Since 1960s to date “swing away from science”, which is a decline in students’ attitudes toward studying science, has become a global concern. Sri Lanka is not an exception and has also faced the dilemma of swing away from science (Jayawardena, 2015). This dilemma, which was emphasized almost 50 years ago (Dainton, 1968), still exists and the contemporary researchers all over the world seek solutions (Narmadha & Chamundeswari, 2013; Rice, Barth, Guadagno, Smith, & McCallum, 2013; Said, 2016). Out of the affective components, which determine swing away from science, students’ *motivation toward learning science* (hereafter designated as MTL) has become crucial due to its developmental decline, especially during the secondary school career (Galton, 2009; Kiemer, Gröschner, Pehmer, & Seidel, 2015; Osborne & Dillon, 2008; Vedder-Weiss & Fortus, 2011). Apart from that, students’ MTL is well known as a key determinant of students’ *performance in science* (hereafter designated as PERS) (Chow & Yong, 2013; De Silva, Khatibi, & Azam, 2017; Glynn, Taasobshirazi, & Brickman, 2009). Motivation, interest, and attitudes toward science and mathematics have become prominent research areas in the field of science and mathematics education. Here, it is noteworthy that those three constructs have often been taken into account interchangeably or as a sub construct of each other (see Potvin & Hasni, 2014).

By referring to the science-specific research studies Carlone, Scott, and Lowder (2014) build the argument that “environment matters to students’ sustained or declining science interests and motivation in early adolescence” (p. 837). A comprehensive cross-sectional study carried out with adolescents of four different age groups uncovered the social support, which is extended by the social agents, namely parents, teachers, and friends as significant predictors of students’ motivational constructs (Rice et al., 2013). Parents’ active involvement is more influential with students’ performance than the other socioeconomic factors. While the parental involvement becomes more vital in the secondary school years, it dramatically declines during this period (Oates, 2017). As Gonida and Urdan (2007) emphasize, factors such as parents’ and students’ gender, socioeconomic status, ethnicity, and other demographic variables add a complexity to the parental involvement on students’ motivation and performance in school. However, students’ motivation as an outcome of parental involvement has recently been explored and yet to be researched (Gonida & Urdan, 2007; Gonzalez-DeHass, Willems, & Holbein, 2005). Besides that, on one hand, research studies on the association between parental involvement and students’ MTL are rare. On the other hand, the limited number of such studies is very often focused on one or two dimensions of motivation rather than taking all the key dimensions of motivation into account. By taking this knowledge gap into consideration, the present study attempts to elaborate the understanding of the aforesaid relationship.

More specifically, the current study addresses three research questions. First, whether there are differences in the level of parental involvement in terms of parents’ ethnicity and income level. Then, whether the parental involvement varies with respect to child’s gender and the school category. Finally, how the parental involvement measured in terms of four dimensions affects the senior secondary public school students’ MTL measured in terms of six dimensions in Sri Lanka.

Through the current study it is expected to fulfill the recommendation made by the World Bank (Athurupane, Dissanayake, Jayewardene, Shojjo, & Sonnadara, 2011) to collect research evidence on the disparities associated with the students’ performance in science in Sri Lanka. The study also sheds light on the association between parental involvement and students’ MTL in a multicultural context of a developing country.

### 2. Literature review

The first half of this review provides a theoretical foundation for the current study and the second half reviews the recent literature, which is mainly focused on students’ MTL, parental involvement, and its impact on students’ motivation toward learning.

### **2.1. Theoretical background**

Social Cognitive Theory (Bandura, 1986) has been applied extensively by the researchers who are interested in understanding students' motivation, learning, and performance (Linnenbrink & Pintrich, 2002; Pajares, 1996; Schunk & Zimmerman, 1998; Urdan & Schoenfelder, 2006). The theory postulates that learning occurs in a social context within which personal (e.g. thoughts, beliefs), behavioral, and environmental factors influence each other in a bidirectional, reciprocal fashion (Bandura, 1989). In addition, "learning is shaped by factors within the academic environment, especially the reinforcements experienced by oneself and by others. At the same time, learning is affected by students' own thoughts and self-beliefs and their interpretation of the classroom context". (Denler, Wolters, & Benzon, 2014, p. 2). Accordingly, parental involvement as an environmental factor and motivation toward learning as a child's personal factor interact with each other and nourish learning.

