Student's Gender and Its Impact on Science Related Subject Learning Quality

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Abstract

In our society is a presumption that training and training result's quality close depends on the student's gender. For instance, - male students better learn such subjects as Mathematics, Physics, Chemistry and so on. By contrast language's, social and humanitarian subjects or courses successfully acquire female students.

Based on the above mentioned objectives of the study is to find out whether the student gender is considered to be a significant factor that influence the successful acquisition of science-based subjects.

As a basis of the study was used general educational schools, where implement primary and secondary, school curricula. The study included 762 students from primary and secondary level. During the study were analysed disciplines such a Mathematics, Physics, Chemistry, Economics, History and Visual Arts.

The main research methods were quantitative methods, such as correlation analysis method (for instance Hi square method), and others.

Result of the research shows that in most of cases there were differences in acquisition of the subjects taking in to account the student gender.

Taking into account the above mentioned study results, in the further study were identified this distinction possible cause ore factors that promotes formation of the mentioned differences, as well, it was necessary to find out methods or approaches that can be integrated in the learning process in order to minimize the students gender impact on subjects learning quality.

1. Introduction

Speaking about today's educational process, including training programs quality of general education institutions, it is essential to pay attention to the teacher and students' mutual cooperation, and this cooperation's influencing factors. Today, one of the factors that has been selected for the study, it's purpose and object is the teacher and student gender, its influence on the curriculum learning quality. Beginning with the 20th century, many studies were oriented, or at a minimum, they have been included in the issue of teacher and pupil gender impact on the learning process, educational achievements, and their quality. Within the study in several cases there were detected significant differences in the interaction processes of breakdown by gender of teachers and students. [1]

Also in this study were found significant differences in assessments by subjects, as well as social study subjects girls gained better scores. By contrast, boys gained better scores in mathematics and physics.

2. Methodology

Based on the above, first and foremost of importance it is to identify all the interaction processes during the learning period within the framework between students and teachers. Secondly, it is essential to identify the teacher and students core competencies that are necessary for high-quality curriculum acquiring.[2]

Based on the above, within the study was developed a teacher and pupil interaction model.

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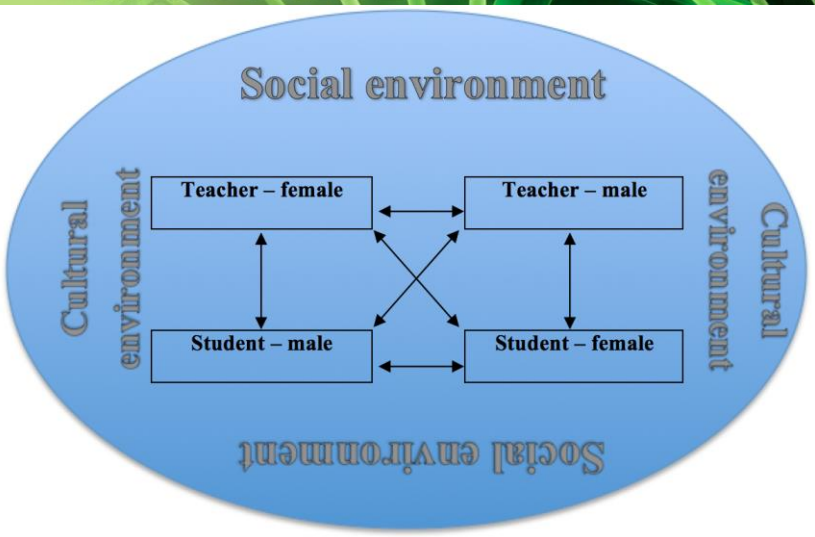

Fig.1. Teachers and students training process interaction model

As shown in Figure 1, it should be taken in to account not only teachers and students gender, but additionally interactions within the social and cultural environment.[3] Social and cultural aspects significantly impact the learning process and the quality of learning achievements, within it implemented the study, which analysed student achievement assessment broken down by their gender and stereotypes.[4]

For obtaining necessary information, it was carried out questionnaire. Each of the teachers and students competencies is characterized by five to six questions or claims. As a result, a questionnaire was established following these question and claim blocks: 1)justice; 2)management capabilities; 3)empathy; 4)communicability; 5) dynamics.

