

SELF-CONFIDENCE IN 4th AND 9th GRADES: DIFFERENCES BETWEEN AGE, GENDER AND SCHOOL SUBJECTS

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ABSTRACT

This study focused on students' self-confidence and analyzed the relationship between self-confidence and gender, age, subject, achievement, and other variables. The students from Latvia, Lithuania, Finland, Poland, Germany, Sweden, and Denmark were compared. The authors of this research analyzed the data from three large scale studies and compared 4th and 15-year-old students' self-confidence in reading, Mathematics, and Science. IEA TIMSS2019 and PIRLS2016 for 4th grade students and OECD PISA2012, PISA2015, and PISA2018 for 15-year-old students (further in the study referred to as 9th grade students). The data analysis was performed on each above-mentioned study and each cycle separately.

The authors of this research quartered all students into four self-confidence groups and performed linear regression analysis where self-confidence was the dependent variable and other described variables – independent. The authors compared students from the lowest and the highest self-confidence groups.

Reading achievement was a strong predictor of reading self-confidence for both grade levels and both self-confidence groups. Mathematics achievement was an equally strong predictor of both self-confidence groups in the 4th grade while in the 9th grade, it was strongly related to the highest self-confidence group. Science achievement wasn't significantly nor strongly related to any of the self-confidence groups or grades.

The fact that students like/enjoy reading/Mathematics/Science was a strong predictor of reading/Mathematics/Science self-confidence in both grade and self-confidence groups, but for students in the lowest self-confidence group this factor was more strongly related to self-confidence. Mathematics anxiety was strongly and negatively related to self-confidence.

Keywords: *Large scale assessments, academic self-confidence, academic self-concept, 4th grade, 15-year-old, OECD PISA, IEA TIMSS, IEA PIRLS*

Introduction

Achievement as a measurement of acquired skills and educational quality as such despite many other factors that influence achievement itself has been one of the most

studied aspects in educational research. It has been found in the IEA's (International Association for the Evaluation of Educational Achievement) and other educational studies, that students' achievement is strongly related to their background information. Geske and colleagues (Geske et al., 2021a) found that reading achievement and students' self-confidence correlation coefficient is up to 0.50 and reading achievement explains up to 25% of students' reading self-confidence (Geske et al., 2021b) at the 4th grade, if the achievement is analyzed together with students liking the subject and engagement, this model explained even up to 57% of confidence variance (Kamppane & Ozola, 2022). Marsh and O'Mara (2008) proved that academic confidence predicted long-term academic attainment better than school grades, IQ, and socioeconomic status.

As achievement represents students' academic skills, confidence has been used as a measure of students' non-academic skills (Stankov & Lee, 2015). If academic skills usually are defined as a cognitive ability to acquire knowledge, non-academic skills often are defined as a set of one's beliefs that are related to or produce certain behavior (Zhou, 2017). Unlike academic skills that can be measured in very precise scales, confidence's measurement varies from study to study. Marsh et al. (2019) notes that self-concept and self-efficacy had been used as the most popular measurements of self-confidence in academic domain.

Studies that are based on social-cognitive theory measure confidence in self-efficacy scale. In large scale comparative educational studies like Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) self-efficacy is defined as Bandura (1977) defined it – measurable extent to which students believe they can engage in, or perform an action, or achieve a certain (successful) result (OECD, 2013b; OECD, 2019b) or evaluation of the ability to solve tasks that are similar to ones in the PISA cognitive test (OECD, 2017a). Despite Sanders and Sanders (2009) state that self-efficacy is a key construct of academic confidence, Stankov and Lee (2015) emphasize that self-efficacy views one's beliefs about success in future, but confidence deals with one's success beliefs based in experience. In this way, confidence more reflects self-concept. Educational studies like PISA and PIRLS and TIMSS measure confidence in self-concept scale, defining it as students' perceived competence or perceived academic ability (OECD, 2013a; OECD, 2019a; Hooper et al., 2015; Yin & Fishbein, 2020).