### **2.2. Motivation toward learning science**

Motivation is recognized as probably the key factor that can be targeted to improve students' learning. In relation to the occurrence of learning "With regard to students, very little if any learning can occur unless students are motivated on a consistent basis." (Williams & Williams, 2011, p. 1). In line with the social cognitive theory, MTL is defined as "an internal state that arouses, directs, and sustains science-learning behavior" (Glynn, Brickman, Armstrong, & Taasobshirazi, 2011, p. 1160). Within the social cognitive theory, intrinsic motivation, extrinsic motivation, personal relevance, self-determination, self-efficacy, and test anxiety are considered as key constructs of motivation toward learning (Glynn & Koballa, 2006; Glynn et al., 2009, 2011). There is a plethora of empirical studies, which proves the individual association of each of these key constructs with students' PERS (Britner, 2008; Bryan, Glynn, & Kittleson, 2011; Hulleman & Harackiewicz, 2009; Olatoye, 2009). Some researchers measured students' MTL in terms of the six motivational dimensions and established its association with students' PERS (Chow & Yong, 2013; De Silva et al., 2017; Glynn & Koballa, 2006).

### **2.3. Parental involvement**

Jeynes (2007) defines parental involvement as "parental participation in the educational processes and experiences of their children" (p. 245). How parents should be involved or what in particular parents should do to promote their children's education are central issues in the current debates (Cousins & Mickelson, 2011). As a result, researchers examine the association between parental involvement and students' performance in general and particularly in science (Atta & Jamil, 2012; Domina, 2005; Khajehpour & Ghazvini, 2011; Lawrence & Barathi, 2016; Porumbu & Necşoi, 2013). Although the idea that parental involvement has a positive impact on students' academic performance is generally accepted, it is still inconclusive in the empirical research literature (Fan & Chen, 2001).

Parental involvement is a multidimensional construct (Anderson & Minke, 2007; Fan & Chen, 2001; Shute, Hansen, Underwood, & Razzouk, 2011). Although there is no universally accepted classification of the dimensions of parental involvement, they are broadly classified into two, namely home-based and school-based involvements (Reilly, 2008; Sui-Chu & Willms, 1996). Attempts to disentangle the effects of different types of parental involvement have yielded conflicting results (Englund, Luckner, Whaley, & Egeland, 2004). Some researchers have found that the involvement in home-based learning activities has the greatest influence on achievement (Ingram, Wolfe, & Lieberman, 2007; Van Voorhis, 2003), while some others have found that school-based parental involvement has the greatest influence on achievement (Lee & Bowen, 2006; Shumow & Miller, 2001). Another factor is the probability that different forms of involvement have differential effects depending on the age or class level of the child. While having a structured system for parental monitoring of homework may be beneficial for primary school children, this may be counterproductive for adolescents who are attempting to assert their autonomy (Cooper, Lindsay, & Nye, 2000). Parental involvement is not only associated with the outcomes related to child's academic achievement, but also associates with behavior and motivation (Kavanagh, 2013; Zangmo, Churngchow, Kaenin, & Mophan, 2016).

#### **2.4. Parental involvement and motivation toward learning**

Parental involvement is considered probably the most important, but the least utilized factor in students' learning (Chen, 2010; Gonzalez-DeHass & Willems, 2003; Hargreaves, 2003). Marsh and James (2014) report that a loving and supportive home environment positively affects students' feelings of motivation and self-efficacy. Parental involvement is associated with different areas of students' motivation, specifically intrinsic motivation, extrinsic motivation, school engagement, self-regulation, autonomy, goal orientation, and motivation toward reading (Gonzalez-DeHass et al., 2005).

Gonzalez, Doan Holbein, and Quilter (2002) reported that parent involvement exerts a positive impact on the mastery goal orientation of a group of American high school students. Specifically, they uncovered that maternal parenting styles (authoritarianism and permissiveness) and students' performance goal orientations are strongly associated. They also found that different types of parental involvements such as homework assistance, attending school events and extracurricular events are positively associated with students' mastery orientation. In this study, ethnicity led to differential findings, while parental education and student gender did not significantly affect the relationship that they studied. Boon (2007) found authoritative parenting style as a strong predictor of mastery goals and self-efficacy among Australian secondary school students. Findings of Hoang (2007) are also in line with previous two researchers.

