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Gender Gap in Science Achievement for Jordanian Students in PISA2015

Emad G. Ababneh *
Jadara University, JORDAN

Manal M. Abdel Samad
National Center for Human Resources Development, JORDAN

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Abstract: The gender gap in achievement is one of the main challenges that face the educational system in Jordan. Since 1989, educational reform plans have attempted to reduce gender gap in achievement. However, the gender gap in science achievement according to PISA 2015 was higher than that of other participating countries. This study aimed to show the trends, and determine the factors associated with the gender gap in science achievement. The data were obtained from 7267 students, who participated in PISA 2015. Descriptive statistics and multiple regression methods were used, for which the results showed that the gap became wider with the same direction since 2006. In addition to that, the study findings suggested that environmental awareness, and sense of belonging to school are the most important factors associated with gender gap among other personal factors.

Keywords: *Gender gap, PISA 2015, science achievement, test, explained variance.*

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Introduction

Educational policies in different countries focus on achieving equity and equality in access to educational services. Also, Jordan is interested in achieving equity and equality through set of educational policies. These policies include: increase access to basic and secondary public education, increase establishing kindergartens, empower students with special needs, and focusing on the poor and remote areas to reduce gaps in educational achievement (MoE, 2018).

Jordan has implemented a number of educational reform programs since 1989. These programs are: the first educational reform program (1989-1999), and the Educational Reform for Knowledge Economy (ERfKE) for two stages, the first one (2003-2009), and the second phase (2010-2015). However, the achievement of students in science and mathematics has continued to decline since 2007, and the gender gap in science and mathematics achievement continued since the first educational reform program (Ababneh, Abulebdeh & Tweissi, 2017).

In this context, Fergusson and Harwood (1997) mentioned that there is an evidence of the existence of a gender achievement gap in many developed countries, as they mentioned that the statistics show that the performance of females is much better than the performance of males in all stages of schooling in some countries, as females getting best results in school, and then they join the university in large numbers. In Jordan, the statistics showed that the proportion of female students to male students at undergraduate level in 2016 was (106.7%), while the proportion of women in the Jordanian labor force was (13.2%) only (Department of Statistics, 2017).

Jordan is far from achieving gender equality, according to Gender Gap Index for 2015 issued by the World Economic Forum (WEF) Jordan ranked 140th internationally and 14th at the regional level in terms of gender equality. Furthermore, women achievement in 2014 has been declined from (74) to (93). The Program for International Students Assessment in it is six cycle (PISA , 2015) showed that the gender gap in science achievement for students aged 15 years amounted to (39) for the favor of females. Also, it showed that the gender gap in mathematics amounted to (14) points for the favor of females (OECD, 2016). In addition to that, the study of International Trends In Mathematics and Science Study (TIMSS , 2015) for the eighth grade students, showed that the gender gap was significant in science and mathematics achievement for the favor of females, as the gap was (42) in science, and (19) in mathematics (Abu Libdeh ,Tweissi & Ababneh, 2017).

Hammer (2003) revealed that the gap in student achievement is mirror to the variation in school and home life, and he pointed out a combination of factors that contribute to the creation of this variation including the extent of parents'

* **Corresponding author:**
Emad G. Ababneh, Faculty of Educational Science, Jadara University, Irbid, Jordan
Email: imad_ababneh@yahoo.com

engagement in their children 's education, teacher preparation and experience, the quality of school curricula, and the class size. Furthermore, Sahranavard and Hassan (2012) indicated the existence of a number of researches that showed a link between achievement in science and gender, including the research of (Erickson & Farkas , 1991), (Bacharach et al., 2003), and (Preckel et al., 2008), as some of the studies showed that males are better than females in science, such as (Martin,Mullis & Gonzalez, 2000) .

