Relationship between gender and academic performance of reading, writing and literature, mathematics and science

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Abstract

The aim of the study is to compare academic performance levels of Albanian students with those of OECD members and partners, as well as to investigate the relationship between gender and academic performance in reading, writing and literature, mathematics and science, focused on PISA 2015. To fulfill these objectives this article relies on a quantitative approach.. The format for review of official documentation instrument is used based on the secondary data of the percentage of students at each proficiency level in reading, mathematics, and science by gender according to PISA 2015 results. The main conclusions of the study highlight: (1) Males display better academic performance than females in the lowest and highest level, meanwhile females perform better than males in medium level in reading, mathematics and science, although there are differences between Albania and OECD members and partners. (2) There is positive correlation between gender and reading, mathematics, and science academic performance.

***Key words**: gender, academic performance, reading, mathematics, science, Albania*

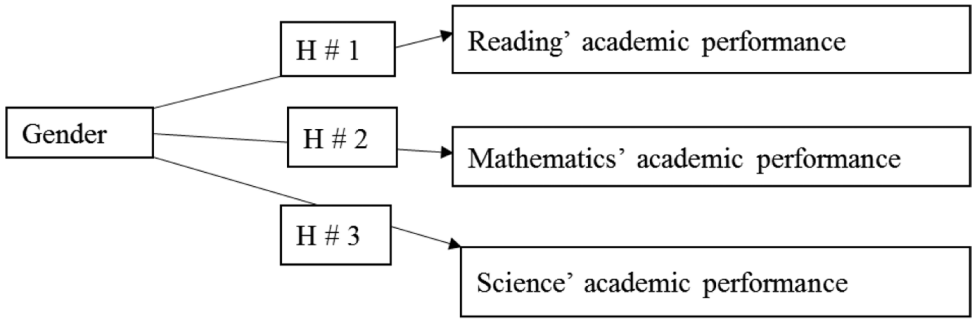
Introduction, theoretical framework and literature review

Academic performance of reading, writing and literature, mathematics and science is one of three main domains of curriculum aim that indicates students' knowledge, skills and competences. Adler (1982) advocated three types of learning that improve intelect: (1) acquisition of organized knowledge, to be taught by didactic instruction, (2) development of basic learning skills thorugh coaching and presentation of ideas, (3) acquisition of values, to be taught by Sokratic method. The ideas of Adler were supported by Dewey and Tyler too. Curriculum design treats nature and organizing of four main parts: (1) objectives, (2) content, (3) methods and organizing, (4) evaluation (Tyler 1949). According to progressivism theory stated by Dewey (1934) skills necesary for democratic living include problem solving and scientific methods. Progressivism emphasized *how to think* not *what to think*. Meanwhile behaviorism according to Thorndike (1932) maintainded that: (1) behavior was influenced by conditions of learning, (2) learner's attitudes, and abilities could improve over time through proper stimuli, (3) instructional experiences could be designed and controlled, (4) it was improtant to select stimuli and learning experiences that were integrated, consistent, and mutually reinforcing. In contrast to cognitivism theory where behavior is in the center of students' activities, progressivism and especially constructivism set knowledeg contruction, and students'learning based on life skills and competences in the center of teaching and learning activities. The ***aim*** of the study is to compare academic performance levels of Albanian students with OECD members and partners, 1st and last ranking country; as well as to investigate the relationship between gender and academic performance of reading, writing and literature, mathematics and science, focused on PISA 2015. The ***research questions*** include: (1) Is there a relationship between gender and reading, writing and literature' academic performance? Does reading, writing and literature' academic performance increase with gender? (2) Is there a relationship between gender and mathematics' academic performance? Does mathematics' academic performance increase with gender (3) Is there a relationship between gender and science' academic performance? Does science' academic performance increase with gender? Independent variable is gender, and dependent variables are (1) reading, writing and literature' academic performance, (2) mathematics' academic performance, (3) science' academic performance. Independent variable is moderator categorical, and dependent variable are considered to be quantitative discrete variables (Fraenkel et. al; 2016).

Conceptual framework

The framework for the study was developed from an extensive review of existing evidence about gender, and reading, writing and literature' academic performance, mathematics' academic performance, science' academic performance. The review began with a search for relevant empirical research through ERIC using the keywords "gender," "reading, writing and literature' academic performance," "mathematics' academic performance", and "science' academic performance". Figure 1, summarizing the framework resulting from our review, proposes a set of relationships among four constructs.

FIGURE 1: Conceptual framework



Relationship between gender and reading performance

Rasmusson and Åberg-Bengtsson in their study (2015) used data from a Swedish PISA-sample (1) to identify a digital reading factor, (2) to investigate gender differences in this factor (if found), and (3) to explore how computer game playing might relate to digital reading performance and gender. In addition to an overall reading factor, the hypothesized digital reading factor was identified. When the overall reading performance was taken into account, a relative difference in favor of the boys for digital reading was indicated. This effect was mediated by a game-playing factor comprising the amount of time spent on playing computer games. Thus, the boys› better performance in digital reading was explained by the computer game-playing factor. Drawing on Eccles and colleagues› expectancy-value theory and Pekrun›s control-value theory and using data from the Childhood and Beyond Study, Lauermann, Eccles, & Pekrun (2017) examined the motivational underpinnings of elementary students› worries about performing

poorly in the domains of mathematics and reading (N = 805, grades 3, 4 and 6). With one exception, the analyses confirmed that children›s expectations of success in and valuing of mathematics and reading interacted in predicting children›s worry about these domains. Children›s worry was strongest when they rated their subjective abilities and expected success in mathematics and reading as relatively low but perceived these subjects as valuable. Brozo et al. (2014), members of the PISA/PIRLS Task Force, provide a summary of major gender differences in performance found overall on PISA 2009, along with relevant trends since 2000. These data are foregrounded from PISA because they add further evidence of a serious global pattern of boys' underachievement in reading and lower reading engagement relative to girls.