In an attempt made in Thailand to find the culturally specific impact of the parenting style on students' goal orientation, associations were found similar to those in the Western countries (Koul, Lerdpornkulrat, & Poondej, 2016). A study on emerging adults' academic engagement, which was measured in terms of grade point average, achievement motivation, and class attendance uncovered mother's parenting style and father's relationship as significant predictors of academic engagement (Waterman & Lefkowitz, 2017). They also uncovered a gender effect on these associations in favor of males.

Generally, child's perceptions of ability and control affect their academic motivation. The literature consistently gives evidence for a relationship between parental involvement and child's perceived control and competence (Koskinen et al., 2000; Marchant, Paulson, & Rothlisberg, 2001). According to Fulton and Turner (2008), while parental warmth and supervision were found as the predictors of female college students' perception of control, only parental warmth was found as a significant predictor of male students' perceptions of control. Additionally, their findings suggest that the effects of parenting on academic motivation may be moderated by the students' gender.

Fan and Williams (2010) explored the associations between parental involvement and grade 10 students' motivation, which was measured in terms of engagement, self-efficacy, and intrinsic motivation. They report that parent-school contact concerning benign school issues and parents' aspirations of their children's educational performance are strongly and positively associated with students' engagement, self-efficacy, and intrinsic motivation. In the USA, Rice et al. (2013) examined the relationship of social support extended by parents, teachers, and peers with students' attitude and self-efficacy toward math and science. Fourth graders, eighth graders, high school students, and college students participated in the study. In general, support showed a direct effect as well as an indirect effect mediated by attitude on self-efficacy and a direct effect on attitude. Social support extended by all three agents established positive self-efficacy and attitudes in four groups of adolescents toward math and science. They, however, found little evidence to support a gender effect on the relationships between social support, attitudes, and self-efficacy.

While parental involvement is important at every grade level, it is critical at the middle level because parents of young adolescents have a tendency to become less actively involved in their children's education (Oates, 2017; Reilly, 2008). It is important to reverse this trend at the secondary level to keep parents actively involved to support their children's learning progression and to overcome the already mentioned developmental decline in secondary students' MTLs. As the secondary school level is the period of life in which children contemplate and negotiate their future trajectories,

it is vital to establish more effective parental involvement in the students' education at this level (Singh, Granville, & Dika, 2002).

So far, this literature review discussed the impacts of diverse aspects of parental involvement on different motivational constructs of the learning motivation. However, there is a dearth of studies, which measured the effect of parental involvement on students' motivation toward learning in general and MTLs in particular by taking the six dimensions of motivation described in the social cognitive theory. It is also clear that many researchers have gathered data on parental involvement from the children rather than approaching the parents. Therefore, the present study attempts to fill the above stated knowledge gap by involving both parents and children in the study.

### 3. Research methodology

The present study employed a quantitative method, which is based on the survey design. Parental involvement measured in terms of four selected dimensions was taken as the independent variable. Students' MTLs measured in terms of the six motivational dimensions described in the social cognitive theory was the dependent variable of interest. The relationship between parental involvement and students' MTLs was scrutinized by using the survey data. The impact of parents' ethnicity, income level, students' gender, and the category of the public school that they attend on the parental involvement and subsequently on the aforesaid relationship were also taken into consideration.

#### 3.1. Population and sampling

The population of interest was Sri Lankan public school secondary-level students who had completed the senior secondary (Ordinary Level) cycle by the end of 2016. By the time of data collection, they had almost completed the secondary level (Grades 6–11) Science curriculum, which is offered in all the public schools as a common compulsory subject for the cohort of secondary school students. The population comprised students representing the three main ethnic groups, Sinhala, Tamil, and Sri Lankan Moors (also known as Muslims). The majority belongs to the ethnicity Sinhala and they can be distinguished by their mother tongue Sinhala. The second largest ethnic group is Tamil who uses Tamil as their native tongue. The third largest ethnic group is Sri Lankan Moors who can be distinguished by the Islamic religion, which they practice. The majority of Moors also speaks Tamil as their mother tongue. Mainly based on their mother tongue, Sri Lankan students attend either Sinhala or Tamil medium schools. The government runs four categories of public schools labeled 1AB, 1C, Type 2, and Type 3. Grade span and subject streams offered by the school are the basis of categorization. Table 1 presents a profile of four categories of public schools based on the *School Census Preliminary Reports 2016* (Ministry of Education, 2016).

