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An analysis of the relationship between student's life satisfaction and academic achievement

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An Analysis of the Relationship Between Student's Life Satisfaction And Academic Achievement

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1.0. **Introduction**

Although it is barely controversial to suggest that student's performance is a function of some internal and external classroom factors, studies have been unhurried to confirm this belief. While numerous studies have been conducted to assess the instructional design, pedagogical strategies and techniques as related to academic performance (Astin, 1993; Kuh et al., 1999, 2001 & 2003), the assumption that students' academic performance could be linked to life satisfaction on more comprehensive contextual and attitudinal variables has been scarcely explored by scholars. Those studies which have focused on students' experiences have concentrated on either the relationship between life's satisfaction and the university or on the objective factors and academic performance (Kusum, 2002; Masooma et al., 2017). It is therefore important to also examine how subjective wellbeing factors such as life satisfaction could affect academic achievement as well. This is important because scholarly work has confirmed a relationship between student's life satisfaction and academic performance (Goldbeck et al., 2007).

On one hand, based on everyone's collective experiences, it is believed that overall life satisfaction rather than satisfaction only with the school or department is a crucial factor in the determination of student's academic performances which has also been corroborated by other scholarly studies (Huebner & Alderman, 1993; Valois et al., 2001). Students who are very satisfied with their lives tend to persist in the face of challenges, conversely, low level of life satisfaction is capable of distracting their focus and deteriorates their academic performance in the classroom (Zullig et al., 2001). The formal simply implies that high performer students are those who are happy because they are satisfied with their lives, while those students who perform poorly in the classroom are those who are likely to drop out of the college because they are not satisfied with their life.

On the other hand, the traditional belief of life satisfaction is that it is rather more of an outcome rather than a predictor of other important variables, however, research has treated it to be more of an independent rather than as a dependent variable. For instance, Cropanzano & Wright, (1999); Staw, et al., (1994); Wright& Cropanzano, (1997, 2000) studied the relationship between life satisfaction and supervisor's ratings of work performance. Staw & Barsade (1993) explored the effects of students' life satisfaction on performance on an in-basket exercise (in-basket exercise

often used to identify talent management) and they found that life satisfaction has a significant impact in the two studies.

That said, several studies have examined the relationship between life satisfaction and academic achievement, however, they have focused on overall achievement rather than subject levels (Çağdaş&Levent, 2018), while those which have examined subject level achievement have been concentrating on non- science and mathematics subjects. For instance (Staw & Barsade, 1993) explored the effects of students' life satisfaction on the performance of students in in-basket exercise (in-basket exercise often used to identify talent management) and finds a strong correlation between the two variables.

Also, those that examined science and mathematics only focused on how it is related to motivation, grit, attitude, and Interest (Kusum, 2002; Masooma et al., 2017). As far as I know, no studies have been conducted to assess students' life satisfaction as related to the achievement of science and mathematics specifically. Lack of studies in this area could slow down or impact decision making in science and mathematics education. Inaccurate or slow decision making could affect student's classroom performances as well as their career aspiration which may impact the country's innovativeness and global competitiveness.

At the national level, one of the key ways to ensure that countries can ensure that they compete in the global market is through enhancing activities such as research and development (R&D). At the center of R & D lie science and mathematics graduates, who are seen as major inputs of each nation's innovation system (Bussière, et al., 2007). At the micro-level, studies have suggested that having some knowledge in sciences and mathematics would lead to better labor market experiences and higher earnings, especially for those with a background in science and mathematics. (Bussière, et al., 2001). According to Ambrosio (1991), science and mathematics play a crucial role in attaining values that promote equality, justice, and self-worth for humanity without any form of segregation or discrimination. The low achievement will hinder the attainments of the necessary values and skills that students are supposed to acquire from the science and mathematical concepts.

Although many interrelated variables affecting students' achievement in science and mathematics have been reported. These include self-perception & family background (Mok & Flynn, 2002), association with friends and teachers (Leung & Zhang, 2000), nature of school, and the environment (Gilman & Huebner, 2006). However, all these factors have been pointed to as the factors culminating in student's life satisfaction. This shows the importance of promoting students' life satisfaction for better academic achievement as it is at the center of all factors affecting students' academic achievement in science and mathematics.

Despite the importance of science and mathematics and the crucial role of life satisfaction in promoting students' achievement specifically in science and mathematics, no studies have been conducted to assess the relationship between life satisfaction and students' achievement in science and mathematics. This study, therefore, aims at bridging the gap by examining the relationship between life satisfaction and science and mathematics achievement at the macro country level using some selected countries from the 2018 Pisa assessments. The knowledge of how student life satisfaction is related to their science and mathematics achievement could enhance the ability of policymakers to make an informed decision regarding policies and practices in science and mathematics education (STEM).

1.1. The Problem and Rational for the study

A concerted effort has been made towards increasing students' achievement in science and mathematics globally. Despite all these efforts; achievement in the subjects has been deteriorating from time to time especially in recent years (Jidamwa, 2012). According to an international student assessment survey carried out by Science Education in Europe (2011), there is a relative gap in the performance of science subjects among European members. Also, Oasaki (2007) report the poor achievement in mathematics and science subjects at primary and secondary school level in Tanzania. The report according to National Examinations Council, Tanzania (NECTA) revealed the result of the national form four examination for Mathematics (31%, 24%, and 18%) in 2007, 2008 and 2009, respectively, Chemistry(33%, 31%, and 28%), Biology (46%, 41 and 43%) and physics (29% 26% and 27%) respectively for the year 2007, 2008 and 2009 (Hamilton et al., 2010).

According to OECD, 2018 reports, achievement in science and mathematics has been disappointing globally, although few countries showed improvement as achievement meets the minimum set by the OECD while more than 50% of students in 24 countries achieved less than the level of proficiency in science and mathematics. The poor achievement could have impacts at the institutional, classroom, and students' levels. At the institutional level (failure to achieve an educational goal), at the student's level (leads to non-completion or non-usage of science and mathematical skills, major depressive disorders (MDD) (Shi, 2014; Correll et al, 1997)and at the national level at large (shortage of experts like doctors, engineers, and teachers, and increases socio-economic divides as people in science occupation earns about 26% more than others) (Langdon, McKittrick, Beede, Khan, & Doms, 2011).