Educational literature refers to many variables vary in it is strength and direction of their relationship to students achievements in various school subjects, as Galdas and Bankston (1997) and Sirin (2005) mentioned that the economic and social factors are one of the strongest predictors of achievements, Rivkin, Hanushek & Kain (2005), as well as Swinton, Thomas, Benjamin & Howard (2010) indicated that the teacher characteristics, which include teacher educational and academic preparation, and training programs that he had received, and his years of experience are variables related to the students achievement. Moreover, the study conducted by Akyuz (2014) showed that TIMSS 2011 mathematics scores of eighth-grade students were positively affected by self-confidence in mathematics, and home educational resources. In addition to that, the study conducted by Quintano, Costellano & Longobardi (2012) revealed that the effect of the economic and social status of the student in Italian students achievement in PISA was little, although it was statistically significant, and that the time spent by students in solving homework, enjoy science, and awareness of environmental issues were the strongest predictors of student achievement in science. In a study conducted by Chang (2008), which was aimed to examine the trends of differences in achievement, self-esteem in science ability, and valuing science based on the TIMSS 1999 and TIMSS 2003 data, the results of the analysis showed that gender differences in achievement have become less over time, and that differences in gender achievement at low levels of performance have been favorable for females. In high-performance levels, male performance is better than female performance, the results also showed that gender differences in self-esteem in science ability, and valuing science were not in line with differences in achievement. In addition to that, the study conducted by Yip, Chiu & Ho (2004) which was utilized PISA 2003 Hong Kong data showed that no statistically significant differences in science achievement by gender. Indeed, the achievement of males is higher than the achievement of females in levels of percentiles that exceed or equal to 75.

A study conducted by Steinmayr and Spinath (2009), which that aimed to investigate the differences in achievement between male and female, according to some traits associated with a student's personality and student's motivation, as the students 'grades in mathematics and their point averages were used. Also, the five major personality factors of the students were measured as well as their intelligence and motivation. The results showed that the females' scores were better than the males' scores after controlling the intelligence variable. Furthermore, Camminatiello, Palette & Speziale (2012) showed that the school-based management, and the standards-based accountability have a significant effect on student achievement based on the analysis conducted for (57) participated in PISA 2006. Mohammadpour , Kalantarrashidi & shekarchizadeh (2015) carried out a study aimed to investigate the variation in science achievement as function to the factors related to the student, school, and the country participated in TIMSS 2007. The study used the data for (134123) eighth grade students enrolled in (4511) schools in (29) countries, and it used a multilevel technique. The results showed that the science achievement is influenced by factors that are associated to students more than the factors that are associated to school or country. Moreover, the results showed that the student attains higher scores when he or she has confidence in science, his or her families economic and social status is high, and when students spend less time in non-academic activities and do homework. In addition to that, the school achievement is higher, when the school has a positive climate, located in the city, has no problems with students' presence , and do not suffer from lack of resources for science education .

Roman and Goiricelaya (2012) found that differences in culture and social norms across countries and across regions within the same country are crucial determinants in understanding gender differences in PISA 2009 test scores: girls perform relatively better in both math and reading in societies where gender equality is enhanced, and the effect varies over the distribution of scores. In addition to that, they found substantial evidence for the intergenerational transmission of gender role attitude, especially from mothers to daughters, as the performance of girls – not that of boys, is better in families where the mother works outside home.

The modern life cannot be envisioned without science. Science and technology have changed the face of humanity in communications, medicine, transport, industry, pharmacy, and also in the destructive military industries. Science has a clear location in the cultural heritage of humanity, as it is part of human history (Espinose, 2005). Consequently, Progress in any society depends on it is interest in science. Therefore, improving science instructional strategies, and achieving equity and equality in science education is the key to strength scientific and technological capabilities of Jordan in the future.

In this context, the Sustainable Development Goals (SDG) adopted by the United Nations Educational, Scientific and Cultural Organization (UNESCO), specifically the fourth objective is focusing on the principle of equity in education, as it states "ensure inclusive and equitable quality education and promote lifelong opportunities for all" and this objective is linked to the principle of "Gender equality inextricably linked to the right to education for all" (UNESCO, 2016). Jordan sets the necessary plans to achieve and harmonize educational policies with the educational global goals, so the

researchers believe on the importance of utilizing PISA 2015 database to inform the educational policies in terms of achieving equity in science education.