The study conducted by Crowe (2005) compared the effects of two oral reading feedback strategies in improving the reading comprehension of eight school-age children with low reading ability. Participants were assigned to one of two intervention groups matched on age, grade, gender, and general reading performance. Intervention 1 (I1) used traditional decoding-based feedback, and Intervention 2 (I2) used communicative reading strategies (CRS), meaning-based feedback. After 10 hours of reading intervention, participants in I2 performed significantly better than the I1 group on a formal measure of reading comprehension and on story-related comprehension questions. No significant differences were found between I1 and I2 in the ability to answer story-related locative, descriptive, or inferential detail questions. Dronkers & Kornder (2015) in their study attempted to explain the differences between reading and math scores of migrants' children (8430 daughters and 8526 sons) in 17 OECD destination countries, coming from 45 origin countries or regions, using PISA 2009 data. They find that migrant daughters from countries with higher gender equality levels obtain higher reading scores than comparable migrant sons do. In addition, the higher the gender equality levels in the destination countries, the lower the reading and math scores of both male and female migrants' children in their destination countries. Further analyses suggest it is the difference between gender equality levels, rather than the levels themselves that explains the educational performance of both female and male migrant pupils. Finally, migrants' daughters seem to perform slightly better educationally, compared with migrants' sons. The study conducted by Stricker, Rock, & Bridgeman (2015) explores stereotype threat on low-stakes tests used in a large-scale assessment, math and reading tests in the Education Longitudinal Study of 2002. Issues identified in laboratory research were assessed: whether inquiring about their race and gender is related to the performance of black and female test takers and, secondarily, whether this association is greater for test takers most identified with math and reading. After high school sophomores completed a questionnaire that included inquiries about their race and gender, only one change

in test performance was consistent with expectations from stereotype-threat theory: black test takers' math scores decreased. Their reading scores and young women's math scores did not decrease, and identification with math and reading did not moderate score decreases for black test takers or women.

The study conducted by Mucherah & Herendeen (2013) examined primary school students' reading motivation and performance on the standardized exam. Participants included 901 seventh and eighth grade students from Kenya. There were 468 females and 433 males. Contrary to previous studies, results showed reading challenge and aesthetics, but not efficacy, predicted reading achievement, indicating reading motivation may not influence achievement similarly across cultures. Gender differences were found in reading achievement but not motivation, an indication of a complex relationship between reading motivation and achievement. The article written by Mateju & Smith (2015) examines gender gaps in academic performance in mathematics and reading between boys and girls of ninth-grade elementary schools in the Czech Republic. Similar to research on other countries, the authors found that girls strongly outperform boys in grades in Czech language, but that this gender gap is not explained by measured ability in reading nor on family background or student attributes. The authors also found gender bias in mathematics grades, after controlling for measured ability and other factors. Girls are also substantially more likely than boys to apply to secondary grammar schools, as well as aspire to a college education, even after controlling for measured ability. The study conducted by Lim, Bong, & Woo (2015) found that gender, books and other types of literacy resources in the home, and parents' attitudes toward reading functioned as consistent predictors of Korean students' positive and negative attitudes toward reading. Parental support for reading and teachers' instruction and assignment strategies in reading directly predicted students' use of learning strategies as well. Positive attitudes toward reading also predicted students' use of memorization, elaboration, and control strategies. Thus, reading attitude was an important mediator between parent-and teacher-related contextual factors and reading/learning engagement of Korean adolescents. Therefore it is hypothesized that:

> **Hypothesis # 1:** There is a linear positive correlation between gender and reading, writing and literature' academic performance.

Relationship between gender and math academic performance

A structural equation model of relationships among testing-related motivation variables (test value, effort, self-efficacy, and test anxiety), test-taking strategies (test tactics and metacognitive strategies), gender, and math test performance were examined in the study conducted by Peng, Hong, & Mason (2014) with a sample

of 10th graders (N = 438; 182 males and 256 females). In general, motivation variables influenced the use of test-taking strategies and demonstrated stronger impacts on math performance than did test-taking strategies. Gender differences were found in self-efficacy and test anxiety. Johnson et al. (2012) in their study examined the differential effects of stereotype threat and lift between genders on math test performance. They asked 3 questions: (a) What is the effect of gender on math test performance?, (b) What is the effect of stereotyping condition (threat, lift, or neither) on math test performance?, and (c) What is the effect of the interaction of gender and stereotyping condition on math test performance? Findings indicated that men performed better on math tests under conditions of stereotype threat than on stereotype lift; women performed better under stereotype lift than on stereotype threat. After reviewing research from the fields of psychology, sociology, economics, and education over the past 30 years, Wang & Degol (2017) summarized six explanations for US women's underrepresentation in math-intensive STEM fields: (a) cognitive ability, (b) relative cognitive strengths, (c) occupational interests or preferences, (d) lifestyle values or work-family balance preferences, (e) field-specific ability beliefs, and (f) gender-related stereotypes and biases.

The research conducted by Ganley & Vasilyeva (2014) examined a potential mechanism underlying gender differences in math performance by testing a mediation model in which women's higher anxiety taxes their working memory resources, leading to underperformance on a mathematics test. Findings showed a significant gender difference in math performance, anxiety, and visuospatial working memory. Further, there was a mediating chain from gender to the worry component of anxiety to visuospatial working memory to math performance. The results suggest that women's heightened worry may have utilized their visuospatial working memory resources, and the resulting gender differences in working memory were associated with gender differences on a math test. The study conducted by Martinez & Guzman (2013) examines the gender and racial/ethnic differences in self-reported levels of challenge, a measure of student engagement, while students are in math and science courses. Results from multivariate regression analyses indicate that boys report similar levels of engagement while in math and science classes, but girls do not. Gender differences in children's emotional experience of math, their math performance, and the relation between these variables were investigated in two studies designed by Erturan & Jansen (2015). Gender differences occurred only in test anxiety (boys had lower test anxiety than girls). Concerning the relationship between emotional experience of math and math performance, math anxiety and math performance were negatively related, but only for girls, even when controlled for test anxiety. However, only the relation between perceived math competence and math performance was significant, for

both boys and girls. The relation between math anxiety and math performance was not significant in this study after controlling for perceived math competence.