Academic self-concept is referred to one's perceptions of one self's ability in the domain of school subjects (Huang, 2011). Studies suggested partitioning academic self-concept into as many other sub self-concepts, as school subjects (Marsh, 1990). Although academic self-concept is hierarchical, Marsh (1986) discovered a paradox –high self-concept in the Mathematics domain is related to lower self-concept in language. This paradox is described as dimensional comparison effect (Marsh et al., 2014). Bandura (1997, 2006) has claimed that self-efficacy under certain conditions may co-vary between similar sub-domains, and in schools requiring high academic ability, high self-efficacy may occur in divers subjects. Marsh et al. (2007) recognized that social or peer comparison has a powerful effect on academic self-concept in scholastic competence (Shavelson et al.,

1976; Marsh, 1990). Marsh and Parker (1984) defined this phenomenon as Big-Fish-Little-Pond-Effect (BFLPE). This effect was analyzed in meta-analytic study by Fang et al. (2018) where researchers summarized the developing and negative nature of this effect on students' academic self-concept.

Alongside students' confidence, one's attitudes (Berger et al., 2020), engagement (Supervia et al., 2020) and anxiety (Gogol et al., 2017) have been studied as factors influencing not only achievement but also confidence. And researchers have warned that low self-confidence levels can lead to avoidance behaviors (Bandura, 1997; Marsh & O'Mara, 2008). Thus, the question arises: do large scale international studies represent any significant factors that characterize students with high and low self-confidence levels?

Purpose of this study

The purpose of this study was to find out if there is a difference between students with low and high self-confidence in terms of age (grade), gender, enjoyment of studying the subject, and other variables in large scale comparative studies, and, if there is a difference which of these factors are more significant to each group.

Methodology

The Sample

To determine whether students' academic self-confidence differs between age (grade) groups and academic subjects the sample was constructed from five large scale studies conducted by OECD (PISA) and IEA (PIRLS and TIMSS) in Latvia, Lithuania, Finland, Sweden, Denmark, Poland, and Germany.

PIRLS is conducted every five years and measures 4th grade students' achievement in reading. TIMSS is conducted every four years and measures 4th and in some countries 8th grade students' achievement in Mathematics and Science domain. The authors of this research chose to use PIRLS2016 and TIMSS2019 database samples for comparison of 4th grade students as these were the newest available data on the date. PISA study is conducted every four years and measures 15-year-old students' achievement in reading, Mathematics and Science as main subject depending on the cycle, the authors chose to compare PISA2012 for Mathematics, PISA2015 for Science and PISA2018 for reading as these were the newest available data on the date.

The sample was analyzed using students' weight and thus represents the whole population.

Self-confidence groups

The four self-confidence groups were created by 25% of students in each self-confidence group. The 1st group consisted of students with the lowest 25% self-confidence values, but the 4th group included students with the highest 25% of self-confidence values.

Dependent variable

In the linear regression analysis students' self-confidence was used as a dependent variable. PIRLS2016, TIMSS2019 (scales "Confident in Mathematics/Science/reading"), PISA2012 (scale "Mathematics self-concept") and 2018 (scale "Perceived competence in reading") measure students' self-confidence according to Marsh & Craven (2006) in domain specific self-concept scale (Martin et al., 2017; Yin & Fishbein, 2020; OECD, 2013a; OECD, 2019a). PISA2015 measured students' self-competence (scale "Science self-efficacy") in science using self-efficacy scale (Bandura, 1997) (OECD, 2017a).

Independent variables

The authors choose two scales from PIRLS2016 study (Martin et al., 2017) – "Students engaged in reading lessons" and "Students like reading" as independent variables for the linear regression analysis. From TIMSS2019 data set the following scales were chosen (Yin & Fishbein, 2020): "Students like learning Mathematics/Science" and "Instructional clarity". From PISA2012 four scales were chosen (OECD, 2013a): "Mathematics anxiety", "Mathematics interest", "Mathematics teacher's support" and "Mathematics behavior". As independent variables from PISA2015 the authors chose five scales (OECD, 2017a): "Inquiry-based science teaching and learning practices", "Interest in broad science topic", "Enjoyment of science", "Index of science activities", "Teacher support in a science classes of students choice". In PISA2018 the authors chose following three scales (OECD, 2019a): "Enjoyment of reading", "Teacher's stimulation of reading engagement perceived by student", "Teacher support in test language lessons".

In all studies of the analysis, student achievement was measured as a set of plausible values as described in technical documentation (Foy & Yin, 2017; Fishbein et al., 2020; OECD, 2014; OECD, 2017b; OECD, 2020). Gender was coded as a dummy variable – all girls had values 0, whereas boys – 1. All scales that were used in this study had the Cronbach's Alpha coefficient above 0.7 points.