Studies suggest several factors determining achievement in science and mathematics which can be grouped into individual (perception about science courses, academic experience in science and mathematics subjects during high school, academic expectation and career aspirations), family (parental or siblings with background or career in science, ethnicity or race), academic institution (curriculum, workload, infrastructure, classroom culture, and teacher competencies) (Breakwell & Robertson, 2001; Cleaves, 2005; Tai, Qi-Liu, Maltese, Fan, 2006; Loman, Gardner & Billup 2010; Ost, 2010; Huelskamp, 2010; Sheppard et al., 2010; Olitsky, Sjaastad, 2012; Christensen et al., 2015). However, all these factors have been reported to directly influence student's life satisfaction while student's life satisfaction directly affects a student's academic achievement in science and mathematics (Leung & Zhang, 2000).

Studies have shown that life satisfaction directly influenced academic achievement in science and mathematics and is related to other educational outcomes, For instance, studies by Duffy, Allan, & Bott, 2012; Ojeda, Flores, & Navarro, 2011, suggest that students who are more satisfied with their lives tend to possess better academic experiences. Also, O'Sullivan, 2011; Ojeda et al., 2011 conducted some studies to show that life satisfaction is also associated with less academic stress and the attainment of academic goals and other research suggest that higher life satisfaction is even related to higher achievement in science and mathematics (Howell, 2009; Rode et al., 2005). It is therefore important to examine how life satisfaction directly impacts achievement in science and mathematics.

Given this background, this study aims at examining the relationship between life satisfaction and student achievement in science and mathematics at the macro level using the 2018 Pisa data of some selected countries that participated in the 2018 Pisa study. This research is significant especially because it recognizes student's centeredness in education policy. Therefore assessing how their achievement relates to their life satisfaction and putting in place the necessary policy implications could help inform and develop an effective educational policy (Nieto, 2004).

1.2 Significance of the studies/ contribution to knowledge

This research seeks to assess the relationship between students' life satisfaction and academic achievement in science and mathematics at the macro country level using the data reported for some selected countries that participated in the 2018 Pisa study in the hope of informing evidence-based policymaking. Studies have either focused on the relationship between overall subject's achievement or non-science and mathematics achievement as related to life satisfaction (Kusum, 2002; Masooma et al., 2017). But no studies have emanated from the discourse on how student's life satisfaction could impact their academic achievement in science and mathematics using a quantitative method of analysis. The findings of this study will contribute significantly to the following policy areas and agencies:

- Education policymakers and administrators will be able to develop effective education policies that could promote student life's satisfaction and specifically science and mathematics education policymakers will be able to make a logical decision and develop appropriate policies based on these findings.
- It will provide comprehensive information to prospective researchers who are interested in the same research thereby adding to the existing knowledge in the literature related to student's welfare &education policy.

1.3. Scope of the studies.

The scope of this study is limited to students who are 15 years old and are about to complete their basic education, selected for all the countries that participated in the Pisa assessment in 2018.

1.4. Research questions

The following research questions will be addressed in this study:

- What is the relationship between average life satisfaction and academic achievement in mathematics and science?
- What is the moderating effect of other variables on the relationship between average life satisfaction and academic achievement in mathematics and sciences?
- How does the relationship between student's life satisfaction and achievement in mathematics and science vary across the selected countries?

2.0. **Literature Review**

2.1. Empirical Review

This chapter will review thematically the related literature under the following headings: *student's life satisfaction and academic achievement*.

Student life satisfaction

Sirin, (2005) found a correlation between student's academic achievement and life satisfaction when moderated with parent's education, the study observed that parents whose education is more than that of their children have their academic achievement correlated but only mother's education was found to be highly correlated. A statistical and practical significance was also found in a study by Joseph et al., (2005) conducted by using online questionnaire-satisfaction to elicit information on the participants. Results indicated that overall life satisfaction was a significant forecaster of both GPA and assessment center ratings, this result was still the same even when traditional academic achievement was controlled for.

Gilman and Huebner (2006) conducted an exploratory study on the relationship between life satisfaction and academic achievement among undergraduate students of a university (UiTM). Contrary to what has been found in other studies, they found that no relationship existed between

life satisfaction and academic performance among undergraduate students of the university (UiTM).

A study by Susan, (2017) conducted in the USA examined the importance for students who are more satisfied with their lives on their academic achievement. Results indicated that students who are more satisfied with their life scored more favorably than the students who are not satisfied at all with their life in the scores on almost every academic outcome investigated, students with the high life satisfaction outperformed the students with average life satisfaction on all of the same academic domains examined, although an exception of beyond-class engagement was found,

Academic achievement

As mentioned above, this study seeks to examine the relationship between students' life satisfaction and their academic achievement specifically in mathematics and science using a macro country level of some selected countries that participated in the 2018 Pisa assessment. To start with, it must be stated clearly here that, literature has used the terms of 'academic achievement' and 'academic success' interchangeably (Kuh et al., 2006; Choi, 2005). Such a trend and mention might be repeated in this review.

John Rugutt and Caroline Chemosit (2018), researched elements that affect student academic achievement using the "structural equation modeling approach". The findings of the study suggest that some factors such as the interaction of students with the institution, internet, and campus technology; quality of instruction, and overall college experience promote student academic achievement. The findings were corroborated by the findings from other scholars who have researched the characteristics of the learner, the learning environment, and the quality of instruction the learner receives (Haertel, Walberg, & Weinstein, 1983). The study, therefore, suggested that replication of this study be made to be sure that they are not unique to the study, he also states that the study was limited by the secondary data used as it is self-reported which was believed to be true and in the variables considered in the study.