In their study Hoppe et al. (2012) combined both approaches and simultaneously assessed the effects of three relatively independent factors on the neurofunctional correlates of mental rotation in same-aged adolescents: math talent (gifted/controls: 17/17), gender (male/female: 16/18) and experimental task performance (median split on accuracy; high/low: 17/17). In conclusion, increased activation of the inferior parietal lobule represents a positive neural correlate of mental rotation performance, irrespective of but consistent with the obtained neurocognitive and behavioral effects of math talent and gender. As experimental performance may strongly affect task-related activations this factor needs to be considered in capability-related group comparison studies on the brain-performance relationship. The study designed by Gherasim, Butnaru & Mairean (2013) investigated how gender shapes the relationships between classroom environment, achievement goals and maths performance. The results indicated gender differences in the perception of teacher and peers support, achievement goals and maths performance. The effects of goal orientations, teacher and peers support on achievement were moderated by gender. Furthermore, the interaction between classroom environment and performance goals on maths grades varied with gender. In the boys' sample, performance-avoidance goals interacted with teacher support, while in the girls' sample, performance-approach goals interacted with peers support. The study conducted by Tomasetto, Alparone & Cadinu (2011) confirmes that stereotype threat impaired girls' performance on math tasks among students from kindergarten through 2nd grade. Moreover, mothers' but not fathers' endorsement of gender stereotypes about math moderated girls' vulnerability to stereotype threat: Performance of girls whose mothers strongly rejected the gender stereotype about math did not decrease under stereotype threat. These findings are important because they point to the role of mothers' beliefs in the development of girls' vulnerability to the negative effects of gender stereotypes about math.

Two studies designed by Smeding et al. (2013) were conducted among French middle-school students (Ns = 1,127 and 498) during a regular class hour. In both studies, whereas girls underperformed on the math test relative to boys in the math-verbal order condition (ST- stereotype threat effect), they performed as well as boys in the verbal-math order condition. Moreover, girls' math performance was higher in the verbal-math order condition than in the math-verbal order condition. Test order affected neither girls' verbal performance nor boys' verbal or math performance. The study conducted by Shera (2014) examined the effects of gender and socio-economic status on reading performance of 15-year-old students. About a third of the total variance in reading performance lies between schools, indicating that school characteristics are important in predicting student achievement.

The results clearly reveal the significant relationships of socio-economic status (SES) and gender with student achievement, even after controlling for family structure (two parent families versus others), learning strategies use, and reading engagement. The longitudinal study results conducted by Ramsey & Sekaquaptewa (2011) showed that, for both male and female students, stereotypes increased during the course. Importantly, there was a significant interaction between gender and changes in implicit stereotyping when predicting course performance. Female students showed a negative relationship between changes in implicit stereotypes and course performance, while male students showed no relationship between changes in implicit stereotyping and course performance. This suggests that only for women, who are stereotyped as poor math performers, did the observed increases in stereotyping over time predict poorer math performance. Therefore it is hypothesized that:

Hypothesis # 2: There is a linear positive correlation between gender and mathematics' academic performance.

Relationship between gender and science academic performance

The purpose of the study conducted by Mutisya (2015) was to determine Primary Teacher Education Trainees' perceptions regarding their preparedness to teach science in primary schools. The study found out that overall more male trainees than female trainees expressed high level of conceptual understanding of science. More male trainee than female trainees further indicated they were ready to teach science during teaching practice and after training. The study recommends that science tutors to ensure trainees have high mastery of science subject content and to provide a gender-appropriate training to demystify gender differences in performance in science and promote gender equity in science education. The results of the research designed by Adigun et al. (2015) showed that even though the male students had slightly better performance compared to the female students, it was not significant. This better performance was found to be pronounced in the private school which was shown to possess the best male brains found in the study area. The research designed by Ganley, Vasilyeva, & Dulaney (2014) integrated the findings by testing the potential role of spatial skills in gender differences in the science performance of eighth-grade students (13-15 years old). In "Study 1" (N = 113), the findings showed that mental rotation ability mediated gender differences in physical science and technology/engineering test scores. In "Study 2" (N = 73,245), science performance was examined in a state population of eighth-grade students. As in "Study 1", the results revealed larger gender differences on items that showed higher correlations with mental rotation. The study designed by Makwinya &

Hofman (2015) was investigating existence of gender differences in such constructs regarding science, and whether development of such constructs is still influenced by how children feel their parents perceive them in relation to sciences. Results showed that, students' self-perceptions and those of parents regarding science are positively related. Further, self-concept and utility-values were higher among boys than girls. Based on the result, it was concluded that, parents' gender-based perceptions regarding science that are still communicated at home might be the reason for the development of children's gender-based self-perceptions regarding sciences. In the article written by Traxler et al. (2016), the authors draw on previous reports from physics, science education, and women's studies to propose a more nuanced treatment of gender in physics education research. A growing body examines gender differences in participation, performance, and attitudes toward physics. They have three critiques: (i) it does not question whether the achievements of men are the most appropriate standard, (ii) individual experiences and student identities are undervalued, and (iii) the binary model of gender is not questioned. Driven by these critiques, they proposed a conception of gender that is more up to date with other fields and discuss gender as performance as an extended example. They also discuss work on the intersection of identities [e.g., gender with race and ethnicity, socioeconomic status, lesbian, gay, bisexual, and transgender (LGBT) status], much of which has been conducted outside of physics.

Curran & Kellogg (2016) present findings from the recently released Early Childhood Longitudinal Study, Kindergarten Class of 2010-2011 that demonstrate significant gaps in science achievement in kindergarten and first grade by race/ethnicity. The authors estimate the black-white science gap in kindergarten at -0.82 SD but find only a small gender gap by first grade. Large disparities between Asian student performance in science as compared to mathematics and reading are documented. Student background characteristics and school fixed effects explain nearly 60% of the black-white and Hispanic-white science achievement gaps in kindergarten. According to Murray (2016) the case study method of teaching uses real-world narratives to teach concepts and content. This method of teaching encourages active learning, which has been shown to have a positive effect on student performance in many disciplines including science. Although more females than males pursue a postsecondary degree, more males than females pursue degrees in the STEM (science, technology, engineering, and mathematics) disciplines, and males also outperform females in the STEM disciplines as well. Because it is well-known that perception affects performance, the goal of this study was to determine the relationship between gender, perception, and performance. The article written by Sinnes & Løken (2014) argues that adjusting science subjects to match perceived typical girls' and boys' interests risks being ineffective, as it contributes to the imposition of stereotyped gender identity formation thereby

also imposing the gender differences that these adjustments were intended to overcome. This article also argues that different ways of addressing gender issues in science education themselves reflects different notions of gender and science. Thus in order to reduce gender inequities in science these implicit notions of gender and science have to be made explicit. The study designed by Bergold et al. (2017) investigated (a) how a latent profile analysis based on representative data of N = 74,868 4th graders from 17 European countries would cluster the students on the basis of their reading, mathematics, and science achievement test scores; (b) whether there would be gender differences at various competency levels, especially among the top performers; (c) and whether societal gender equity might account for possible cross-national variation in the gender ratios among the top performers. The latent profile analysis revealed an international model with 7 profiles. Thus, consistent with expectations, (a) the profiles differed only in their individuals' overall performance level across all academic competencies and not in their individuals' performance profile shape. Inspection of the gender ratios revealed (b) that boys were overrepresented at both ends of the competency spectrum. However, there was (c) some cross-national variation in the gender ratios among the top performers, which could be partly explained by women's access to education and labor market participation.