Four types of schools have been established all over the country and children are entitled to get access to the nearest public school. As a result of occasional school development projects implemented by the government, 1AB schools are generally considered the best-equipped schools in the country (Dorabawila, Samita, & Thattil, 2002). These schools provide access to a group of students who perform well in the national level exam known as Grade 5 Scholarship Examination. A series of national-level studies conducted to assess students' PERS by the National Education Research and Evaluation Center (NEREC) unexposed that Grade 8 students in 1AB schools outperformed their counterparts in the other school categories (NEREC, National Education Research & Evaluation Centre, 2008, 2013, 2015).

Students were chosen from randomly selected 18 educational zones representing the nine provinces of the country. From each zone, one 1AB school, one 1C school, and one Type 2 school were randomly chosen. One class of Grade 11 students from each of the 54 selected schools and their parents participated in the study. Altogether 689 student–parent dyads were in the sample. A profile of the students is given in Table 2.

**Table 1. Four categories of public schools in Sri Lanka**

School category	Number of schools	Number of students	Number of teachers	Average number of students	Student-teacher ratio	Grades span
1AB	1,016	1,626,565	76,012	1,601	21	Grades 1-13 or 6-13 with Advanced Level Science stream
%	10.0	39.2	32.7			
1C	1,805	1,034,743	60,001	573	17	Grades 1-13 only with Advanced Level Arts and/or Commerce streams
%	17.8	25.0	25.8			
Type 2	3 408	826,255	61,586	242	13	Grades 1-11
%	33.5	20.0	26.5			
Type 3	3,933	655,767	35,004	167	19	Grades 1-5 or 1-8
%	38.7	15.8	15.0			
Total	10,162	4,143,330	232,603		18	
%	100	100	100			

**Table 2. A profile of students**

	Ethnicity			School category		
	Sinhala	Tamil	Muslim	1AB	1C	Type 2
Male	230	71	43	119	99	126
Female	208	83	54	127	126	92
Total	438	154	97	246	225	218
Composition	63.6%	22.4%	14.0%	35.7%	32.7%	31.6%

### 3.2. Survey instruments

To assess students' MTLs, the Science Motivation Questionnaire (hereafter designated as SMQ) developed by Glynn and Koballa (2006) was adapted. The SMQ consists of 30 items to be assessed with a five-point Likert scale, which ranges from 1 for "never" to 5 for "always". There are five items coming under each of the six motivation dimensions, which are described as key constructs of motivation, in the social cognitive theory. The score that a student can gain for the 30 items varies from 30 to 150. The total score achieved was treated as a measure of students' MTLs. Students whose score was in the range of 30-69, 70-109, and 110-150 were treated as having low, moderate, and high level of MTLs, respectively. In calculating the total score, test anxiety items were reverse scored, so the lower test anxiety means a higher level of motivation. Students' MTLs in each dimension was determined by taking the sum of scores for the corresponding five items of the particular dimension. The minimum and the maximum scores of a dimension were 5 and 25, respectively. Students score in the range of 5-11.7, 11.8-18.3, and 18.4-25 were treated as having a low, moderate, and a high level of motivation in the corresponding dimension, respectively (Glynn et al., 2009).

The Parental Involvement Questionnaire (hereafter designated as PIQ), which measured the involvement of parents in their children's education was particularly developed for the current study by adopting questionnaire items from the previous studies (Hoover-Dempsey, Sandler, & Walker, 2002; National Coalition for African American Parental Involvement in Education, 2005; Ohio Department of Education, 2009). The PIQ consists of two parts. Part A comprises 20 self-assessment items to be marked with a five-point Likert-type scale ranging from 1 for "Not at all" to 5 for "To a large extent". These 20 items were chosen from the previous studies to assess the four dimensions of parental involvement, namely "monitoring" child's out of school activities, "discussing" school activities, "communicating" with the school personnel, and "volunteering" at the school (Sui-Chu &

Willms, 1996). The total score achieved for the PIQ is treated as a measure of the level of parental involvement in the child's education. The minimum and the maximum score that a parent can gain for the 20 items in the questionnaire are 20 and 100, respectively. Parents who score for the PIQ in the range of 20.0–46.7, 46.8–73.4, and 73.5–100 are treated as having low, moderate, and high level of overall involvement, respectively. Part B comprised of two nominal scale items, which asked parent's ethnicity and monthly income of the family.