Muhammad Amjad Saleem and Muhammad Imran Qureshi, (2011) in their study titled, "Credentials and examination of the factors affecting the students' academic achievement in higher

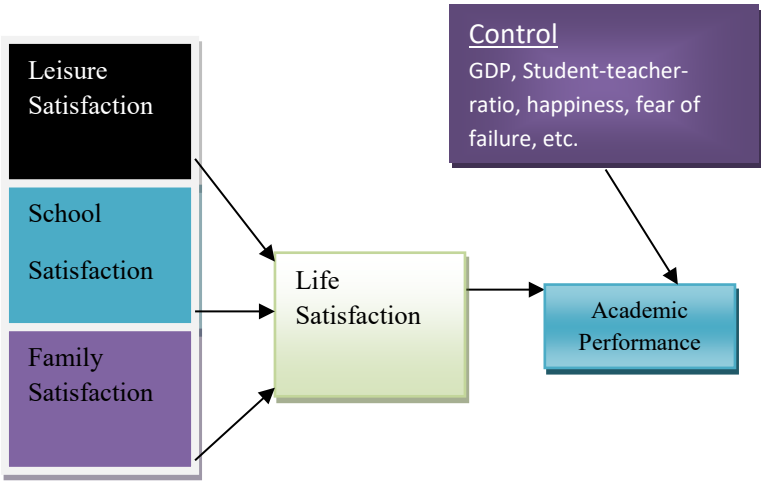
education" using regression analysis on the students' cumulative grade points as regards educational factors, individual factors and socio-economic factors were found significant. Their finding suggests that academic achievement is dependent on educational factors, individual factors, and socio-economic factors. They posited some critical views that if students fail to develop good study habits and learn English as a medium to improving on their studies then the institutions, teachers, parents, and government that are to provide them such environment and facilities will help promote their academics but without these, students will also fail. They further suggested that more research should be done to look at other factors such as motivational, behavioral, contingent, and situational factors that could impede academic achievements in higher education of learning. This study further enumerated some of the academic and social factors identified by the previous researchers.

In a bid to bridge the gap in the literature suggested by the previous study Sommer & Dumont (2011) assessed how cognitive factors could predict student educational outcomes using students at the University of Fort Hare. Several factors were identified to predict academic performance through their influence on the student's adjustment to university life. Some of the factors include: "academic motivation, self-esteem, perceived stress, academic overload, and help-seeking" Dumont (2011), which all boils down to affecting their life satisfaction. Given their findings, they advocated for career orientation programs and a conducive climate for student learning. They also believed that students should be engaged in skill development training/workshops (stress, time, and work management) early enough, which would help improve their abilities to cope with the various demands of school life.

From the reviewed literature, none of the researchers have deliberately examined the student's academic achievements in mathematics and sciences as it is affected by their life satisfaction. This research will provide holistic views on student's achievement in mathematics and sciences as affected by their life satisfaction.

2.2. Theoretical Framework for the study

Author's Paradigm, (2020)



The above model is based on an "Integrated life" perspective (Luthans, 2002; Rice, McFarlin, Hunt; Near, 1985), which proposes that students' academic performance is affected by satisfaction in all life domains. This in turn provides a platform through which we can understand how life satisfaction influences student's academic achievements in mathematics and science. The potency of this theory to support the empirical findings of the study makes it a suitable choice for evaluation.

The theory describes life satisfaction as a product of not only satisfied with the school but also with leisure and family. The idea behind this theory is that all these have significant impacts in shaping students life satisfaction which in turn affects their academic performances(Çağdaş & Levent, 2018; Rode et al., 2005), High life satisfaction could promote academic achievement, and in the same vein, low life satisfaction is capable of hampering greatly the student's academic achievement(Muhammad et al, 2008).

Also, I propose that satisfaction levels within specific domains are the previous circumstances of life satisfaction and that other factors like the GDP (per capita), student-teacher ratio, sense of belonging, fear of failure and happiness could moderate the relationship between the average life satisfaction and academic performances of students. The reason for the inclusion of all these

variables is not only because they could be a good moderator of academic achievement but because they have been used in some other studies (Kuh et al., 2006; Choi, 2005).

The explanation here is based on the fact that life satisfaction may not be sufficient enough to boost student's academic performances in some context, because life satisfaction may mean different things to different students due to the cultural differences. Therefore, when moderated with some other personal and institutional factors, it is expected that academic achievement would be positively influenced. In this context, GDP per capita, student-teacher ratio, sense of belonging, fear of failure, and happiness are used as moderating variables.

Studies have shown that higher education spending could enhance student's academic achievement (Robert et al, 1987 and Ronald et al. 1991). The ideal is that education spending could promote infrastructural development and teacher's efficiency which will in turn allow learners to learn in a conducive, relaxed environment and under competent teacher and this would bring about positive student academic output (Fredrick et al., 1990).

Small class sizes could also promote student's satisfaction with the school. This is expected to enhance greatly such student's wellbeing outcomes (life satisfaction and happiness) and thereby higher academic performance. A small student-teacher ratio helps teachers build classroom community and attends to an individual's student academic challenges. This close relationship between teacher and students as a result of small class size leads to the promotion of an implicit feeling of a sense of belonging (OECD, (2016): Mauldin et al. (2001)).

A sense of belonging will assist the learner build and foster strong links and bonds in the classroom (Kasworm, 2001; Maher, 2004). The inability of the student to build such bonds with the classroom could affect the student's life satisfaction and could cause non-completion of the study and non-usage of the acquired knowledge (Bean & Metzner, 1985). It is therefore imperatives that sense of belonging be considered as one of the strong factors capable of influencing students' life satisfaction and academic achievement. This was acknowledged in our study.

Happiness on the other hand has been reported to be one of the key drivers of academic success. It has been seen as components that include positive emotions, life satisfaction, and the absence of negative emotions (Diener, 2000). Also, a study suggests that happiness could greatly influence life satisfaction, promote positive relationships with others and it could also promote the student's personal growth. All these are what students need to be a high academic performer in the classroom (Kalantari, 2003).

Generally, fear of failure is one thing that propels students to reading, because they do not want to fail. Although some studies have suggested that fear of failure is not a positive predictor of academic achievement. For instance, Adams and Biddle, (1970), they posited that fear of failure could hinder retention and the remembrance of subject concepts. They believe that when students fear that he might fail a subject; such students may fail eventually due to the negative feeling (Burns, 1984; Dunkin & Biddle 1974; Stodolsky, 1988).