The main purpose of the study conducted by Huang & Chen (2016) was to examine possible gender differences in how junior high school students integrate printed texts and diagrams while solving science problems. Compared to male students, female students spent more time and displayed more fixations in solving science problems. The female students took more time to read the print texts and compare the information between print-based texts and visual-based diagrams more frequently during the problem-solving process than the male students. However, no gender differences were found in the accuracy of their responses to the science problems or their performances in the spatial working memory task. In the article written by Rolka & Remshagen (2015), the authors assess the impact of context-based learning tools on student grade performance in an introductory computer science course. It is found that the addition of robots did not improve the students' performance in setting. Instead, their findings support the existing literature stating that gender and ethnicity are important predictors of student success. Fortus & Daphna (2017) examined the science-related mastery, performance-approach, and performance-avoid goal orientations, perceptions of the science teachers, parents, schools, and peers' goal emphases in relation to science of the students in these schools. The authors compared between students in religious schools (newly collected data) and secular schools (data reported in prior studies), and found that there is a distinct difference between these two populations that is associated with differing attitudes toward gender and science at these schools. The study designed

by Chang& Kim (2009) examined the effects of computer access and computer use on the science achievement of elementary school students, with focused attention on the effects for racial and linguistic minority students. After controlling for age, gender, prior science performance, and family socioeconomic level, the results revealed that access to home computers and purposeful computer use had positive effects on the science performance of english-speaking students. Using item-response theory (Rasch analysis), Federer, Nehm & Pearl (2016) evaluated differences in performance by gender on a constructed-response (CR) assessment about natural selection. The results identify relationships between item features and performance by gender; however, the effect is small in the majority of cases, suggesting that males and females tend to incorporate similar concepts into their CR explanations. Therefore it is hypothesized that:

Hypothesis # 3: There is not a linear positive correlation between gender and science curriculum' academic performance.

Methodology

The methodology used in the study "Relationship *between gender and academic performance of reading, writing and literature, mathematics and science*" is quantitative approach. The instrument used in the study- format for review of official documentation, is been designed with dimensions and statements that focus on gender and academic performance of reading, writing and literature, mathematics and science data. The secondary data of percentage of students at each proficiency level in reading, mathematics, and science by gender is based on PISA 2015 results (OECD, 2016). The findings of the instrument were summarized in synthetic way to use as the basis for the analysis of the findings. The percentage of students at below level 1b- the lowest level, level 3- the medium level and level 6- the highest level in reading, mathematics, and science by gender were analysed.

The conceptual framework guiding the study (see Figure 1) was tested using Pearson correlation and multivariate regression. The descriptive statistics include comparing and analyzing of frequencies of percentage of students at below level 1b, level 3 and level 6 in reading, mathematics, and science by gender between Albania and OECD members and partners, as well as 1st and last country ranking in PISA 2015. The hypothesis that investigates the relationship between gender and academic performance of reading, writing and literature, mathematics and science were tested using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity.

Results and discussion

Descriptive statistics

PISA assessment test measure knowledge and skills of students ranking in six levels: below 1b level, level 1b, level 1a, level 2, level 3, level 4, level 5, and level 6 according to scores achieved by students in increasing order from lowest to highest level. PISA assess students in three main curriculum domains: reading writing and literature (from hereafter reading), mathematics, and science.

Reading' academic performance

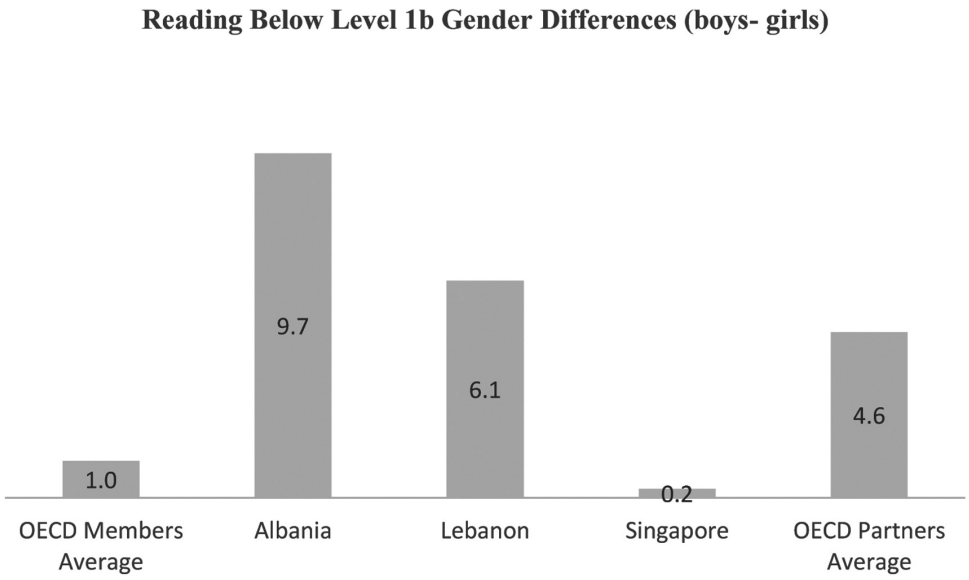
TABLE 1: Percentage of students at each proficiency level in reading, by gender, Albania vs OECD