Results

The authors of this study chose to compare students from the first (the lowest) and the fourth (the highest) self-confidence groups from each country of comparison.

To test whether Big-Fish-Little-Pond-Effect could be seen in the model, the authors analyzed the first dataset where all students were grouped by class/school and then – the second dataset where all students were grouped by country. In TIMSS2019 Science study, if the first dataset was used, the explained variance was on average by 10% larger than if the second dataset was used, in opposite, if the TIMSS2019 Mathematics study was used, the explained variance was the same or smaller. As in PISA data students were selected randomly from a school and might not represent a class, the authors chose to perform all the analysis with the second dataset where all students were grouped by country.

Results from PIRLS2016 dataset

After performing a linear regression analysis, the following data were obtained (see Table 1).

As displayed in the Table 1, all four independent variables were significant in at least one country and one confidence level. The reading achievement was significant for both confidence groups of students in Denmark and Latvia, whereas in all other countries of comparison, this variable was significant and strongly related to students' self-confidence only for the lowest confidence group students. For the students in the lowest self-confidence group liking to read was a significant predictor of their self-confidence in all countries of comparison except Finland. The engagement in reading lessons predicted a very small and insignificant part of students' self-confidence except of the lowest group in Lithuania. Negative value in all groups could indicate that students in the lowest self-confidence group do not understand their teacher's guidance. Gender played a significant role only in Lithuania where in the lowest self-confidence group girls had lower self-confidence than boys, i.e., boys had stronger linear relationship. As displayed in the Table 1 the students in the highest self-confidence group in Poland all had the highest value of the self-confidence scale and for this reason Poland was excluded from linear regression model.

Overall, the model explained larger variance of self-confidence values for the lowest self-confidence group. In Lithuania, Denmark and Sweden explaining around 10% of self-confidence variance.

Table 1 Linear Regression Coefficients of Regression Equations Representing How Students' Self-Confidence in PIRLS2016 was Affected by the Selected Independent variables

Independent variable	Self-Confidence group	Denmark	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Students engaged in reading lessons	The lowest	0.04	-0.05	-0.01	-0.02	-0.09	-0.05	0.02
	The highest	0.03	-0.03	0.00	0.06	0.04	n/a	-0.03
Students like reading	The lowest	0.20	0.09	0.14	0.25	0.16	0.16	0.15
	The highest	0.07	-0.01	0.01	0.07	0.10	n/a	0.04
Gender*	The lowest	0.06	0.04	0.00	0.04	0.08	0.00	0.04
	The highest	0.00	0.04	0.03	-0.04	0.03	n/a	-0.02
Reading achievement	The lowest	0.25	0.26	0.19	0.21	0.36	0.32	0.28
	The highest	0.10	-0.01	0.05	0.09	0.00	n/a	0.06
R ²	The lowest	0.12	0.07	0.06	0.09	0.13	0.04	0.10
	The highest	0.02	0.00	0.00	0.03	0.02	n/a	0.01

*Gender – if the value is negative, the girls have a stronger linear relationship, if – positive, the boys have a stronger linear relationship, if the value is equal to zero – boys and girls have an equal effect
All values in the bold are significant.

Results from PISA2018 dataset

The result of a linear regression model from PISA2018 reading dataset is displayed in Table 2.

As in PIRLS2016, in PISA2018 reading achievement was important predictor of students' self-confidence in both confidence groups for all countries of comparison except for students in the highest confidence group in Finland, Latvia and Poland; and in the lowest self-confidence group it was more strongly related to self-confidence than in the highest group as it was in PIRLS2016.

The second highest and the strongest predictor of students' self-confidence in the highest confidence group was gender – boys in the highest self-confidence group had stronger linear relationship with self-confidence than girls in all countries of comparison. In Latvia, Lithuania and Poland in the lowest self-confidence group boys had lower self-confidence than girls. These results are in accord to other studies in self-concept domain where results were explained by dimensional comparison effects and gender stereotypes (Wilgenbush & Merell, 1999).

Enjoyment of reading predicted confidence better for the lowest self-confidence group than for the highest although it was significant in both groups for students in Germany, Poland and Sweden. In Lithuania this variable was significant only among the highest self-confidence group students, but in Finland and Latvia – among the lowest self-confidence group students.