Going from Micro-level to Macro level.

This study adopts a macro-level approach of countries to examine the relationship between average life satisfaction and academic achievement in mathematics and sciences. Some variables such as the student's sense of belonging, happiness, and fear of failure were all at the micro-level, whereas only education expenditure (GDP) and student-teacher ratio are the macro-level of the variables used in this study. The researcher has adopted this approach with the belief that such micro-level variables are good controlling variables for this study and because they have also been used before in some other scholarly works (Tofi, Fleet, Timutimu, &Thorpe, 1996). However, this study opens room for further study at micro-level analysis in this same area of study. This will provide a stronger and broader knowledge of the issues surrounding this discourse.

Domain satisfaction and life satisfaction

That said, many researchers have found measures of satisfaction with life domains to be a positive correlate of overall life satisfaction. Many of these studies have deliberately explained the differences in life satisfaction from place to place (Andrews & Withey, 1976; Campbell, Converse, & Rodgers, 1976; Near, Smith, Rice, & Hunt, 1983; Near, Smith, Rice, & Hunt, 1984; Rice, Near, & Hunt, 1979). These studies have suggested that life satisfaction is composed of a mechanism of

satisfaction with different life domains and the importance of any of these domains to life satisfaction varies by the type of population been considered (e.g., Andrews & Withey, 1976). Although scholarly reports have shown that many domains of satisfaction exist, individual research has adopted the domains that are more related to the type of population been addressed and the level which is been considered. The population for this study was the 15-year-old students near the completion of their compulsory education, so I included a wide variety of satisfaction measures I thought relevant to this population, such as satisfaction with the school, leisure, and family relationships. In this study, I did not measure those domains because of the nature of data (secondary data) been used and the macro-level of countries variables adopted. This is a serious gap acknowledged in this study.

3.0. **Methodology**

Overview of the approach and the Data analysis

This study adopted a macro- country-level approach to studying the relationship between average students' life satisfaction and academic achievement in science and mathematics using the 2018 OECD Pisa data reported for the Pisa assessment in 2018.

The PISA which means Program for International Student Assessment usually explores the extent to which students in their 15th years that are close to the end of their required education, have achieved the basic competencies and potentials that are crucial for full involvement in the contemporary world. The evaluation focuses on the foundation school subjects of science, reading, and mathematics. Reading was the key subject that is usually been assessed in PISA 2018. The PISA 2018 reading assessment, which is always been delivered on computers in most of the countries and economies that usually participated, incorporated new text and assessment formats made achievable through digital delivery. The major aim of this is to assess reading literacy in the digital environment while retaining the ability to measure trends in reading literacy over the past two decades. Reading literacy as defined according to PISA 2018 is appreciative, using, evaluating, reflecting on and appealing with texts to realize one's goals, to develop one's understanding, and to participate in the society. The study used about six hundred thousand

students: representing about 32million students who are 15year old in 79 participating countries and economies. These sets of students were made to seat the test.

Therefore, the data from the Pisa OECD 2018 assessment was used in this study. The researcher downloaded the already collected data from the Pisa portal, where the 2018 data was selected. Data for 61 selected countries that participated in the 2018 Pisa assessment were incorporated into this study. The researcher made a serious effort towards the careful sorting of the data. Although some data were missing, especially those used or the controlling variables such as the GDP, etc. However, such missing data were excluded and were not used in my analysis. 79 countries were to be used initially but were reduced to 61 because many of the countries do not have complete data for all the variables used. Only 2018 GDP per capital data was downloaded from the World Bank portal.

Students' life satisfaction was measured by the OECD assessments by simply asking the students about the level of their satisfaction with their life (self-reported). Questions such as "how satisfied are you with your life?", "are your ideas close to your expectations?" Students were asked to rank their life satisfaction on a scale of 0 to 10, where 0 is completely satisfied and 10 is not satisfied at all. The researcher only extracted the already collected data measured in their mean (average) for the student's life satisfaction, which afterward was fed into an excel sheet for analysis. The careful transfer was ensured from the Pisa OECD to the excel to avoid an error. The average value of the reported (downloaded) life satisfaction data was only used in this study.

Student's mathematics and science achievements were measured across the countries by the OECD using mathematics and science reading. This was the major indicator of Mathematics and science achievements in 2018. The reported data for science and mathematics achievement was downloaded from OECD Pisa 2018. The careful transfer was made from the data source into the excel sheet to afford conformity. The average value of the reported mathematics and science achievements was also used for the whole countries selected for the analysis and that participated in the 2018 Pisa study.

Controlling variables used in this study include happiness, fear of failures, GDP (per capita), sense of belonging, student-teacher ratio. Although many of these variables were in the micro-level of

student factors, the researcher has used them because they have been reported to be a good moderator of student's life satisfaction effects on academic achievement. Data were also downloaded for all these variables from the OECD except the GDP per capital data which was downloaded from the World Bank. The downloaded data were arranged in an excel sheet for cleaning, after which it was prepared for analysis.

Happiness was measured by OECD along with life satisfaction by simply asking them about their mood and how it has changed over the years. They also asked about those factors that determine their happiness. They were asked to rate their level of happiness on a scale of 0-10 where 0 is satisfied and 10 is not satisfied at all. The student-teacher ratio was measured by the number of students per teacher. The data used was reported in the ratio of such proportion. The average value of the reported sense of belonging data was used and it was measured by simply asking them to agree, strongly agree, disagree, or strongly disagree with the questions that were used to measure their sense of belonging. Such questions include, "*I feel like I belong to school", "I make friends easily at school", and "I feel like I am an outsider or left out of things at school*". Fear of failure was measured by asking them about their feeling when they are failing. This includes, "When I am failing, I worry about what others think of me", "I am afraid that I might not have good talent". To answer these questions they were asked to choose either, "agree", "strongly agree" or "disagree", "strongly disagree".

Series of multivariate, bivariate, and univariate analyses were included in this study. The univariate analysis includes descriptive statistics which was used to measure key findings to describe the data. Bivariate analysis using cross-tabulations and Chi-square tests was used to identify significant variations in the findings while the correlation was done to identify the associations between the dependent and independent variables. Furthermore, multivariate analysis was performed to test the study research questions. Specifically, multiple linear regressions. The study employed software such as SPSS, and Excel.