		Below Level 1b	Level 1b	Level 1a	Level 2	Level 3	Level 4	Level 5	Level 6
		%	%	%	%	%	%	%	%
OECD Members Average	Boys	1.8	6.8	15.9	24.4	26.6	17.9	5.9	0.9
	Girls	0.7	3.7	11.2	22.1	29.3	23.1	8.5	1.4
	Gender Differences (boys- girls)	1.0	3.1	4.7	2.3	-2.7	-5.2	-2.6	-0.5
Albania	Boys	12.2	21.5	29.2	22.6	11.2	2.9	0.4	0.0
	Girls	2.5	10.3	24.9	32.1	21.4	7.4	1.4	0.1
	Gender Differences (boys- girls)	9.7	11.2	4.4	-9.4	-10.2	-4.5	-1.0	-0.1
Lebanon (Last country)	Boys	27.4	23.7	21.0	14.5	9.0	3.6	0.7	0.1
	Girls	21.3	25.2	22.3	17.0	9.7	3.6	0.8	0.1
	Gender Differences (boys- girls)	6.1	-1.5	-1.3	-2.5	-0.7	0.0	-0.1	0.0
Singapore (1st Country)	Boys	0.4	3.3	9.9	17.6	26.3	26.3	13.4	2.7
	Girls	0.2	1.6	6.7	16.2	26.1	28.6	16.1	4.6
	Gender Differences (boys- girls)	0.2	1.7	3.2	1.5	0.2	-2.3	-2.7	-1.9
OECD Partners Average	Boys	8.3	16.4	23.6	23.5	17.3	8.5	2.2	0.3
	Girls	3.6	10.6	21.1	26.6	22.3	11.9	3.4	0.5
	Gender Differences (boys- girls)	4.6	5.8	2.5	-3.1	-5.0	-3.4	-1.2	-0.2

Source: (OECD, 2016)

Below there is a figure illustrated reading below level 1b gender differences' academic performance. Level 3, and level 6 gender differences' academic performance are analysed and discused too.

GRAPH 1: Percentage of students in reading below level 1b gender differences



The data obtained as shown in table 1 or graph 1 indicates that: (1) 8.7% more boys than girls in Albania compared to OECD members average, (2) 5.1% more boys than girls in Albania compared to OECD partners average, (3) 9.5% more boys than girls in Albania compared to Singapore (1st country, (4) 3.6% more boys than girls in Albania compared to Lebanon (last country) are ranked in below level 1b reading. So there are big differences in gender boys and girls ranking in below level 1b reading between Albania and OECD members and partners, as well as 1st and last country, where boys perform better than girls.

The data obtained as shown in table 1 indicates that: (1) 7.5% more girls than boys in Albania compared to OECD members average, (2) 5.2% more girls than boys in Albania compared to OECD partners average, (3) 10% more girls than boys in Albania compared to Singapore (1st country), (4) 9.5% more girls than boys in Albania compared to Lebanon (last country) are ranked in level 3 reading. So there are big differences in gender boys and girls ranking in below level 1b reading between Albania and OECD members and partners, as well as 1st and last country, where girls perform better than boys.

The data obtained as shown in table 1 indicates that: (1) 0.4% more girls than boys in OECD members average compared to Albania, (2) 0.1% more

girls than boys in OECD partners average compared to Albania, (3) 1.8% more girls than boys in Singapore (1st country) compared to Albania, (4) 0.1% more girls than boys in Albania compared to Lebanon (last country) are ranked in level 6 reading. So there are little differences in gender boys and girls ranking in level 6 reading between Albania and OECD members and partners, as well as 1st and last country, where girls perform better than boys. As a conclusion in reading the boys perform better than girls in the lowest level, meanwhile girls perform better than boys in medium and highest levels, although there are differences between Albania and OECD members and partners, as well as 1st and last country.

Mathematics' academic performance

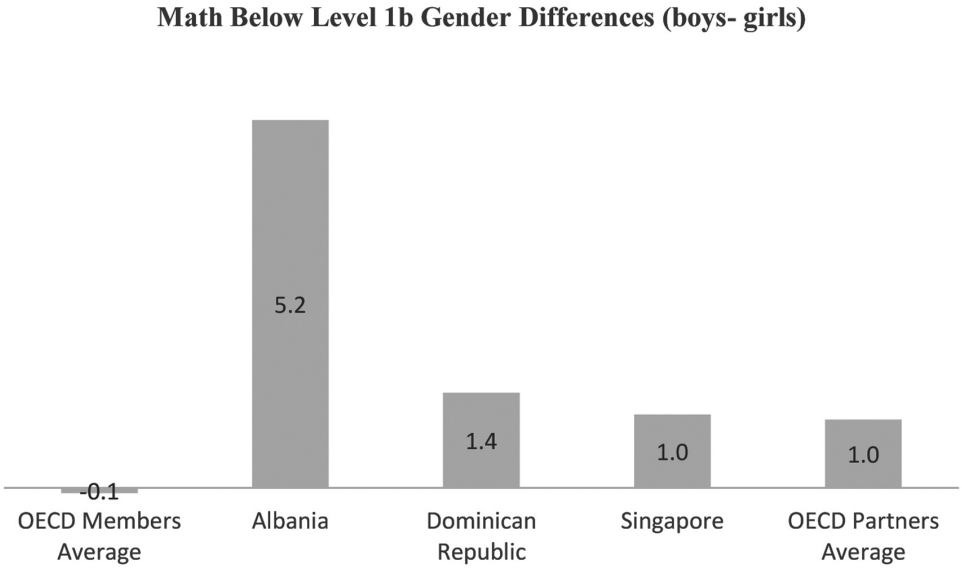
TABLE 2: Percentage of students at each proficiency level in mathematics, by gender, Albania vs OECD

		Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
		%	%	%	%	%	%	%
OECD Members Average	Boys	8.4	14.6	21.6	24.0	19.0	9.5	2.9
	Girls	8.5	15.2	23.5	25.7	18.2	7.2	1.7
	Gender Differences (boys- girls)	-0.1	-0.7	-1.9	-1.7	0.8	2.2	1.3
Albania	Boys	29.0	26.4	23.9	14.3	5.2	1.1	0.1
	Girls	23.7	27.5	27.0	15.3	5.6	0.9	0.1
	Gender Differences (boys- girls)	5.2	-1.1	-3.1	-1.0	-0.3	0.3	0.0
Dominican Republic (Last country)	Boys	69.0	21.3	7.9	1.6	0.2	0.0	0.0
	Girls	67.6	23.2	7.6	1.4	0.2	0.0	0.0
	Gender Differences (boys- girls)	1.4	-1.9	0.3	0.3	-0.1	0.0	0.0
Singapore (1st Country)	Boys	2.6	6.1	12.7	19.3	23.7	21.1	14.6
	Girls	1.5	4.9	12.2	20.8	26.6	22.5	11.5
	Gender Differences (boys- girls)	1.0	1.2	0.5	-1.5	-2.9	-1.4	3.0
OECD Partners Average	Boys	26.0	21.6	20.4	15.5	9.8	4.8	1.9
	Girls	25.0	22.7	21.5	15.7	9.5	4.3	1.5
	Gender Differences (boys- girls)	1.0	-1.0	-1.1	-0.2	0.3	0.6	0.5

Source: (OECD, 2016)

Below there is a figure illustrated math below level 1b gender differences' academic performance. Level 3, and level 6 gender differences' academic performance are analysed and discused too.