Both questionnaires were translated into Sinhala and Tamil. The construct validity of the original SMQ has been established by Glynn et al. (2009). Other researchers have also acknowledged its validity (Chow & Yong, 2013; Salta & Koulougliotis, 2015; Zeyer et al., 2013). To assure that questionnaires were validly translated, the procedure proposed by Spielberger and Sharma (1976) was followed. First, a Sinhala senior lecturer and a Tamil senior lecture who are fluent in English and attached to the National Institute of Education, Sri Lanka translated the questionnaires into their mother tongues. Two other senior lecturers of the same institution who were blind to the original questionnaires did the back-translation. The back-translation was checked with the original questionnaires, and the identified discrepancies were rectified. Cross-language equivalence between original questionnaires and translated versions were established by administering the SMQ to a group of bilingual students and the PIQ to a group of bilingual parents.

The face validity of the translated questionnaires was established by consulting a group of Sinhala medium and Tamil medium science teachers and the respective language teachers. Then, the Sinhala and Tamil medium SMQs were administered to a group of 64 Sinhala and 58 Tamil medium students, respectively, for pilot testing in the second school term in 2016. Similarly, a pilot test was conducted with 37 Sinhala-speaking parents and 31 Tamil-speaking parents. Of the group of students participated in the pilot study, 15 students from each medium were interviewed by giving a brief orientation and asking four questions used by Glynn et al. (2009) for the same purpose. Out of the parents involved in the pilot study, 12 Sinhala parents and 10 Tamil parents were also interviewed by raising four semi-structured questions about their home-based and school-based involvement.

Followed by the pilot studies, in terms of Cronbach's alpha the reliability of Sinhala and Tamil medium versions of the SMQ and PIQ were determined. The alpha values of the 30 items in Sinhala and Tamil medium SMQs were 0.889 and 0.854, respectively. The same measure of 20 items in Sinhala and Tamil medium PIQ was 0.805 and 0.833, respectively. All these figures, which are greater than 0.7, indicate the suitability of the survey instruments to be used in the study. The level of MTLs of the students who participated in the pilot study and their level of MTLs determined from the interviews were highly in line with each other. In addition, students' MTLs determined by the SMQ and students' PERS determined by the average term test score for science showed a statistically significant correlation of 0.625. These findings further assured the SMQ as a valid instrument to measure Sri Lankan students' MTLs. The findings of the pilot study and interviews with parents were also tallied, which meant that parents who got a high score for the PIQ had a higher level of parental involvement as uncovered by the interviews. Apart from that the level of parental involvement measured using PIQ and students' MTLs showed a positive association between each other, as indicated by a correlation coefficient of 0.217.

### **3.3. Data collection and analysis**

Prior to the school visits, respective principals were officially informed through the zonal education offices. One of the researchers personally visited each school to administer the SMQ in order to assess students' MTLs. After completing the SMQ, the PIQ together with a covering letter stating the purpose of the survey was distributed to the students who participated in the study. Students were requested to get it completed by one of their parents (or guardian) and hand over to the class teacher on the following day. The researcher gave a self-addressed envelope and the stamp fee to the respective class teacher. Then, she/he sent the completed PIQs to the researcher by post. A record of students' science test score for five successive term tests (three terms in Grade 10 and first two

terms in Grade 11) was taken from the each school visited. Finally, 1,316 of correctly completed SMQs were collected and 689 PIQs were received. Accordingly, 689 student–parent dyads were taken into account.

Statistical Package for the Social Sciences (SPSS), for Windows 17 was used for the data analysis. Independent sample *t*-tests, one-way analysis of variance (ANOVA), Tukey's *post hoc* test, and Dunnette' T3 procedure were applied. A Pearson's correlation coefficient was also computed.

#### 4. Research findings

This section presents descriptive statistics to get a feel about the respondents, the associations between variables, results of statistical tests, and a regression model, which predicts students' MTLs in terms of parental involvement.