4.0. Results and Discussion

4.1. Result

The descriptive data are presented below. The table I below shows the number of total observation in the sample (N = 61) of all the control variables, the range, sum, mean, and the standard deviation for student-teacher ratio (19, 763, 12.51, 4.190), Fear of failure(1, -4, -.0.6, .195), sense of belonging(1, -7, -.11, .179), happiness(24, 5533, 90.70, 4.511), and GDP(per capita) (114031, 1513372, 24809.37, 23993.229)respectively were also suggested by the table. The average(mean) of 24, 809 of the total observation in the GDP per capita data was involved in this analysis which makes it the highest value while fear of failure has the lowest average value(-.06). In the same way, Most of the observation are widely spread out in the GDP per capita data (S.D=23993.229) while the observation in the sense of belonging data (S.D= 179) are much closely spread out around the mean.

Table 1**:** *Descriptive Statistics of the controlling variables*

Variables	N	Range	Sum	Mean	Std. Deviation
Student-teacher ratio	61	19	763	12.51	4.190
Fear Of Failure	61	1	-4	-.06	.195
Sense of belonging	61	1	-7	-.11	.179
Happiness	61	24	5533	90.70	4.511
GDP(per capital)	61	114031	151337 2	24809.3 7	23993.229
Valid N (listwise)	61				

To test the first research question, I calculated a bivariate correlation among the study (dependent and independent) variables (see table II), life satisfaction was found to be negatively correlated with mathematics achievement, although it was significant at p-value equals .001 and science

achievements also negatively correlated with life satisfaction but significant at the p-value equals .000.

Table II: Correlations between average student's life satisfaction and mathematics and science

S/N	Variables	Mean	S.D	1	2	3
1	Student's life satisfaction	7.24	.612		-.446**(.000)	-.415**(.001)
2	Math's performance	452.87	56.391			.946**(.000)
3	Science performance	448.66	53.425			

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

To test the second research question, a multiple regression was employed with the academic achievements in mathematics and science as the criterion and life satisfaction, happiness, fear of failure, sense of belonging, student-teacher ratio and GDP(per capital) as the predictor variables. A result of this analysis is presented in table III. The model as a whole was significant, F (7.085), F (1.547) at p-value = .000 & p- value= .001 respectively for mathematics and science as well as for the Adj R^2 (.378), (4.785).Student's life satisfaction (β= -.311, t= 2.225, p =.030), (β= -.277, t= -1.835, p =.072), was found to significantly related to achievement in mathematics but not significantly related to science achievement. Student-teacher ratio (β= -.363, t= -3.344, p =.002), (β= -.248, t= -2.113, p =.039), was significantly related to both academic achievement in mathematics and sciences. fear of failure(β= -.009, t= -.066, p=.948), (β= .001, t= .004, p= .997) was not at all related to achievement in mathematics and science, as well as sense of belongings (β=.123, t= 1.126, p=.265), (β= .061, t= .518, p=.606) and happiness (β=.068, t= .639, p=.525), (β=.027, t= .235, p=.815). GDP (per capital) (β=.240, t= 2.019, p =.049), (β=.292, t= 2.275, p = .027) was in fact a significant individual predictor of mathematics and science academic achievement.

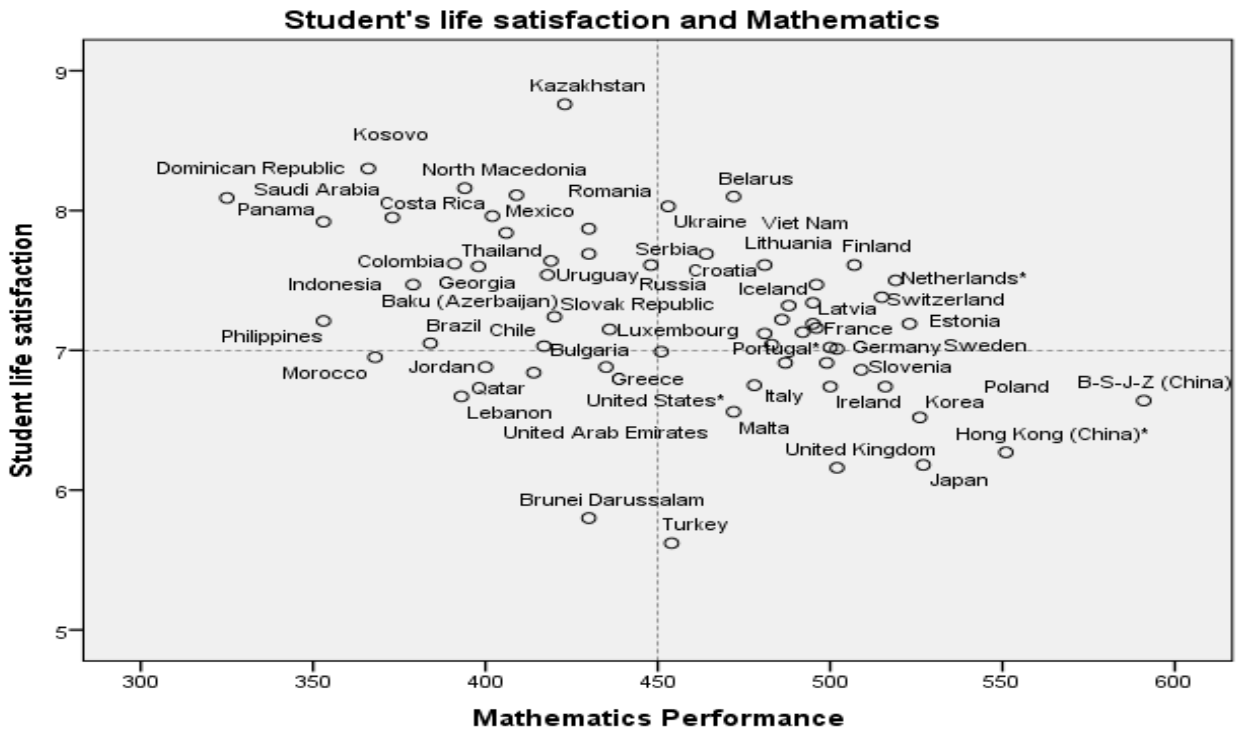
Table III: regression analysis on math's and science achievements and the controlling measures