GRAPH 2: Percentage of students in math below level 1b gender differences



The data obtained as shown in table 2 or graph 2 indicates that: (1) 5.1% more boys than girls in Albania compared to OECD members average, (2) 4.2% more boys than girls in Albania compared to OECD partners average, (3) 4.2% more boys than girls in Albania compared to Singapore (1st country, (4) 3.8% more boys than girls in Albania compared to Dominican Republic (last country) are ranked in below level 1b math. So there are big differences in gender boys and girls ranking in below level 1b math between Albania and OECD members and partners, as well as 1st and especially last country, where boys perform better than girls.

The data obtained as shown in table 2 indicates that: (1) 0.7% more girls than boys in OECD members average compared to Albania, (2) 0.8% more girls than boys in Albania compared to OECD partners average, (3) 0.5% more girls than boys in Singapore (1st country) compared to Albania, (4) 1.3% more girls than boys in Albania compared to Dominican Republic (last country) are ranked in level 3 math. So there are little differences in gender boys and girls ranking in level 3 math between Albania and OECD members and partners, as well as 1st and especially last country, where girls perform better than boys, except Dominican Republic.

The data obtained as shown in table 2 indicates that: (1) 1.3% more boys than girls in Albania compared to OECD members average, (2) 0.5% more boys than girls in Albania compared to OECD partners average, (3) 3.0% more boys than girls in Albania compared to Singapore (1st country, (4) 0.0% difference between girls and boys in Albania as well as in Dominican Republic (last country) are ranked in level 6 math. So there are little differences in gender boys and girls ranking in level

6 math between Albania and OECD members and partners, as well as 1st and last country, where boys perform better than girls. As a conclusion in mathematics the boys perform better than girls in the lowest and the highest levels, meanwhile girls perform better than boys in medium level, although there are differences between Albania and OECD members and partners, as well as 1st and last country.

Science' academic performance

TABLE 3: Percentage of students at each proficiency level in science, by gender, Albania vs OECD

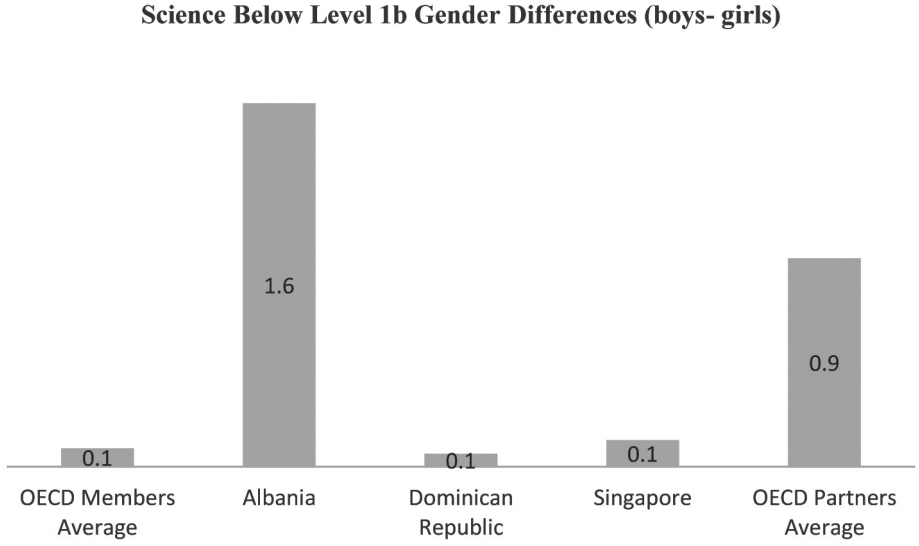
		Below Level 1b	Level 1b	Level 1a	Level 2	Level 3	Level 4	Level 5	Level 6
		%	%	%	%	%	%	%	%
OECD Members Average	Boys	0.6	5.2	15.9	23.9	26.1	19.3	7.5	1.3
	Girls	0.5	4.6	15.5	25.7	28.4	18.7	5.8	0.8
	Gender Differences (boys- girls)	0.1	0.6	0.4	-1.8	-2.4	0.6	1.8	0.6
Albania	Boys	2.4	13.3	33.2	31.3	15.5	4.1	0.3	0.0
	Girls	0.8	7.3	26.5	37.7	22.4	4.9	0.4	0.0
	Gender Differences (boys- girls)	1.6	5.9	6.8	-6.4	-6.9	-0.9	-0.1	0.0
Dominican Republic (Last country)	Boys	15.8	39.7	29.4	11.6	3.0	0.4	0.0	0.0
	Girls	15.7	39.5	31.3	11.0	2.2	0.3	0.0	0.0
	Gender Differences (boys- girls)	0.1	0.2	-1.9	0.6	0.8	0.1	0.0	0.0
Singapore (1st Country)	Boys	0.2	2.3	7.7	14.4	22.3	26.6	19.4	7.1
	Girls	0.1	1.6	7.3	15.8	24.6	28.9	17.7	4.0
	Gender Differences (boys- girls)	0.1	0.7	0.5	-1.4	-2.2	-2.3	1.7	3.1
OECD Partners Average	Boys	3.0	13.9	26.1	25.3	18.2	9.8	3.2	0.5
	Girls	2.1	11.5	25.9	27.9	19.9	9.7	2.6	0.4
	Gender Differences (boys- girls)	0.9	2.3	0.2	-2.6	-1.7	0.2	0.6	0.1

Source: (OECD, 2016)

Below there is a figure illustrated science below level 1b gender differences' academic performance. Level 3, and level 6 gender differences' academic performance are analysed and discused too.

The data obtained as shown in table 3 or graph 3 indicates that: (1) 1.5% more boys than girls in Albania compared to OECD members average, (2) 0.7% more boys than girls in Albania compared to OECD partners average, (3) 1.5% more boys than girls in Albania compared to Singapore (1st country, (4) 1.5% more boys than girls in Albania compared to Dominican Republic (last country) are ranked in below level 1b science. So there are relatively little differences in gender boys

GRAPH 3: Percentage of students in science below level 1b gender differences



and girls ranking in below level 1b science between Albania and OECD members and partners, as well as 1st and last country, where boys perform better than girls.