Questionnaires structure, according to the above presented competencies blocks consisting of thirty questions, of which twenty six questions were designed to respond to those respondents using a Likert scale, but four, - making a choice between offered answers. Polls implementation methodology was based on developed guidelines. [5]

The number of respondents was calculated using the formula: [6]

$$n = \frac{P \times Q \times t_{\alpha}^{2}}{\Delta_{\alpha}^{2} + \frac{P \times Q \times t_{\alpha}^{2}}{N}} \quad (1)$$

where

n – number of respondents;
N – general group amount or audience size;
P – probability of positive event;
Q = 1 – P – probability of negative event;
α – probability, reliability.
(In social studies, the reliability should be 95% and, therefore α = 0.5)
t = 1,96
Δ = 0,03 – margin error.

The above-mentioned formula is valid if the amount of the general group is within [1000; 10000].
If N < 1000, then survey must be carried out at least 95% from target group.

Based on above mentioned conditions, the survey was carried out using: a)Chi-square analysis; b) the graphical analysis; c) the cross-correlation and mathematical analysis..

In addition, it was carried out student analysis using 2015./16. study year assessments of study subjects: Mathematics, Physics, Chemistry, First Language, Literature, Nature Sciences, Computer Sciences and Economics.

It was taken into account the following conditions:

a) Over study should be choose subjects that run by the teachers of both genders;
b) Those who acquire the chosen subject, should be numerically proportional to each selected subject.

2.1. The Participants

General group in school year 2015./16. consisted of 2,138 students. Based on the above-mentioned calculations methodology, it was determined the minimum necessary number of respondents.

$$n = \frac{P \times Q \times t_\alpha^2}{\Delta_\alpha^2 + \frac{P \times Q \times t_\alpha^2}{N}} = \frac{0{,}5 \cdot 0{,}5 \cdot 1{,}96^2}{0{,}03^2 + \frac{0{,}5 \cdot 0{,}5 \cdot 1{,}96^2}{2138}} = 711{,}8 \approx 712$$

It shows that for 95 percent confidence level, the survey must be carried out not less than 712 respondents. Respondent's breakdown by class and gender is given in the Table 1.

Table 1. Respondent's breakdown by class and gender (M – male; F – female)

Class	5. grade		6. grade		7. grade		8. grade		9. grade		10. grade		11. grade		12. grade	
Student gender	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Number of students	67	54	66	51	72	49	74	31	65	42	45	27	42	18	47	12

The study included 762 students, of which – 478 male and 284 female. Respondent's were from fifth to twelfth grade students who acquire one or more of following subjects: Mathematics, Physics, Chemistry, First Language, Literature, Nature Sciences, Computer Sciences, Economics.

2.2. Data Collection Procedure

Implementation period of the survey: 2015./16. school year from January until May. The above-mentioned subject teachers distributed a questionnaire to students, providing the questionnaire filling instructions. Duration for completing questionnaire was 40 minutes. At the end of the survey questionnaire the data were compiled using MS Excel software.
Student's assessment data for analysis was obtained using electronic database, which was used for education institutions in Latvia.

2.3. Data Analysis Procedure

For the data quantitative analysis was used MS Excel software and chi-square criterion function.
Within study it needs to be clarified how the respondents given answers interconnects with each other, by students and teachers genders. In this case the above-mentioned methods are completely appropriate. In addition to this, the study was carried out with graphical data analysis.

3. Results

Respondent's answers chi-square criterion analysis summary of results is shown in Table 2.

Table 2. Chi-square criterion analysis summary

Nr.	Question	Chi-square theoretic	Chi-square empiric
1.	In this subject boys receive better score than girls	9,487	61,652
2.	If needed, then I can correct a bad grade in this subject	9,487	21,421
3.	In this subject's lessons the atmosphere is efficient and constructive	9,487	97,076
4.	Usually teacher's grade is corresponding to my level of knowledge in this subject	9,487	63,235
5.	If I haven't studied and I'm not ready for the test then the teacher lets me write it another time	9,487	146,279
6.	If I haven't finished my homework, I can bring it some other day	9,487	70,224
7.	Usually I like lessons in this subject	9,487	89,158
8.	During lessons students aren't listening to the teacher, they are inattentive, etc.	9,487	39,284
9.	Lessons in this subject begins and ends according to the class schedule	9,487	16,050
10.	In this subject the scores for boys and girls are equal	9,487	37,198
11.	Teacher provides a good discipline throughout the lesson	9,487	128,351
12.	If needed, I can tell teacher my secret	9,487	93,754
13.	I can freely discuss the problems in my class (group) with the teacher	9,487	60,310
14.	If need, I can seek help from teacher to understand the study material	9,487	64,921
15.	If I have a wrong answer on the task, teacher allows me to correct it	9,487	47,278
16.	I can ask the teacher an advice that's not related to the lesson	9,487	83,699
17.	Usually I study the new study materials independently	9,487	7,032
18.	Teacher explains the new study material only verbally	9,487	39,028