Table 2 Linear Regression Coefficients of Regression Equations Representing How Students' Self-Confidence in PISA2018 was affected by the Selected Independent variables

Independent variable	Self-Confidence group	Denmark	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Enjoyment of reading	The lowest	0.06	0.12	0.16	0.09	0.00	0.14	0.15
	The highest	0.05	0.03	0.13	-0.07	0.09	0.10	0.08
Teacher's stimulation of reading engagement perceived by student	The lowest	0.07	0.07	-0.09	0.06	0.14	0.07	0.13
	The highest	0.08	0.06	0.08	-0.02	0.08	0.07	0.06
Teacher support in test language lessons	The lowest	-0.03	0.12	0.07	0.01	0.02	0.03	0.03
	The highest	0.02	-0.02	-0.01	0.07	0.02	0.00	-0.05
Gender*	The lowest	0.01	0.01	-0.04	-0.11	-0.07	-0.10	-0.04
	The highest	0.17	0.20	0.18	0.12	0.09	0.18	0.14
Reading achievement	The lowest	0.16	0.23	0.14	0.19	0.08	0.19	0.19
	The highest	0.13	0.07	0.08	0.03	0.08	0.04	0.10
R^2	The lowest	0.04	0.11	0.06	0.08	0.04	0.09	0.09
	The highest	0.06	0.04	0.05	0.03	0.03	0.04	0.03

*Gender – if the value is negative, the girls have a stronger linear relationship, if – positive, the boys have a stronger linear relationship, if the value is equal to zero – boys and girls have an equal effect
All values in the bold are significant.

PISA2018 measures students' perception of teachers' support and stimulation. Teachers' support in language lessons significantly predicted students' self-confidence only for Finland's lowest self-confidence group students whereas for Sweden's highest self-confidence group students it predicted confidence negatively. The data analysis displayed that teachers' stimulation was more significant for the highest self-confidence group students in all countries of comparison except Latvia and Poland, but for the lowest self-confidence group students in Germany, Sweden and Lithuania.

As with PIRLS2016 data, this model explained the variance of students' self-confidence better for the lowest confidence group except Denmark, where this model explained the variance of confidence better for the highest self-confidence group.

Results from TIMSS2019 Mathematics dataset

The result form TIMSS2019 Mathematics dataset linear regression model is displayed in Table 3.

As instructional clarity described students' perceived clarity of teacher, it was not surprising, that this variable was significant predictor of self-confidence for the highest confidence group, except in Denmark and Poland where this variable was significant for both groups.

Gender predicted Mathematics self-confidence better for the highest self-confidence group in Finland and for both confidence groups in Denmark and Germany, and better for boys than girls.

As with reading, the model better explained the variance of self-confidence in Mathematics for the lowest self-confidence group for all countries of comparison except Poland. On average, explained variance for the lowest self-confidence group was 20% whereas for the highest – 14%.

Table 3 Linear Regression Coefficients of Regression Equations Representing How Students' Self-Confidence in TIMSS2019 was affected by the Selected Independent variables

Independent variable	Self-Confidence group	Denmark	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Instructional clarity	The lowest	0.09	0.01	-0.07	-0.01	-0.02	0.07	0.00
	The highest	0.18	0.13	0.07	0.14	0.13	0.33	0.11
Students like Mathematics	The lowest	0.40	0.42	0.46	0.35	0.55	0.36	0.38
	The highest	0.28	0.31	0.23	0.23	0.27	0.11	0.28
Gender*	The lowest	0.06	0.05	0.10	0.03	0.00	0.03	0.05
	The highest	0.07	0.08	0.10	0.05	-0.02	0.04	0.05
Mathematics achievement	The lowest	0.16	0.16	0.12	0.18	0.24	0.11	0.14
	The highest	0.17	0.11	0.14	0.21	0.23	0.15	0.16
R ²	The lowest	0.22	0.20	0.21	0.15	0.32	0.16	0.15
	The highest	0.17	0.14	0.09	0.13	0.14	0.17	0.12

*Gender – if the value is negative, the girls have a stronger linear relationship, if – positive, the boys have a stronger linear relationship, if the value is equal to zero – boys and girls have an equal effect
All values in the bold are significant.