The data obtained as shown in table 3 indicates that: (1) 4.5% more girls than boys in Albania compared to OECD members average, (2) 5.2% more girls than boys in Albania compared to OECD partners average, (3) 4.7% more girls than boys in Albania compared to Singapore (1st country), (4) 7.7% more girls than boys in Albania compared to Dominican Republic (last country) are ranked in level 3 science. So there are considerably differences in gender boys and girls ranking in level 3 science between Albania and OECD members and partners, as well as 1st and especially last country, where girls perform better than boys, except Dominican Republic.

The data obtained as shown in table 3 indicates that: (1) 0.6% more boys than girls in OECD members average compared to Albania, (2) 0.1% more boys than girls in OECD partners average compared to Albania, (3) 3.1% more boys than girls in Singapore (1st country) compared to Albania, (4) 0.0% the difference between boys than girls in Albania as well as in Dominican Republic (last country) are ranked in level 6 science. So there are little differences in gender boys and girls ranking in level 6 science between Albania and OECD members and partners, as well as 1st and last country, where boys perform better than girls. As a conclusion in science the boys perform better than girls in the lowest and the highest levels, meanwhile girls perform better than boys in medium level, although there are differences between Albania and OECD members and partners, as well as 1st and last country.

Inferential statistics

Test of hypothesis

The relationship between gender and below level 1b, level 3, and level 6 students' academic performance was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity.

Hypothesis # 1: There is positive correlation between gender and reading' academic performance

Below there is a table illustrated correlation coefficients between gender and below level 1b reading' academic performance generated on SPSS 20.0. The other correlation coefficients between gender and level 3 and level 6 reading' academic performance are analysed and discused too.

TABLE 4: Correlation coefficients between gender and below level 1b reading' academic performance variables

Correlations				
			Boys	Reading Below Level 1b
Boys	Pearson Correlation		1	-.146
	Sig. (2-tailed)			.007
	N	350		350
Reading Below Level 1b	Pearson Correlation		-.146	1
	Sig. (2-tailed)	.007		
	N	350		350
Correlations				
		Girls		Reading Below level 1b
Girls	Pearson Correlation	1		-.526
	Sig. (2-tailed)			.002
	N	72		72
Reading Below level 1b	Pearson Correlation	-.526		1
	Sig. (2-tailed)	.002		
	N	72		72

As shown in table 4 there is a low, negative correlation between boys (gender) and below level 1b reading' academic performance, r = -.146, N = 350, p < .005; and medium negative correlation between girls (gender) and below level 1b reading' academic performance: r = -.526, N = 72, p < .005, with high levels of gender associated with lower levels of reading' academic performance. The value of correlation, for

boys and girls indicates that increasing of gender values would result in decreasing of reading' academic performance, although there are differences. Therefore girls perform better than boys, and the gender as an independent variable influences from a little too considerably reading below level 1b.

There is not a significant relationship between boys (gender) and level 3 reading' academic performance, r = .189, N = 321, p > .005; as well as for girls and level 3 reading' academic performance: r = .216, N = 501, p > .005. Therefore girls perform better than boys, but the gender as an independent variable does not influence level 3 reading.

There is a low, positive correlation between boys (gender) and level 6 reading' academic performance, r = .232, N = 0.3, p < .005; and medium positive correlation for girls and level 6 reading' academic performance: r = .435, N = 3, p < .005, with high levels of gender associated with higher levels of reading' academic performance. The value of correlation, for boys and girls indicates that increasing of gender values would result in increasing of reading' academic performance, although there are differences. Therefore girls perform better than boys, and the gender as an independent variable influences from a little to considerably level 6 reading.

Therefore, there is positive relationship between gender and reading' academic performance. These findings are supported by (Rasmusson and Åberg-Bengtsson, 2015, Brozo et al., 2014, Dronkers & Kornder, 2015, Stricker, Rock, & Bridgeman, 2015, Mucherah & Herendeen, 2013, Mateju & Smith, 2015, Lim, Bong, & Woo (2015). As a conclusion Hypothesis 1#: *There is positive correlation between gender and reading' academic performance, is been mostly supported, although there are differences between levels.*

Hypothesis #2: There is positive correlation between gender and mathematics' academic performance

Below there is a table illustrated correlation coefficients between gender and below level 1b math' academic performance generated on SPSS 20.0. The other correlation coefficients between gender and level 3 and level 6 math' academic performance are analysed and discused too.

TABLE 5: Correlation coefficients between gender and math below level 1b' academic performance variables

Correlations			
		Boys	Math Below Level 1b
Boys	Pearson Correlation	1	-.431
	Sig. (2-tailed)		.020

	N	830	830
Math Below Level 1b	Pearson Correlation	-.431	1
	Sig. (2-tailed)	.020	
	N	830	830
Correlations			
		Girls	Math Below level 1b
Girls	Pearson Correlation	1	-.121
	Sig. (2-tailed)		.030
	N	556	556
Math Below level 1b	Pearson Correlation	-.121	1
	Sig. (2-tailed)	.030	
	N	556	556

As shown in table 5 there is a medium negative correlation between boys (gender) and below level 1b math' academic performance, r = -.431, N = 830, p < .005; and low negative correlation between girls (gender) and below level 1b math' academic performance: r = -.121, N = 556, p < .005, with high levels of gender associated with lower levels of math' academic performance. The value of correlation, for boys and girls indicates that increasing of gender values would result in decreasing of math' academic performance, although there are differences. Therefore girls perform better than boys, and the gender as an independent variable influences a little below level 1b math' academic performance.

There is a low, positive correlation between boys (gender) and level 3 math' academic performance, r = .299, N = 410, p < .005; as well as for girls and level 3 math' academic performance: r = .116, N = 360, p < .005, with high levels of gender associated with higher levels of math' academic performance. The value of correlation, for boys and girls indicates that increasing of gender values would result in increasing of math' academic performance, although there are small differences. Therefore boys perform better than girls, and the gender as an independent variable influences a little level 3 math' academic performance.