Variables	Math's Performance			Science Performance		
	β	T	p-value	β	T	p-value
Student's life satisfaction	-.311	-2.225	.030	-.277	-1.835	.072
Student-teacher ratio	-.363	-3.344**	.002	-.248	-2.113	.039
Fear Of Failure	-.009	-.066	.948	.001	.004	.997
Sense of belonging	.123	1.126	.265	.061	.518	.606
Happiness	.068	.639	.525	.027	.235	.815
GDP(per capital)	.240	2.019	.049	.292	2.275	.027
F(7.085), F(1.547)			.000			.001.
Adj R^2 (.378), (4.785).						

p<0.05*, p<0.01, R^2(**.440), (.347).

Figure 1 reports the variations in the relationship between average life satisfaction and Mathematics and Science academic achievements of 15-year-old students across the selected 61 countries to answer the third research question. A significant variation was found among the countries in their life satisfaction and academic achievement in mathematics and science. Most countries have a significant positive relationship between life satisfaction and academic achievement in Mathematics and sciences (Belarus, Vietnam, Croatia, and Finland, etc.), whereas some other countries (Hong Kong, UK, Korea, and Ireland, etc.) have a negative relationship. One interesting thing is that majority of the countries with their life satisfaction highly correlated with their academic achievement maintained it in the two plots for achievement in mathematics and science subjects. However, the plots showed an overall negative correlation in the relationship between average life satisfaction and average academic achievements in sciences and mathematics of 15-year-old students across the selected countries at the macro-country level context.

Figure 1: *relationship between average life satisfaction and academic achievement in Mathematics and Science across the 61 selected countries.*


Student's life satisfaction and Mathematics
Student life satisfaction
Mathematics Performance
9
8
7
6
5
300
350
400
450
500
550
600
Kazakhstan
Kosovo
Dominican Republic
North Macedonia
Saudi Arabia
Romania
Belarus
Panama
Costa Rica
Mexico
Ukraine
Viet Nam
Thailand
Lithuania
Finland
Serbia
Colombia
Croatia
Uruguay
Netherlands*
Indonesia
Georgia
Russia
Iceland
Baku (Azerbaijan)
Slovak Republic
Switzerland
Latvia
Brazil
Chile
Luxembourg
France
Estonia
Philippines
Portugal*
Germany
Sweden
Bulgaria
Morocco
Jordan
Slovenia
Greece
Poland
B-S-J-Z (China)
Qatar
Italy
United States*
Ireland
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Lebanon
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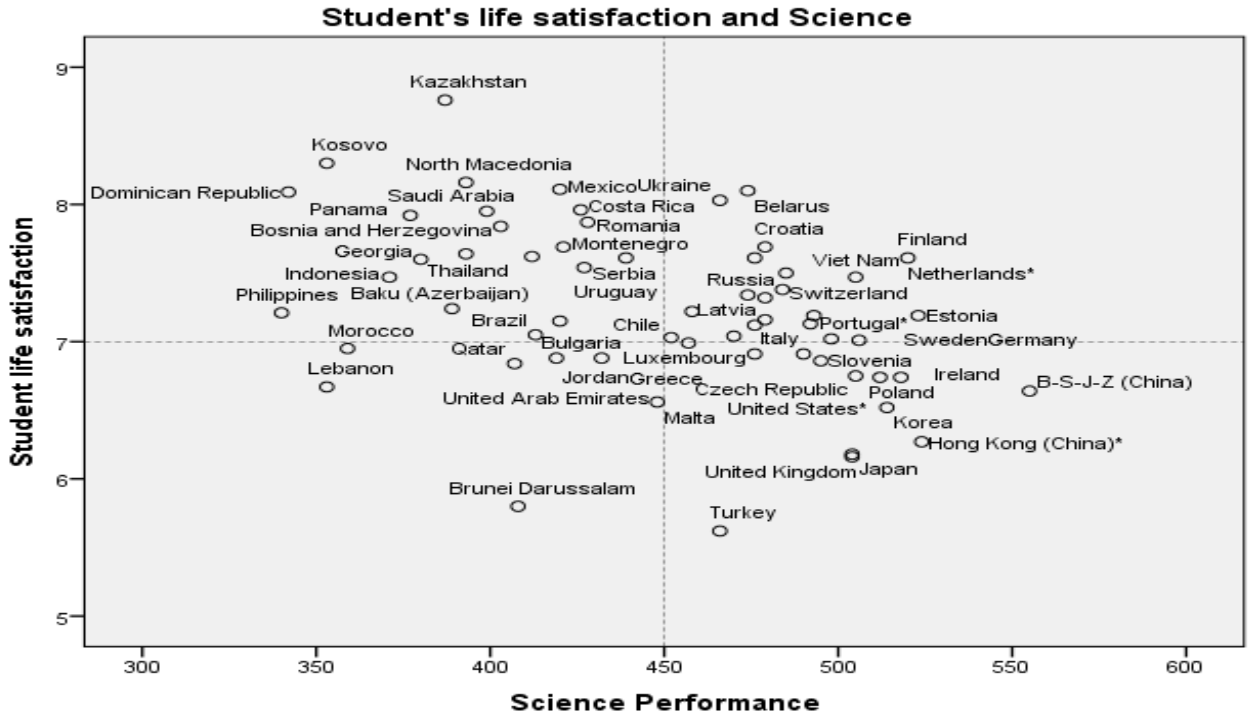
Hong Kong (China)*
United Arab Emirates
United Kingdom
Japan
Brunei Darussalam
Turkey


Student's life satisfaction and Science
Student life satisfaction
Science Performance
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8
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300
350
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500
550
600
Kazakhstan
Kosovo
North Macedonia
Dominican Republic
Mexico
Ukraine
Saudi Arabia
Belarus
Panama
Costa Rica
Bosnia and Herzegovina
Romania
Croatia
Finland
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Montenegro
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Indonesia
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B-S-J-Z (China)
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4.2. Discussion

These findings contribute to the discussion of student's life satisfaction in the context of education which has only gained particular attention recently (Suldo et al., 2006; Ferguson et al., 2011). These findings are potentially the answer to the rigorous school environments in the modern competitive society. This is because studies exploring student's life satisfaction in relation or as a predictor of achievement in mathematics and sciences are still scanty (Suldo et al., 2006).