The purpose of this study is to explore the indices associated with gender gap in science achievement. Different indices at the student and school level are important for investigation. The school level indices determined as school location, class size, number of available computers per student at modal grade, educational leadership, instructional leadership, professional development, teachers participation, shortage of educational material, index proportion of science teachers with ISCED level 5A and a major in science, index science specific resources Student behavior hindering learning, teacher behavior hindering learning. The student- level indices were highest education of parents, home educational resources, ICT resources, and index of economic, social and cultural status, subjective well-being: sense of belonging to School, environmental awareness, inquiry-based science teaching and learning practices, teacher support in science, and classes of the student's choice. These indices were investigated using multiple regression analysis using the Program for International Students Assessment (PISA) 2015 database.

What is the Program for International Students Assessment (PISA)?

The Program for International Students Assessment (PISA) aims to determine to what extent the 15-years students acquiring the fundamental skills and knowledge in mathematics, science and Reading literacy that help them to participate actively in the community, as the study supervised by the Organization for Economic Co-operation and Development: OECD.

The study was conducted for the first time in 2000, as the focus of the study was on reading, and it was implemented for the second time in 2003, where the focus was on mathematics, and the third cycle was in 2006, where the focus was on science, so as the study in every cycle focus periodically in a specific domain. The length of the study cycle is three years, and the focus of PISA2015 was on Science Literacy. Jordan participated for the first time in this study in 2006, and continued participation in the consecutive cycles: 2009, 2012, and 2015.

It is worthy to note that the study offers other options for participants' countries such as Financial Literacy, and Global Competencies. The study also shifted since 2015 to Computer Based Assessment (CBA), as Paper-Based Assessment (PBA) considered an option for some countries, where, Jordan chose to participate as PBA- Country since 2006.

The study tools consisted of two main components: tests and questionnaires. The test items organized in a certain way in (30) booklets, as each booklet includes four clusters distributed in a certain format that cover two or three domains, and students sit for two hours to perform the test. In the 2015 cycle, the study included a questionnaire for the student, as the student provides information about the economic and social situation surrounding him, and on his learning style and strategies, in addition to that each school principal should answer the items of the school questionnaire, which includes demographic information about the school as well as information about educational climate.

Science Literacy

The process of scientific literacy assessment is particularly important in PISA study, because the acquisition of scientific and technological knowledge in a society is an indicator of the ability of individuals to participate actively in it, so this kind of knowledge has become a priority for the countries that wish to prepare their societies for life, and in improving their standard of living.

Scientific and technological issues are a real challenge for individuals at the personal, national, and global levels. This motivates officials at the national level to determine the ability of individuals to act when addressing and responding to these issues, especially when this is considered a preliminary indicator by which we can predict the way of how individuals will respond in the future against life situations related to science and technologies, so the focus in the science literacy is on the extent to which students possess the main competencies in this domain. The scientific Literacy assessment in PISA interests in assessing to what extent students explain phenomena scientifically, evaluate and design scientific survey, interpret data and evidence scientifically.

Participating Countries in PISA2015

The Program for International Student Assessment is a standardized international assessment that is developed by the participating countries and the international expertise bodies that technically supervise the study, as this assessment administered to students at the age of 15 years. The number of countries participating in the program is (43) countries during the first cycle (2000), and it was increased to (41) countries in the second cycle (2003) , the number of countries was (56) countries in 2006, and (65) countries in 2009 and 2012, whereas it was (72) countries in 2015.

The content of this assessment covered the areas of mathematics, science, and reading. The Assessment does not depend heavily on the students' mastery of the school curriculum, but depends on the knowledge and skills that students need at age (15) year, as it focuses on understanding the principles, mastering processes, and employing the principles and process in different situations in each of the areas covered by the assessment.

For Jordan, this assessment is classified as a paper-based test. The duration of this test is two hours per student. The test items are a mixture of multiple choice items and open-ended items, where the total number of items in 2015 was

(271), and different booklets with different questions administered to a different group of students. In addition to that, the students answer (30) minutes- questionnaire includes items on the students, student's home, and the student's learning style. In addition to that, a school questionnaire is also distributed to be filled by the principals, as it needs to (20) minutes. It includes items on issues related to the school.