There is not a significant relationship between boys (gender) and level 3 reading' academic performance, r = .189, N = 321, p < .005; as well as for girls and level 3 reading' academic performance: r = .216, N = 501, p < .005. The value of correlation, for boys and girls indicates that increasing of gender values would result in increasing of math' academic performance, although there are little differences. Therefore boys perform better than girls, and the gender as an independent variable influences a little level 3 math' academic performance.

There is not a significant relationship between boys (gender) and level 6 math' academic performance, r = .453, N = 2, p > .005; as well as for girls and level 6 math' academic performance: r = .117, N = 2, p > .005. Therefore boys and girls perform

equally, but the gender as an independent variable does not influence level 6 math' academic performance.

Therefore, there is positive relationship between gender and mathematics' academic performance. These results are supported by (Peng, Hong, & Mason, 2014, Johnson et al., 2012,Wang & Degol, 2017, Ganley & Vasilyeva, 2014, Martinez & Guzman, 2013, Erturan & Jansen, 2015, Hoppe et al., 2012, Gherasim, Butnaru & Mairean, 2013, Tomasetto, Alparone & Cadinu, 2011, Smeding et al., 2013, Shera, 2014). As a conclusion Hypothesis 2 #: *There is positive correlation between gender and mathematics' academic performance, is been supported.*

Hypothesis # 3: There is positive correlation between gender and science curriculum' academic performance.

Below there is a table illustrated correlation coefficients between gender and below level 1b science' academic performance generated on SPSS 20.0. The other correlation coefficients between gender and level 3 and level 6 science' academic performance are analysed and discused too.

TABLE 6: Correlation coefficients between gender and science below level 1b' academic performance variables

Correlations			
		Boys	Science Below Level 1b
Boys	Pearson Correlation	1	-.146
	Sig. (2-tailed)		.050
	N	68	68
Science Below Level 1b	Pearson Correlation	-.146	1
	Sig. (2-tailed)	.050	
	N	68	68
Correlations			
		Girls	Science Below level 1b
Girls	Pearson Correlation	1	-.526
	Sig. (2-tailed)		.006
	N	18	18
Science Below level 1b	Pearson Correlation	-.526	1
	Sig. (2-tailed)	.006	
	N	18	18

As shown in table 6 there is a relatively low, negative correlation between boys (gender) and below level 1b science' academic performance, r = -.276, N =

68, p < .005; as well as for girls (gender) and below level 1b science' academic performance: r = -.161, N = 18, p < .005, with high levels of gender associated with lower levels of science' academic performance. The value of correlation, for boys and girls indicates that increasing of gender values would result in decreasing of science' academic performance, although there are differences. Therefore girls perform better than boys, and the gender as an independent variable influences a little below level 1b science' academic performance as a dependent variable.

There is a medium, positive correlation between boys (gender) and level 3 science' academic performance, r = .496, N = 444, p < .005; as well as for girls and level 3 science' academic performance: r = .499, N = 525, p < .005, with high levels of gender associated with higher levels of science' academic performance. The value of correlation, for boys and girls indicates that increasing of gender values would result in increasing of science' academic performance, although there are small differences. Therefore girls perform better than boys, and the gender as an independent variable influences a little level 3 science' academic performance.

There is not a significant relationship between boys (gender) level 6 science' academic performance, r = .277, N = 0.3, p > .005; as well as for girls and level 6 science' academic performance: r = .312, N = 0.2, p > .005. Therefore girls perform better than boys, but the gender as an independent variable does not influence level 6 science' academic performance.

Therefore, there is positive relationship between gender and science' academic performance. These findings are supported by (Adigun et al., 2015, Ganley, Vasilyeva, & Dulaney, 2014, Makwinya & Hofman, 2015, Traxler et al., 2016, Murray, 2016, Sinnes & Løken, 2014, Bergold et al., 2017, Huang & Chen, 2016, Federer, Nehm & Pearl, 2016). As a conclusion Hypothesis 3 #: *There is positive correlation between gender and science curriculum' academic performance, is been mostly supported, although there are differences between levels.*

Conclusions and implications

Regarding to reading' academic performance the boys perform better than girls in the lowest level, meanwhile girls perform better than boys in medium and highest levels, although there are differences between Albania and OECD members and partners, as well as 1st and last country. Regarding to mathematics' academic performance the boys perform better than girls in the lowest and the highest levels, meanwhile girls perform better than boys in medium level, although there are differences between Albania and OECD members and partners, as well as 1st and last country. Regarding to science' academic performance the boys perform better than girls in the lowest and the highest levels, meanwhile girls perform better than

boys in medium level, although there are differences between Albania and OECD members and partners, as well as 1st and last country.

Regarding to relationship between gender and reading' academic performance it is found that there is positive correlation between variables. The value of correlation, for boys and girls mostly indicates that increasing of gender values would result in increasing of reading' academic performance, although there are differences between levels as well as between boys and girls. Regarding to relationship between gender and mathematics' academic performance it is found that there is positive correlation between variables. The value of correlation, for boys and girls indicates that increasing of gender values would result in increasing of mathematics' academic performance, although there are differences between boys and girls. Regarding to relationship between gender and science' academic performance it is found that there is positive correlation between variables. The value of correlation, for boys and girls mostly indicates that increasing of gender values would result in increasing of science' academic performance, although there are differences between levels as well as between boys and girls. Therefore education institutions as well as teachers should enhance their work in order to increase the students' academic performance for each level, as well as to narrow the differences in gender achievements of students in reading, mathematics and science.

The results of the study, supported by other researchers about the relationship between gender and reading, mathematics, and science' academic performance have important implications for future research. Such research should investigate the influence of other teaching methods, class management or other variables on academic performance. Results of this study also have important implications for practice. The important programs and other interventions, should designed to develop and to support students and teachers. Overall the findings of this study enhanced theoretical and practical understanding as to gender and reading, mathematics, and science' academic performance are in a positive relationship.

About the author

Dr Nazmi Xhomara is a lecturer at the Department of Education Sciences, Faculty of Social Sciences and Education, European University of Tirana. Dr Xhomara graduated on science teaching in 1988. As he was passionate about scientific research he obtained a Master Degree on "Research on Education" in 2012, and a Doctoral degree on "Education Sciences/Pedagogy" in 2015. He has published 6 books as well as numerous articles on the subjects of curriculum development, teaching and learning. He has participated in a numerous international conferences also. Currently, he is lecturing on Policy Education, Leadership and Management of Education, Curriculum, and Research Methods at the European University of Tirana.

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