19.	During the lesson teacher asks questions to students	9,487	29,949
20.	Usually I understand the new study material through teacher's handouts	9,487	41,606
21.	Teacher explanation of the study material is clear and understandable	9,487	75,576
22.	To acquire the study material, I only need the information given during lessons	9,487	36,235
23.	If someone offends me, teacher stands up for me	9,487	32,051
24.	Usually teacher is busy	9,487	30,758
25.	Teacher usually answers questions I ask	9,487	84,983
26.	In this subject girls receive better scores than boys	9,487	42,862
27.	Teacher uses technical support to explain study material	7,814	140,707
28.	Teacher's reaction and reaction to a student being late to a lesson	7,814	48,856
29.	Teacher's reaction to homework not being done	7,814	25,357
30.	Teacher's reaction to mistakes made during the lesson	7,814	36,028

The calculation results show that the total average chi-square criterion empirical value is 59,698, but theoretical – 9,265. (See. Table 2) This means that the answers of the respondents to the questions in questionnaire are highly dependent on the students and teachers gender. The data in the table reflects the results of each question analysis separately using the chi-square test.
In a separate study it was made student assessment analysis broken down by classes, students gender and subjects. Summary of the data, see Table 3.

Table 3. Comparison of assessment breakdown by subjects and students gender

Student gender		Male	Female	Assessment comparison, female / male
Number of students		478	284	
Average score in the subject	Mathematics	5,57	6,04	0,47
	Physics	6,23	6,41	0,18
	Chemistry	6,32	6,71	0,39
	Visual Arts	5,77	7,42	1,65
	Economics	6,19	8,2	2,01
	First Language	5,38	6,44	1,06
	Literature	5,85	7,11	1,26
	Social Sciences	6,56	7,64	1,08
	Nature Sciences	5,84	6,25	0,41
	Comp. Sciences	7,1	7,3	0,2

In an analysis was found that female students receive better assessments in all subjects. However, if mutually compare the on science based subject block with social and humanitarian direction block subjects yet, it can be shown that female students acquire better social and humanitarian block subjects. Male students better study exact subjects.

4. Conclusions

Based on the results of the study can be concluded:

1. From the chi-square criterion analysis follows:
   1.1. There is a strong difference between the respondents, broken down by the teachers and students gender. (See. Table 2)
   1.2. Assessing the respondent's responses to individual survey questions using chi-square criterion methods, there are distinct differences in the breakdown by the teacher or the student's gender.
   1.3. The biggest difference to be determined by the teacher and the student's gender are seeing the respondents in their replies to the questions relating to the discipline in the classes.
   1.4. The survey results showed that male teachers are more open to new technological developments. In their daily work they more likely than women teachers use computer projectors, overhead projectors and IT-related data processing devices.
2. From the learning performance analysis of students follows:
   2.1. Male students better learn on science-based subjects: Mathematics, Physics, Chemistry and so on.
   2.2. Female students learn better social and humanitarian subjects.

References

[1] N. Rashidi and S. Naderi, 'The Effect of Gender on the Patterns of Classroom Interaction', Education, vol. 2, no. 3, pp. 30–36, 2012.
[2] K. Selvi, 'Teachers ' Competencies', vol. VII, no. 1, pp. 167–176, 2010.
[3] I. Crespi, 'Gender socialization within the family : a study on adolescents and their parents in

Great Britain', Bhps, pp. 1–36, 2003.
[4] E. Komisija, Dzimuma noteiktās izglītības rezultātu atšķirības Apskats par veiktajiem pasākumiem un pašreizējo situāciju Eiropā. .
[5] Geske, A., Grīnfelds, A. Izglītības pētniecība. – Rīga: LU, 2006. – 96. lpp.
[6] Goša, Z. Statistika. – Rīga: LU, 2004. – 236. lpp.