##### 4.1. A respondents' profile

A demographic profile of the sample of students is given in Table 2. The average age the students was 16 years and there were 344 (49.9%) boys and 345 (50.1%) girls. The sample comprised of 63.6% Sinhala, 22.4% Tamil, and 14.0% Moor students. Representations of 1AB, 1C and Type 2 school students were 34.6, 28.8, and 36.6%, respectively.

Out of 689 parents who completed the PIQ, 260 (37.7%) were male and 429 (62.3%) were female. Among the respondents, 19 (2.8%) were guardians such as grandparents, aunts, uncles, brothers, and sisters. The rest was either fathers or mothers. According to the survey data, 62.5% of them earn less than US \$ 200 per month, while 29.7% earn a monthly income within the range of US \$ 200–400. Only 7% earns over US \$ 400 per month. In this study, these three groups are referred to as low-, middle-, and high-income groups, respectively.

##### 4.2. Levels of students' MTLs and parental involvement

Based on the students' responses to the 30 items in the SMQ, their average score for all the items and for each set of items under the six dimensions are given in Table 3. Accordingly, students' MTLs is at a moderate level. The average of presents' scores for the 20 items given in the PIQ is 62.20 ( $\pm 8.39$ ). This figure indicates that parents' involvement in child's education is at a moderate level.

Table 4 presents the level of parental involvement with respect to their ethnicity and income level. It is apparent from this table that Muslim parents' level of involvement in their children's education is higher than that of the other two ethnicities. Sinhalese parents' level of involvement is the lowest. While the level of parental involvement among the middle-income group is the highest, that of the low-income parents is the lowest.

To test if there is a statistically significant difference in the level of parental involvement between three ethnicities one-way ANOVA was run. Here, the equality of variances assumption was met as assessed by Levine's test ( $p > 0.05$ ). The  $p$ -value is 0.246 ( $> 0.05$ ). Therefore, there is no statistically significant difference in the level of parental involvement relating to the parents' ethnicity.

**Table 3. Level of motivation toward learning science**

Construct	Mean	Std. deviation	Level of motivation
MTLS	100.4	11.5	Moderate
Intrinsic motivation	19.6	4.0	High
Extrinsic motivation	19.6	4.1	High
Personal relevance	18.2	4.1	Moderate
Self-determination	13.2	3.9	Moderate
Self-efficacy	19.1	4.0	High
Test anxiety	10.7	3.7	Low

Similarly, to test if there is a statistically significant difference in the level of parental involvement between parents belonging to the three income levels, one-way ANOVA was run. The  $p$ -value of 0.003, which is less than 0.05 indicated a significant difference in the level of parental involvement at least between two income groups. Tukey's *post hoc* test was applied to identify those pairs and the result showed a statistically significant difference between low- and middle-income groups only.

Table 5 presents the level of parental involvement with respect to the child's gender and the category of school that he/she attends. It is apparent from the Table 5 that the level of parental involvement in female students' education is slightly higher than that of the male students. It can also be seen that 1AB school parents have the highest level of involvement in children's education, while Type 2 school parents have the lowest.

To assess the difference in the level of parental involvement with respect to the child's gender, independent samples  $t$ -test was used at the significance level of 0.05. Table 6 presents the results. The test confirms that there is no significant difference ( $t = -0.494, p = 0.622$ ) between the level of parental involvement in girls' and boys' education.

To test if there is a statistically significant difference in the level of parental involvement in relation to the category of school that their child attends, the non-parametric Kruskal-Wallis test was applied as homogeneity of variances assumption was violated (Levene's test  $p$ -value < 0.001). The results are tabulated in Tables 7 and 8.