Achievement in the Mathematics was a significant and strong predictor of 4th grade students' self-confidence in all countries of comparison and both confidence groups. The regression coefficient was larger for the highest self-confidence group students in Denmark, Germany, Latvia, Poland, and Sweden.

The strongest and most significant predictor of self-confidence level was the fact, that students like Mathematics. This variable was stronger for the lowest self-confidence group in all countries of comparison. Regression coefficient in Poland was more than three times larger for the lowest self-confidence group than for the highest.

Results from PISA2012 dataset

Analysis of the PISA2012 Mathematics dataset was summarized in Table 4.

As it was researched and found in other studies, anxiety predicts negatively not only achievement but self-confidence as well (Brumariu et al., 2022). Results of the linear regression analysis in both groups and in all countries of comparison showed negative traits.

Achievement in Mathematics predicted the students' self-confidence significantly in both confidence groups, but in the highest more than in the lowest, except in Finland and Germany where the regression coefficients were slightly higher for the lowest self-confidence group.

Table 4 Linear Regression Coefficients of Regression Equations Representing How Students' Self-Confidence in PISA2012 was affected by the Selected Independent variables

Independent variable	Self-Confidence group	Denmark	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Mathematics Anxiety	The lowest	-0.13	-0.03	-0.13	-0.09	-0.04	0.05	-0.06
	The highest	-0.23	-0.18	-0.07	-0.19	-0.14	-0.12	-0.11
Mathematics Interest	The lowest	0.02	0.22	0.06	0.03	0.18	0.13	0.10
	The highest	0.15	0.12	-0.03	0.03	0.20	0.02	0.14
Mathematics Behavior	The lowest	0.16	0.10	0.06	0.06	0.00	0.06	0.09
	The highest	0.00	0.18	0.18	0.35	0.09	0.29	0.16
Mathematics Teacher's Support	The lowest	0.05	-0.02	0.04	0.19	0.12	0.09	0.16
	The highest	0.07	0.09	0.03	0.10	0.13	0.07	0.07
Gender*	The lowest	0.05	0.12	0.21	0.16	0.08	0.00	0.14
	The highest	0.09	0.18	0.13	0.05	0.23	0.13	0.13
Mathematics Achievement	The lowest	0.19	0.28	0.43	0.20	0.40	0.41	0.33
	The highest	0.34	0.25	0.42	0.29	0.42	0.43	0.38
R ²	The lowest	0.10	0.19	0.30	0.12	0.23	0.17	0.21
	The highest	0.27	0.24	0.22	0.27	0.32	0.33	0.25

*Gender – if the value is negative, the girls have a stronger linear relationship, if – positive, the boys have a stronger linear relationship, if the value is equal to zero – boys and girls have an equal effect
All values in the bold are significant.

Although not all items in the Mathematics behavior scale show students' positive behavior towards the subject, it is not surprising that this variable strongly predicted self-confidence for students in the highest confidence group except in Denmark. Whereas all items in the Mathematics interest scale showed students' positive attitude or enjoyment of the subject, and for this reason, if students in the lowest self-confidence group showed more positive attitudes, their self-confidence was higher. The interest in Mathematics was significant for both groups – the highest and the lowest in Finland and Lithuania, but for the highest group – in Denmark and Sweden, for the lowest – in Poland. In Germany and Latvia this variable was not significant for any of the self-confidence groups.

Mathematics teacher's support was a significant predictor for the lowest self-confidence group students in Latvia and Sweden, but in Lithuania this variable was significant for students in both groups.

Gender was a significant predictor mainly for the students in the highest self-confidence group for all countries of comparison except Latvia. In Finland, Germany and Sweden gender was a significant predictor for both confidence groups. In PISA2012 as in TIMS2019 boys had stronger linear relationship with confidence than girls.

In contrast with TIMSS2019 linear regression model, this model better explained the variance for the highest self-confidence group students for all countries of comparison except Germany. On average, this model explained 27% of variance for the highest self-confidence group students and 19% – for the lowest.

Results from TIMSS2019 Science dataset

The results from liner regression models with TIMSS2019 Science dataset are displayed in the Table 5.