According to the first research question (see above). The finding from the study suggests a negative relationship between life satisfaction and academic achievement in mathematics and science. This result answered the research question: the result suggest that, if students' life satisfaction goes up, it is expected that academic achievement in mathematics and science would go down, in the same vein, if life satisfaction is lower, then achievement in mathematics and sciences are also expected to go up, hence, life satisfaction does not have a positive influence on student's academic performance.

Although the result of the finding is surprising, yet the finding has some critical implications and it is in line with other scholarly studies. For instance, a study by Çeçen (2008) does find that participation in sports science increases students' life satisfaction but does not find a relationship between life satisfaction and academic performance of such students. The study suggests that student's academic achievement may not necessarily be related to their life satisfaction because life satisfaction could mean different things to different students and it could also vary across cultures. Also, some other scholars have corroborated these findings and their study suggest that students life satisfaction may not necessarily be responsible for their high academic performance as many other factors could influence academic achievement (Diener, Suh, Lucas, & Smith, (1999); Rubin, Bommer, & Baldwin, (2002).

Conversely, some other studies have argued that life satisfaction is associated with high academic achievement. For instance, Ana et al. (2019) in their study, found a correlation between academic achievements and life satisfaction. Their study suggests that students who are exposed to violence have very low life satisfaction and in turn was related to their academic performance. Joseph et

al., (2005) in their study, also found that a strong relationship exists between life satisfaction and academic performance than was university satisfaction. Also, high life satisfaction is associated with academic advantages that cannot be seen among students with average or low satisfaction levels. Specifically, the most satisfied students earned the highest scores in their academics (Susan, (2017)).

The second research question goes on to examine how other variables would moderate the effects of life satisfaction on the academic achievement of students in mathematics and science. It examined specifically, whether some other variables like the GDP, student-teacher ratio, happiness, and sense of belongings and fear of failure would moderate the relationship between life satisfaction and achievement in mathematics and science. It also explores the predicting effects of those controlling variables and sees whether they are better predictors of academic achievement in mathematics and science. Asking the research questions to know what the effect of all the above-mentioned variables would have on the relationship between average life satisfaction and academic achievement in mathematics and science of a 15-year-old student.

Student's life satisfaction was found to be significantly related to achievement in mathematics but not significantly related to science achievement. The student-teacher ratio was also significantly related to both academic achievements in mathematics and sciences. Also, fear of failure was not at all related to achievement in mathematics and science, as well as a sense of belongings and happiness, finally, GDP per capita was found to be a significant individual predictor of mathematics and science academic achievement.

We expected life satisfaction to be a good predictor of both mathematics and science, however, the reverse was the case in this study, as life satisfaction only significantly relates to mathematics achievement but not science achievement. Yet these findings are still in line with some studies that have supported these arguments and this will be discussed below (Melissa Malik et al., (2013)) and Bradley and Corwyn, 2004).

Firstly, while the average life satisfaction of 15 years old students was significantly related to their academic achievement in mathematics, it was not significantly related to achievement in the

sciences. There may be some other factors that enhance academic achievement generally and in sciences specifically among these students rather than life satisfaction alone and because their responses were used at the macro-country level. Even though Life satisfaction may be desirable and important to students, it may mean different things for these students which may not necessarily influence their achievement in mathematics and sciences (Lewis et al., 2011; Diener, 1985). Another reason may be that because many of the students used in this study reported moderate life satisfaction which may not predict their academic achievement generally. Studies have shown that students with higher life satisfaction perform better academically compared to those who have moderate or low life satisfaction(Gilman and Huebner, 2006)& (Susan, 2017).

Although there may be some impact of life satisfaction which are critical on student's academic achievement, however, individual students tend to attach different meanings to life and what really makes them happy and these sense of feelings may not necessarily be responsible for their academic achievements (Diener et al. (1985)). This study also uses macro country-level data adapted from the 2018 Pisa data for analysis which may also be responsible for the result of the study. This simply means that using the macro-level data to generalize or moderates by micro-level variables might not completely guarantee the reliability of the resulting output and this calls for a study that will examine the micro-level data to assess this gap.

Happiness is a subjective wellbeing outcome that has been seen as a significant predictor of academic output because it is related to a positive sense of feelings which could promote life satisfaction and therefore enhances higher academic performance (Diener, 2000). However, our result does not found any significant relationship between happiness and academic achievement in mathematics and science. This could be because happiness is subjective and it is driven by an event that is subject to changes, that is, a student who is very happy now may not be happy anymore in the next few hours. Many other things apart from happiness may be strong enough to influence academic achievement (Kalantari, 2003).

The student-teacher ratio was found to be a significant predictor of both mathematics and science achievement. This is not surprising, because studies on student achievement have also reported the same thing and so we expected that both mathematics and science achievement should be

significantly predicted by student-teacher ratio. This is because the number of students per teacher is generally associated with class size and it is mainly believed that smaller classes provide a better teaching and learning environment. On the other hand, it is believed that when the number of students in a class exceeds the number that a teacher would be able to teach effectively, such teacher tends to lose efficiency and thereby impacting negatively on the classroom instruction which eventually hindered the students from performing well (Goodenow & Grady, 1993). Studies have shown that a small class size promotes good interaction between students and teachers which could help them boost their academic achievement (Graue, Rauscher& Sherfinski, 2009).

This study did not find a fear of failure to be a significant predictor of achievement in mathematics and science. This result is right based on the general view of people on one hand. On the other hand, studies have shown that fear of failure does not have a significant relationship with academic achievement. For instance, Adams and Biddle, (1970), posited in their study that when students develop fear towards a subject, they may fail the subject due to the negative feeling. Other studies also suggest that fear of failure could affect student retention and hinder them from remembering course contents (Burns, 1984; Dunkin & Biddle 1974; Stodolsky, 1988; La Paro et al. 2004).