As shown in Table 8, the  $p$ -value of 0.001 (< 0.05), confirms a statistically significant difference in the level of parental involvement with respect to the category of school. Dunnett T3 procedure was

**Table 4. Level of parental involvement with respect to their ethnicity and income**

		<b>N</b>	<b>Level of parental involvement</b>	<b>Std. deviation</b>
Ethnicity	Sinhala	438	61.79	8.70
	Tamil	154	62.86	7.72
	Muslim	97	62.98	7.92
Income level	Low	438	61.37	8.41
	Middle	210	63.71	8.15
	High	41	63.24	8.39

**Table 5. Level of parental involvement with respect to the child's gender and school category**

		<b>N</b>	<b>Level of parental involvement</b>	<b>Std. deviation</b>
Gender	Male	344	62.04	8.13
	Female	345	62.36	8.65
School category	1AB	246	63.91	6.99
	1C	225	61.88	8.85
	Type 2	218	60.60	9.01

**Table 6. Comparison of parental involvement with respect to the child's gender**

	<b>Gender</b>	<b>N</b>	<b>Mean</b>	<b>Std. deviation</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Parental involvement	Male	344	62.04	8.13	-0.494	687	0.622
	Female	345	62.36	8.65			

applied to determine the pairs of groups, which are significantly different. Results revealed statistically significant differences between 1AB and 1C parents as well as 1AB and Type 2 parents.

#### 4.3. Association between parental involvement and students' MTLs

The extent that a pair of variables covaried and the direction of association were determined by Pearson correlation values. Table 9 shows the correlations of parental involvement and its dimensions with students' MTLs. It is apparent from the table that there is a significant positive correlation of 0.206 between parental involvement and students' MTLs. All four dimensions also significantly associate with MTLs. While *monitoring* shows the strongest association with MTLs, *communicating* shows the lowest.

The association between parental involvement and the six motivational dimensions, to be exact intrinsic motivation (IM), extrinsic motivation (EM), personal relevance (PR), self-determination (SD), self-efficacy (SE), and test anxiety (TA) are given in Table 10. Parental involvement has a statistically

**Table 7. Ranks of parental involvement with respect to school category**

	School category	N	Mean rank
Parental involvement	1AB	246	379.37
	1C	225	341.85
	Type 2	218	309.46
	Total	689	

**Table 8. Test statistics<sup>a,b</sup> which confirm differences in the level of parental involvement with respect to the school category**

	Parental involvement
$\chi^2$	14.373
df	2
Asymp. Sig.	0.001

<sup>a</sup>Kruskal-Wallis test

<sup>b</sup>Grouping variable: school type

**Table 9. Association of parental involvement and its dimensions with students' MTLs**

		Parental involvement	Monitoring	Discussing	Communicating	Volunteering
MTLS	Pearson correlation	0.206*	0.182*	0.179*	0.111*	0.132*
	Sig. (2-tailed)	0.000	0.000	0.000	0.004	0.000
	N	689	689	689	689	689

\*Correlation is significant at the 0.01 level (2-tailed).

**Table 10. Associations of parental involvement with students' MTLs and its dimensions**

		MTLS	IM	EM	PR	SD	SE	TA
Parental involvement	Pearson correlation	0.206**	0.172**	0.192**	0.090*	0.098**	0.200**	-0.111**
	Sig. (2-tailed)	0.000	0.000	0.000	0.018	0.010	0.000	0.004
	N	689	689	689	689	689	689	689

\*Correlation is significant at the 0.05 level (2-tailed).

\*\*Correlation is significant at the 0.01 level (2-tailed).

significant association with each of the motivational dimensions listed above. Parental involvement has the highest and the lowest association with self-efficacy and personal relevance, respectively.

## 5. Findings and discussion

The findings of the study generally support the world view that parental involvement affects students' motivation toward learning and particularly confirm its impact on students' MTLS. In their meta-analysis, Gonzalez-DeHass et al. (2005) summarize the association between various aspects of parental involvement and the dimensions of students' motivation, which are crucial to academic performance. Almost all the correlation values of the associations that they have cited are within the range of 0–0.4. The correlation of 0.206 between parental involvement and MTLS, which is determined in the current study, also belongs to the same range. Although a correlation of 0.206 may be seen as low, it should be noted that this value represents a medium effect size, which is undoubtedly considered a significant one in social science researches (Stevens, 1990). Researchers also report that the level of parental involvement in the secondary students' education is low compared to the other levels (Rice et al., 2013).

While it is inconclusive, which aspect of parental involvement has the greatest effect on students' performance (Englund et al., 2004), the current study indicates that home-based parental involvement dimensions, namely “monitoring” child's out of school activities and “discussing” school activities have stronger association with MTLS compared to the school-based involvement. As the large majority of mothers participated in the study is unemployed, they may have more time to involve in their children's home-based educational activities. Consequently, home-based parental involvement may be more frequently occurring in the Sri Lankan context.