Table 5 Linear Regression Coefficients of Regression Equations Representing How Students' Self-Confidence in TIMSS2019 was affected by the Selected Independent variables

Independent variable	Self-Confidence group	Denmark	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Instructional clarity	The lowest	0.06	-0.04	-0.13	-0.02	0.00	0.01	0.09
	The highest	0.21	0.08	0.11	0.20	0.19	0.24	0.18
Students like Science	The lowest	0.39	0.41	0.38	0.40	0.42	0.43	0.37
	The highest	0.21	0.32	0.10	0.19	0.23	0.19	0.27
Gender*	The lowest	0.02	-0.01	0.02	-0.03	0.03	-0.01	0.00
	The highest	0.09	0.02	-0.02	-0.03	0.07	0.04	-0.02
Science achievement	The lowest	0.12	0.10	0.06	0.07	0.07	0.06	0.06
	The highest	0.01	0.07	0.01	-0.01	0.07	-0.02	0.06
R ²	The lowest	0.19	0.16	0.13	0.15	0.17	0.19	0.17
	The highest	0.13	0.12	0.03	0.10	0.12	0.13	0.13

*Gender – if the value is negative, the girls have a stronger linear relationship, if – positive, the boys have a stronger linear relationship, if the value is equal to zero – boys and girls have an equal effect
All values in the bold are significant.

In contrast to other linear regression models, Science achievement was significant only for the lowest self-confidence group students in Denmark and Finland, but for all other groups and countries this variable wasn't significant. Gender was not significant for both groups and all countries of comparison except for the highest self-confidence group in Denmark where boys had higher self-confidence than girls.

In the given linear regression model, the most significant and strongest predictor of self-confidence variance was liking the Science. For both confidence groups, especially for the lowest group students, this variable predicted students' self-confidence the most.

As with self-confidence in Mathematics, instructional clarity variable was significant and more related for the highest self-confidence group students.

This model explained on average 17% of 4th grade students Science self-confidence variance for the lowest confidence group and on average 10% of confidence variance for the highest self-confidence group students.

Results from PISA2015 dataset

As it was mentioned in the methodology part, PISA2015 Science was the only dataset that measured self-confidence in self-efficacy scale. In order to get a better insight, the authors added more variables to the linear regression model than for other models. The result of the model is displayed in Table 6.

Although self-efficacy and self-concept are correlated with very high correlation coefficient (Marsh et al., 2004), the results do not display the same patterns as with self-concept scale. Despite 4th grade students' self-confidence was weakly related to Science achievement, PISA study shows the opposite, especially for the lowest confidence group.

Gender was a significant predictor of Science self-efficacy in all countries of comparison for the highest self-confidence group and positive values show that the relationship was stronger for boys. In Lithuania and Poland gender was a significant predictor for the lowest self-confidence group where negative values show that boys had lower self-confidence than girls.

The variable "Index science activities" that represents different activities were students are engaged with science topics including watching TV shows and simulate natural phenomena on computer, was strongly and significantly related to confidence for the highest confidence group in all countries of comparison. Only for the lowest self-confidence group students in Denmark and Poland this variable was not significant.

Enjoyment of science was a significant factor for the lowest self-confidence group students in Finland, Germany, Latvia, Lithuania, and Poland. It might indicate that having fun, liking, enjoying and being happy are very important emotional states for students who have low self-confidence in Science.

The variable "Interest in broad science topics" that represents a concern about broad scientific topics, was strongly and significantly related to self-confidence for the lowest confidence group students. Only in Finland the variable was significant for the highest self-confidence group students. As the value was negative for the highest self-confidence groups it could indicate that students with high self-confidence in Science are not interested in broad science topics, but concentrate more attention to few in particular.

Table 6 Linear Regression Coefficients of Regression Equations Representing How Students' Self-Confidence in PISA2015 was affected by the Selected Independent variables