Research questions

The study's main questions are:

1-What are the magnitude and trend of the gap in science achievement between males and females over time?

2- What are the main factors associated with the student and the school that contribute to the gap in science achievement between males and females in PISA2015?

Method

This study is an exploratory study that utilizes the Program for International Students Assessment (PISA) 2015 database. Different variables at student and school level were explored through multiple regression technique to identify variables associated with gender gap in science achievement.

Data source

This study utilizes the Program for International Students Assessment (PISA) 2015 database in order to answer research questions 1 and 2, whereas to answer research question 1 the database for the cycles 2006, 2009, 2012 and 2015 were utilized. PISA uses a two-stage stratified random sampling design. At the first stage, schools were selected at random, and at the second stage 35 students selected at random from each school.

In the Program for International Students Assessment (PISA) 2015, the data collected through the school questionnaire, the student's questionnaire and the science test in the international database. The data were downloaded from the site of the Organization for Economic Co-operation and Development: OECD (OECD, 2016).

Sample

The Jordan sample size is (7267) students enrolled in (250) schools out of which (2464) are female students. Table (1) shows the distribution of the schools and students by gender.

Table 1: Number and Percentages of Schools and Students Participated in PISA2015 by Gender

School †gender	Number of School	%	Number of Students	%
Male	111	44.4	3144	43.3
Female	78	31.2	2464	33.9

The distribution of the sample according to the school location is shown in the table (2).

Table 2: Number of Schools and Students Participated in PISA2015 by School Location

School location	Number of schools	%	Number of Students	%
Urban	193	77.2	5937	81.7
Rural	57	22.8	1330	18.3

Study variables

The dependent variable

The dependent variable in this study is the science achievement scores for students participated in PISA2015 which were reported on a common scale with a mean (500) and standard deviation (100). Indeed, the study has a specific design by rotating the items over the (30) booklets developed in PISA2015 in which not all students received the same items. Therefore the Item Response Theory (IRT) was employed to generate a distribution of plausible values for each student, where (10) plausible values estimated for each student in this cycle. Consequently, the ten plausible values were used in the analysis as a dependent variable through utilizing (IDB Analyzer) software (IEA, 2017).

Independent variables

For the purpose of this study, the indices derived by PISA are used as independent variables, where all indices derived based on the items from the student's questionnaire and school questionnaire were selected for further investigations. The indices, then subject to two steps of analyses which are:

Testing the significance of the correlation coefficient between science achievement scores and the indices, where the index is reserved if the correlation coefficient is statistically significant at (α=0.05).

† 61 schools are Coed schools

Table 3 and Table 4 show the correlation coefficients between the schools and students indices and the science achievement.

Table 3: Correlation Coefficient between Science Scores and the PISA2015 School's Indices

School index	Correlation coefficient
Class Size	*0.11
Number of available computers per student at modal grade	0.04
Educational leadership (WLE)	-0.01
Instructional leadership (WLE)	0.03
Professional development (WLE)	-0.01
Teachers participation (WLE)	-*0.09
Teacher participation (Sum)	*0.13
Shortage of educational material (WLE)	-0.10
Index proportion of science teachers with ISCED level 5A and a major in science	-0.06
Index science specific resources (Sum)	*0.15
Student behavior hindering learning (WLE)	-*0.16
Teacher behavior hindering learning (WLE)	-0.04

*: significant at (α=0.05)

Table 4: Correlation Coefficients between Science Scores and the PISA2015 Student's Indices

Student index	Correlation coefficient
Highest Education of parents (ISCED)	*0.25
Home educational resources (WLE)	*0.27
ICT Resources (WLE)	*0.25
Index of economic, social and cultural status (WLE)	*0.31
Subjective well-being: Sense of Belonging to School (WLE)	*0.23
Environmental Awareness (WLE)	*0.43
Inquiry-based science teaching and learning practices (WLE)	*-0.09
Teacher support in science classes of students choice (WLE)	*0.01

Testing the statistical differences between males and females by the selected indices were examined in step 1, as these indices included in the regression models.