The sense of belongings was a negative predictor of academic achievement in mathematics and sciences. This is surprising because studies have suggested that a sense of belonging helps learners to learn and acquired a high academic performance. For instance, Maslow's (1962) hierarchy of needs shows that until students have a sense of belonging in class no form of learning will take place. Osterman, (2000) posited that because many organizational policies and practices prevent the development of a sense of belongings among students, it has affected their academic performance adversely. Furthermore, Finn, (1989) suggested that students who are isolated because they feel marginalized in the school and classroom, do not complete their studies before they drop-out. This is because they do not have good grades which could allow them to proceed to the next level.

The GDP per capita measured in this study was found to be a significant predictor of academic achievement in both mathematics and science. This finding shows that an increase in spending on education would significantly and positively impact the student academic achievement in science

and mathematics which helped us answered the second research question that seeks to see if GDP is a good predictor of science and mathematics achievement. This result is not surprising because it is in line with the general believes that education spending is a significant predictor of academic achievement. Although some studies have reported that there is no significant relationship between government spending and academic achievement. For instance, Hanushek, (2005) examined per-pupil expenditures and students' academic achievement over three decades, the result shows that while more than half of government expenditure was spent on education, yet student's performances remain the same. Illinois elementary school test data also suggest a negative correlation between per-pupil education spending and student academic achievement (Sharp, 1993). The study suggests that education spending may not necessarily be strong enough to impact significantly student's academic achievement. However, studies that have reported a significant relationship between government spending on education and student academic achievement are far more than those who have reported the formal (Robert et al, 1987: Ronald et al. 1991).

Going by this wider literature view that GDP is a good predictor of academic achievement. Studies have suggested that education expenditure is related to infrastructural development. Infrastructural development would allow students to learn in a good atmosphere and a friendly environment. Other scholarly findings that have also argued this finding that education expenditure is a significant predictor include the (Arrington, 2010) and (Zimmerman & Dibenedetto, 2008) their studies show that education expenditure improve student's performances at the public schools level.

To answer the third question in this study, a scatter plot diagram was drawn to show how the relationship between life satisfaction and academic achievement in mathematics and science varies across the 2018 61 Pisa selected countries. The result of the study revealed interesting findings with some implications. The result suggests that, across countries, there is an unassuming, negative relationship between average performance in science and the average life satisfaction of 15-year-old students (Figure I). In other words, students in low-achieving countries tend to report higher levels of life satisfaction than students in high-achieving countries. It should not be surprising to see some countries deviating from the trends, for instance, some countries stand out from this

general pattern. In Finland, the Netherlands, and Switzerland, for example, students perform above average in science and were more likely to report that they are satisfied with their life.

Students in the countries in the upper left quadrant of Figure I, notably those in Kosovo, Panama, Romania, the Dominican Republic, Kazakhstan, and Montenegro, reported relatively high life satisfaction, but the countries score lower than average in science and mathematics. Countries and economies in East Asia, including Hong Kong (China), Korea, and B-S-J-Z (China), achieve much better than the countries average, but students in these countries and economies reported fairly low satisfaction with life.

These findings should therefore not be taken as the final evidence and relationship between students' life satisfaction and achievement in mathematics and science. This is because the result reflects the impacts of cultural differences across the countries and while the results may not be able to distinguish between cultural factors that may influence student's satisfaction with life and other school factors which also have significant impacts on student's life satisfaction.

5.0. Limitations

The macro-level analysis of this present study means that it cannot be assured which reasons are responsible for the negative prediction of average mathematics and science academic achievement of 15-year-old students by their average life satisfaction in the regression analysis. Also, the other factors that might be responsible for the negative relationship across the 61 countries could not be explained in this study.

The data used in this present study is the secondary data from Pisa 2018, specifically, this study used the average (mean) value of the life satisfaction and the academic achievement in mathematics and sciences at the macro- country level to generalize micro- individual student's level. This practice is a limitation that must be acknowledged in this study. Pisa data is also a self-reported survey data and must not be taken as the final evidence for generalization.

6.0 Conclusion and Future direction

Finally, the present study tried to explore the relationship between average life satisfaction and academic achievement of 15year old students across the 61 selected 2018 Pisa countries. So far as I know, no study has examined the effect of average life satisfaction on the academic achievement in mathematics and sciences of 15-year-old students across the selected countries. This study provides a strong indication that life satisfaction may not have significant impacts on the achievement of 15-year-old students in sciences but could influence the achievement in mathematics. Despite the various studies that have argued these findings; this, therefore, provides a platform to understand the relationship between life satisfaction and academic achievement. Although these findings should not be taken as final evidence due to the macro country-level analysis nature of the current study.

However, the study suggests that education spending(GDP) and student to teacher ratio is a key predictor of 15-year-old students' average academic achievement across the selected 2018 Pisa countries whereas life satisfaction may not necessarily have so much effect on this part of student's life. Therefore this study seriously persuades more studies to be done especially using micro-level data to assess students' life satisfaction as it relates to achievement in mathematics and science. Also, researchers should debate and engage in questions about gender roles and family SES.

Also, a negative relationship was observed in the average life satisfaction of students and their academic achievement in science and mathematics across the selected countries, although there were exceptions for some countries. This finding confirms our first findings that found no correlation between academic achievement in mathematics and science and the average student's life satisfaction.

7.0. Practical Policy Implication

This study has some important practical policy implications which must be taking into consideration. First, as seen in the result of this study, life satisfaction alone may not be responsible for students achievement in their academic specifically in science, institution, science education policymakers and other education agencies should ensure that they combine other factors such as

promoting student-teacher relationship in the classroom which could promote student's life satisfaction for better academic performances.

Finally, GDP per capita has been proved to be a good predictor of academic achievement in this study, this suggests that the government should provide more funding in the mathematics and science education sector to promote such country's global competitiveness and infrastructural development.

8.0. References

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