The correlation analysis of the study established the association between parental involvement and students' MTLS. When factors such as gender, socioeconomic status, ethnicity, and other demographic variables act on the two variables, the relationship between them become more and more complicated (Gonida & Urdan, 2007). As one of its objectives, the present study examined the complexity of the relationship through several facets. One of them is parents' ethnicity. One-way ANOVA test reveals that the level of parental involvement is not significantly different with respect to the ethnicity. However, ANOVA confirms that the second facet, namely parents' income level leads to a significant difference in the level of parental involvement. While the parents of middle- and high-income groups show a higher level of involvement compared to the low-income parents, the difference is significant only between low- and middle-income groups. It is somewhat surprising that middle-income parents had the highest level of involvement in their children's education. Parents in Asian cultures, who put primacy on learning, see education as the key path for social mobility and economic survival (Caleon et al., 2015). But, middle-income parents have a higher socioeconomic potential to support their children to reach higher social strata compared to the low-income group. This factor may explain the significant difference in parental involvement between the parents of low- and middle-income groups in Sri Lanka.

The independent sample *t*-test proves that the third facet, namely child's gender, is not a significant factor determining the level of parental involvement in Sri Lanka. In other words, Sri Lankan parents' involvement in the child's education has no gender bias. However, depending on the category of school that the child attends, the level of parental involvement differs significantly. The difference was significant between 1AB parents and 1C parents, as well as between 1AB and Type 2 parents. This observation cannot be explained with a single reason, but it might be associated with the school culture, nature of school–parent interactions, socioeconomic status, etc.

The current study examined the association of parental involvement with students' motivation, which is measured by the SMQ. Because the SMQ combines six key dimensions of motivation, it assures that this study measured students' MTLS in a more comprehensive manner compared to many other studies, which is a unique feature of the current study. Accordingly, parental involvement is highly associated with self-efficacy, extrinsic motivation, and intrinsic motivation compared to the

other three dimensions. Identifying parental involvement activities, which specifically enrich each of the key dimensions of MTLs is open for further research.

## 6. Conclusion

Active parental involvement has a great significance today more than ever (McEwan, 2005). Especially in developing countries, however, parental involvement is still limited to the traditional parents' meetings, which are mainly focused on non-academic matters. All three groups, namely school principals, teachers, and parents do not show a broad understanding of the potential that parental involvement possesses to enhance child's motivation toward learning and performance. By referring to the association between parental involvement and students' MTLs revealed in the current study, it can be concluded that the dilemma of students' swing away from science can be mitigated by establishing comprehensive parental involvement practices.

The findings of the study may help school principals to plan and implement more effective parental involvement programs to develop students' MTLs, which subsequently lead to uplift the performance in science. Apart from that, principals need to pay more attention to the disparities in the level of parental involvement associated with the school category and parents' income level, which are exposed in the study. Measures should be taken to minimize the disadvantage that children experience due to these disparities. Active parental involvement is a channel for teachers to understand the challenges that students face at home (Tutwiler, 2005). However, Hargreaves (2003, p. 128) states that parents are often one of teachers' "most underused resources". Particularly, science is a subject, which goes beyond the classroom walls and interacts with the day-to-day life. Therefore, teachers can incorporate the findings regarding parental involvement, its association with students' MTLs to provide more meaningful learning experiences for secondary school students in collaboration with their parents. Further, these results help parents to understand the significance of their involvement in the child's education, and particularly its effect on child's MTLs. They should find ways and means that they can operate to nourish their children's MTLs. As revealed in the present study parent's involvement has significant associations, especially with child's extrinsic motivation, intrinsic motivation, and self-efficacy, parents can strengthen their home-based involvement in such a way that the child gets more exposure to the science in practice in real life.

Overall, the present study contributes to the literature that home-based parental involvement has the greatest influence on students' MTLs. The comparatively weak association between parental involvement and students' MTLs uncovered in the present study also indirectly supports the world view that parental involvement is relatively weak at the secondary level as proved by the other researchers. Moreover, the study sheds light on the complexity added to the relationship between parental involvement and students' motivation toward learning while taking socioeconomic and demographic variables into consideration.

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