The results of the above two steps are reported in the appendix (1). The results presented in the appendix indicated that the differences in science scores means by home educational resources, ICT resources, sense of belonging to school, environmental awareness, and class size were statistically significant at (α=0.05).

Statistical analysis

The analysis method is articulated as follows:

1- To answer research question 1, T-test for independent samples were used to test the differences between the means of males and females' science achievement by years. In addition to that, line- chart was drawn to clearly show the trend of the gap between males and females.
2- To answer research question 2, hierarchical regression analysis was used in a way that revealed the contribution of a certain index in interpreting the science achievement variation between male and female students. The following variables and/or index were interred to the regression analysis as control variables: student gender, school location, index of economics' social, and cultural status, and highest education of parents.

Results

The gender gap in science achievement was continued over the years 2006, 2009, 2012, and 2015, as it was (28) in 2006 increased to (39) in 2015, the differences between achievements means for female and male students were significant at the level of significance (α=0.05) in favor of female students in all PISA cycles. Moreover, the gender gap in science achievement was the highest among all participating countries in PISA 2015 (OECD, 2016). Table (5) shows the gap in terms of it is the magnitude and direction between male and female in all cycles.

Table 5: Science Achievement of Students by Gender for PISA 2006, 2009, 2012, 2015

Year	Student gender	Mean	The standard error of the mean	Gender Gap
2006	Male	408	4.5	-28*

	Female	436	3.3	
2009	Male	398	5.5	-35*
	Female	433	4.2	
2012	Male	388	5.4	-42*
	Female	430	2.9	
2015	Male	389	3.9	-39*
	Female	428	3.6	

*: significant at (α=0.05)

Figure 1 shows the trend of the gender gap in science achievement for PISA 2006, 2009, 2012, and 2015. The maximum gap was in 2012 and the minimum gap was in 2006.

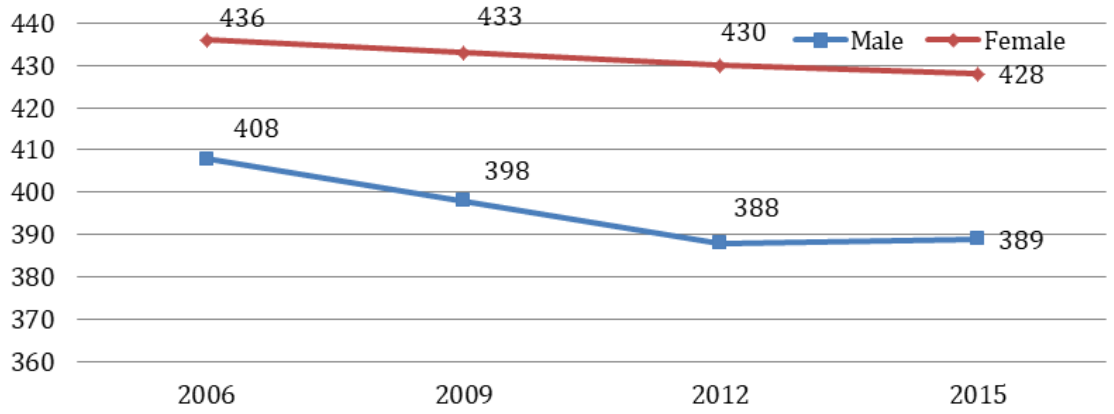

Figure 1: The Trend of Gender Gap in Science Achievement During 2006-2015

Simple regression analysis was performed to test the significant differences between males and females (Model 1), as the results showed that the (39) score difference is statistically significant at (α=0.05). Table (6) showed the simple regression output.

Table 6: Coefficients and Amount of Explained Variance for Model 1.

Variable	Unstandardized coefficient		Standardized coefficient		T
	B	B.se	Beta	Beta.se	
Constant	389	3.91	-	-	99.52
Student gender	39	5.38	0.23	0.03	7.26
R^2			**0.05**		

In the second step (Model 2), the science scores not only controlled by gender but also by the location of the school, as the second multiple regression model showed that location has a significant regression coefficient where it is (T) value equal to (6.08). Consequently, the determination coefficient increased from (5%) to (10%), and the difference between female mean achievement and male mean achievement reduced to (38) scores. Table (7) shows the regression output for the second model.