Independent variable	Self-Confidence group	Denmark	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Inquiry-based science teaching and learning practices	The lowest	0.07	0.05	0.05	0.06	0.09	-0.02	0.08
	The highest	0.07	0.06	0.01	0.04	0.21	-0.06	0.10
Interest in broad science topics	The lowest	0.29	0.20	0.29	0.12	0.15	0.24	0.17
	The highest	0.04	-0.19	-0.06	-0.05	-0.01	-0.06	-0.07
Enjoyment of science	The lowest	0.03	0.12	0.11	0.12	0.09	0.14	0.07
	The highest	-0.03	0.04	0.09	0.05	0.01	0.04	-0.02
Index science activities	The lowest	0.07	0.07	0.13	0.17	0.12	0.04	0.11
	The highest	0.23	0.25	0.22	0.17	0.09	0.17	0.15
Teacher support in science classes of students choice	The lowest	0.06	0.01	0.01	-0.02	0.05	0.03	0.06
	The highest	-0.01	-0.01	0.03	0.12	-0.03	0.08	0.01
Gender*	The lowest	-0.04	-0.05	-0.05	-0.05	-0.07	-0.08	0.00
	The highest	0.10	0.17	0.16	0.09	0.17	0.15	0.19
Science achievement	The lowest	0.22	0.13	0.12	0.11	0.19	0.19	0.07
	The highest	-0.11	-0.04	-0.02	0.01	-0.08	-0.10	-0.16
R ²	The lowest	0.22	0.14	0.20	0.12	0.13	0.15	0.11
	The highest	0.09	0.12	0.10	0.08	0.11	0.07	0.11

*Gender – if the value is negative, the girls have a stronger linear relationship, if – positive, the boys have a stronger linear relationship, if the value is equal to zero – boys and girls have an equal effect
All values in the bold are significant.

Teacher support in science classes of students choice was a significant predictor only for the highest self-confidence group students in Latvia and Poland whereas inquiry-based science teaching and learning practices was a significant predictor only for the lowest self-confidence group students in Latvia and the highest self-confidence group students in Lithuania and Sweden. That could indicate both – either there are no such practices in the classroom for other countries of comparison or this variable is not related with self-confidence and impacts other variables more than confidence.

Conclusions

This study has answered the research question – whether there is a differences between students with low and high self-confidence in terms of: age (grade), gender, enjoyment of studying the subject and other variables, and, if there is a difference which of these factors are more significant to each group. All models better explained the variance of self-confidence for students from the lowest self-confidence group except PISA2012 study where the model explained variance better for the highest self-confidence group.

For both age groups achievement and enjoyment were significant predictors of students' self-confidence. One can say that on average for 4th grade students' interest/enjoyment was more significant than that of 9th grade students, whereas 9th grade students' gender played more significant role than 4th grade students' gender representing dimensional comparison effects. Despite research literature describe that gender stereotypes exist, this study shows that in the highest self-confidence group boys had stronger linear relationship than girls in all studied academic domains.

By comparing the different academic domains, data analysis showed that Mathematics and Science self-confidence for both age groups was more significantly related to interest and enjoyment than reading for both confidence groups.

When comparing different age groups of the same academic domain in both self-confidence groups, the data displayed that reading self-confidence for 4th grade students lowest self-confidence group was more strongly and significantly related with liking/enjoyment to read and achievement in reading than for 9th grade students. In opposite students self-confidence in 9th grades' highest self-confidence group was more strongly related to engagement (feeling of teachers stimulation) in the reading lesson and achievement than 4th grade. The Mathematics self-confidence for 4th grade lowest confidence group students was more significantly and strongly related to the fact that students like Mathematics than 9th grade students having interest in Mathematics or having Mathematics behavior. Achievement in Mathematics was more significant for both 9th grade self-confidence group students than for 4th grade students and more significant and strongly related to self-confidence for the highest confidence group.

To measure self-confidence in Science for 9th grade students self-efficacy scale was used. As this scale consists of different type statements and different Likert type scale, it is not directly comparable with self-confidence measured in self-concept scale, but as other studies have proven – self-concept is strongly related to self-efficacy if measured in the same domain, it was not surprising, that the data analysis showed similar patterns. When comparing different age groups one can see that liking Science is more strongly and significantly related to Science self-confidence for the 4th grade students in the lowest self-confidence group than in the highest and more than in the 9th grade. The achievement in science was more strongly and significantly related to confidence in the 9th grade and for students in the highest confidence group. Instructional clarity and inquiry-based science teaching and learning practices were more strongly correlated with the self-confidence for students from the highest self-confidence group in both age groups.

Grouping 4th grade students first by school and then by country revealed social comparison or Big-Fish-in-Little-Pond effect in TIMSS2019 Science dataset, but not in TIMSS2019 Mathematics dataset.

In conclusion the authors would like to emphasize that this study highlighted the factors that were more significant for students in the lowest self-confidence group. These conclusions can be used in preparation of interence programs with the aim to support students with low self-confidence.

This study adds theoretical and practical findings to the body of research that is dedicated to better understanding students' self-confidence and the factors that impact it.

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