Table 7: Coefficients and Amount of Explained Variance for Model 2.

Variable	Unstandardized coefficient		Standardized coefficient		T
	B	B. Se	Beta	Beta. Se	
Constant	356	6.52	-	-	54.56
Student gender	38	5.15	0.22	0.03	7.31
School location	43	7.13	0.21	0.03	6.08
R^2			**0.10**		

In the third model (Model 3), index of economic, social-cultural status (SCS), and the highest education of parents were entered to multiple regression, as the results revealed that student gender, school location, and index of social, economic and cultural status are significant at (α=0.05) whereas, it appeared that the highest education of parent isn't significant at (α=0.05). Furthermore, it was shown that the difference between female mean achievement and male mean achievement is decreased from (38) to (37), and the change of (R^2) is (7%). Table (8) shows the result of the third multiple regression.

Table 8: Coefficients and Amount of Explained Variance for Model 3.

Variable	Unstandardized coefficient		standardized coefficient		T
	B	B.se	Beta	Beta.se	
Constant	373	9.28	-	-	40.22
Student gender	37	4.54	0.22	0.03	8.18
School location	33	6.11	0.17	0.03	5.45
Index of economic, social and cultural status(SCS)	22	2.7	0.27	0.03	8.31
Highest Education of parents	0.45	1.52	0.01	0.03	0.3
R^2			**0.17**		

In order to examine gender difference in science achievement after controlling over the remaining set of indices which are: a sense of belonging to School, class size, environmental awareness, home educational resources, and ICT resources. The result indicated that all indices are significant at (α=0.05) except class size, and ICT resources indices. Consequently, the change of (R^2) is increased from (17%) to (29%). Table (9) shows the result of the complete multiple regression model.

Table 9: Coefficients and Amount of Explained Variance for Model 4.

Variable	Unstandardized coefficient		Standardized coefficient		T
	B	B.se	Beta	Beta.se	
Constant	364	10.54	-	-	34.57
Student gender	18	4.21	0.11	0.03	4.27
School location	24	6.35	0.12	0.03	3.7
Index of economic, social and cultural status(SCS)	11	2.85	0.13	0.03	3.74
Highest Education of parents	4	1.43	0.03	0.03	2.54
Subjective well-being: Sense of Belonging to School	9	1.54	0.11	0.02	5.78
Class Size	0.22	0.26	0.03	0.03	0.85
Environmental Awareness	19	1.01	0.32	0.01	18.73
Home educational resources	4	1.18	0.06	0.02	3.05
ICT Resources	-0.6	1.5	-0.01	0.02	-0.4
R^2			**0.29**		

Conclusions

Gender gap in science achievement is a big challenge for Jordan's education system. Since 2006, the trend of the gap revealed that, the improvements did not occur over the time. During the past 15 years, two large education reform programs were implemented to address issues related to curricula, teachers, early childhood education, and school buildings. Indeed, marginal effects were recorded in terms of the education quality as an outcome of these education reforms, and the gender gap in science achievement remained inherent to the education system. The persistence of the gender gap in achievement since 20006, according to PISA data, raises serious questions about the effectiveness of the educational polices, which focused partly on reducing the gap. There is no doubt that several reasons have led to the survival of the gender gap in science achievement, and this requires a profound rethinking of educational policies, so that the gender gap issues are taken into account in the development of curricula and teacher training. This finding is in line with Fergusson and Harwood (1997) study, where they mentioned that, there are an evidences of a gender gap in achievement in many developed countries, as they reported that the statistics show that the performance of females is much better than the performance of males in all stages of schooling in some countries, where females getting the best results in school, and then they join the universities in large numbers. Saheranavard and Hassan (2013) indicated that, number of researches showed a link between achievement in science and gender, including the research of (Erickson & Farkas, 1991), (Bacharach et al., 2003), and (Preckel et al., 2008). Some of the studies showed that males are better than females in science, such as the study of (Martin, Mullis & Gonzalez, 2000).

As the study findings indicated, the factors that are associated with gender gap in science achievement are: school location, environmental awareness, ESCS, sense of belonging, home educational resources, and the highest educational parents. Obviously, all of these factors are related to the student except the school location. These results are consistence with the results of some studies such as the study conducted by (Quintana, Costellano & Longobardi, 2012) and the study conducted by (Akyuz, 2014). However, the results of the current study differ with the results of other studies, for example the study findings showed that, the class size has no statistically significant effect on the science achievement gap, this result wasn't in line with (Hammar, 2003) findings. The reason might be the difference in social, cultural, and other contextual factors between various contexts.

The results of the current study showed that some variables related to gender gap in science achievement are demographic variables such as highest educational level for parents, home educational resources, and Economic-Social and Cultural Status (ESCS), as it is difficult to propose educational interventions to control the level of their impact on science achievement. On the other hand, the results of the study showed that there is a strong effect of environmental awareness variable on gender gap in science achievement. This result of the study suggest that students who have the ability to explain environmental phenomena, predict how changes to an environment will affect the survival of certain species, and interpret the scientific information provided on the labeling of food items, and use scientific evidences to change attitudes toward environment issues score higher than their peers. This result is consistent with the result of the study conducted by Akyuz (2014), which showed that awareness of environmental issues is one of the strongest predictors of students' achievement in science.

Another conclusion of this study is that sense of belonging variable has positive effect on the gender gap in science achievement. Therefore, students' feelings about school, such as feeling lonely, feeling happy at school, feeling that he is part of the school and not stranger, are all variables that contribute to making a difference in science achievement. There are differences in science achievement between rural and urban schools in Jordan. The results of the study showed that this factor contributes to the gender gap in science achievement, as the rural school seems to differ in many aspects from the urban school, including teacher's characteristics, availability of educational resources, and the learning- teaching environment in general.

In conclusion, this study may help decision makers adopt gender-sensitive educational policies in aspects related to curricula and textbooks, and teacher training. The learning –teaching environment within the schools can be enhanced to increase student interaction. Moreover, the educational policies should pay more attention to male schools to bridge the gap between male and female students. On the other hand, environment clubs can be activated in male schools to increase awareness of environmental issues. The study recommends conducting a qualitative study to understand more deeply and comprehensively the factors that contribute to gender gap in science achievement.

References

Ababneh, E., Abulebdeh, K., & Tweissi, A. (2017). National report on the Program for International Students Assessment (PISA2012). Unpublished Report. National Center for Human Resources Development (NCHRD).

Abulebdeh, K., Tweissi, A., & Ababneh, E. (2017). National report on Trends in International Mathematics and Science Study (TIMSS 2015). Unpublished Report. National Center for Human Resources Development (NCHRD).

Akyuz, G. (2014). The effects of student and school factors on mathematics achievement in TIMSS 2011. *Education and Science*. 39(172), (150-162).

Camminatiello, I., Paletta, A., & Speziale, M. T. (2012). The effect of school-based management and standards-based accountability on student achievement: evidence from PISA2006. *Electronic Journal of Applied Statistical Analysis*, *5*(3), 381-386.

Chang, Y. (2008). Gender differences in science achievement, science, self –concept, and science values. In proceedings of the IRC-2008, Chinese Taipei, September 16-20, 2008. Retrieved from http://www.iea.nl/irc2008_timss.html.

Department of Statistics (DOS). (2017). Jordan in numbers. Published Bulletin. Retrieved from www.dos.gov.jo.

Espinosa, L. M. (2005). Curriculum and assessment consideration for young children of cultural, linguistic, and economically diverse background. *Psychology in the Schools*, *42*(8), 837-853.

Fergusson, D., & Harwood, L. (1997). Gender differences in educational achievement in a New Zealand Birth cohort. *New Zeeland Journal of Educational Studies*, *32*(1), 83-96.

Galdas, S., & Bankston., C. (1997). The effect of school population socioeconomic status on individual students' academic achievement .*The Journal of Educational Research*, *90*(5), 269-277.

Hammer, B. (2003). ETS identifies affecting student achievement .Black issues in higher education - Washington update. Retrieved from https://search.proquest.com/openview/f5d2b06234ca4df81710f396d841ddbe/1?pq-origsite=gscholar&cbl=27805.

Ministry of Education. (2018). Educational Strategic Plan (ESP) for (2018-2022). Retrieved from http://www.moe.gov.jo/ar/node/21815

IEA. (2017) . IDB analyzer (version 4) . Retrieved from https://www.iea.nl/data.

Mohammadpour, I., Shekarchizaedeh, A., & Kalantarrashidi, S.A. (2015). Multilevel modelling of science achievement in the TIMSS participating countries. *The Journal of Educational Research*, *108*(6), 449-464.

OECD. (2016). PISA2015 results (Volume 1): excellence and equity in education, PISA, OECD Publication, Paris. doi:10.1787/978926426649-en

Quintano, C., Castellano, R., & Longobardi, S. (2012). Advanced statistical methods for the analysis of large datasets. Springer, Heidelberg Dordrecht, London, New York.

Rivkin, S., Hanushek, E., & Kain, J.(2005). Teachers, schools, and academic achievement. *Journal of the Econometric Society*, 73(2), 417-458.

Roman, A., & Goiricelaya, S. (2012).Gender gaps in PISA test scores: the impact of social norms and the mother's transmission of role attitudes .Discussion paper No.6338. Retrieved from http://ftp.iza.org/dp6338.pdf.

Sahranavard, M., & Hassan, S.A. (2012). The relationship between self-concept self –efficacy, self-esteem, anxiety and science performance among Iranian students. *Middle –East Journal of Scientific Research*, *12*(9), 1190-1196.

Sirin, R. (2005). Socioeconomic status and academic achievement: a meta-analytic review of research. *Review of Educational Research*, 75 (3), 417-453.

Steinmayr, R., & Spinath, B. (2009). The importance of motivation as a predictor of school achievement. *Learning and Individual Differences*, 19 (1), 80-90.

Swinton, J. Thomas, S., Benjamin, W., & Howard, C. (2010). Does in-service professional learn for high economics teachers improve students achievement?. *Education Economics*, *18*(4), 395-405.

UNESCO. (2016). Sustainable Development Goal 4 and It Is Targets. Available at: https://en.unesco.org/education2030-sdg4/targets.

Yip, D. Y., Chiu, M. M, & Ho, E. (2004). Hong Kong students achievement in OECD – PISA study: gender differences in science content, literacy skills, and test formats. *International Journal of Science and Mathematics Education*, 2 (1), 91-106. doi:10.1023/B:IJMA.0000026537.85199.36

Appendix 1

Index	Student gender	Mean	Standard error of mean
Higher Education of parents (ISCED)	Female	4.45	0.05
	Male	4.59	0.06
Home educational resources (WLE) *	Female	-0.64	0.04
	Male	-0.84	0.05
ICT Resources (WLE) *	Female	-0.73	0.04
	Male	-0.85	0.04
Index of economic, social and cultural status (WLE)	Female	-0.43	0.04
	Male	-0.42	0.04
Subjective well-being: Sense of Belonging to School (WLE) *	Female	0.30	0.03
	Male	0.08	0.03
(Environmental Awareness WLE) *	Female	0.55	0.04
	Male	-0.13	0.04
Inquiry-based science teaching and learning practices (WLE)	Female	0.60	0.02
	Male	0.64	0.04
Class size *	Female	34.43	0.79
	Male	31.00	0.78
Teachers participation (WLE)	Female	0.29	0.11
	Male	0.59	0.12
Teacher participation (Sum)	Female	0.66	0.12
	Male	0.60	0.14
Index science specific resources (Sum)	Female	5.65	0.22
	Male	5.37	0.22
Student behavior hindering learning (WLE)	Female	-0.04	0.14
	Male	0.29	0.11