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Cross National Study on Pre-Service Elementary and Science Teachers' Opinions on Science Teaching

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Cross national study on opinions on science teaching was revealed on a sample of 1799 (596 males, 1203 females) pre-service elementary and science teachers' enrolled in various departments at selected universities in Croatia, Czech Republic, Lithuania, Slovakia, Slovenia and Turkey. Three factors explaining 43.4% of variance were extracted from a pool of 22 items of affirmative statements. In combination with all three factors it was possible to construct a ghost teacher. Such teacher, constructed from the study, recognizes the importance of active student-centred teaching with respect to culture of the society, both in content and values, but will in practice teach with high achievements in mind and teacher centred practice as a vehicle towards success. Differences between teachers from different countries, between genders and between study tracks are statistically significant. The most influential factor determining opinions is the dominant teaching culture of the country.

Keywords: pre-service teachers, opinions, science teaching, international study

INTRODUCTION

Teaching is a complex activity influenced by multiple factors, and what teachers actually do in a classroom is most relevant to students' learning (Kennedy 2010). Hawley and Rosenholtz (1984, p. 3, as cited in Supovitz & Turner 2000) concluded that

> *In virtually every instance in which researchers have examined the factors that account for student performance, teachers prove to have a greater impact than program. This is true for average students and exceptional students, for normal classrooms and special classrooms.*

When someone tries to identify the most important factors which affect teachers' work as effective or ineffective (Tschannen-Moran & Hoy 2001; Hus & Ivanuš Grmek 2011), the list seems endless. Factors can be broadly categorized in two groups as: external factors and internal factors (e.g. Guskey & Passaro 1994; Supovitz & Turner 2000; Flores & Day 2006; Kennedy 2010). The external factors are not considered here since they are out of the scope of this work. The reason

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State of the literature

- It is generally accepted that teachers are the most important factor in education.
- Opinions and beliefs of the teachers are an important factor, affecting teaching and learning as an outcome.
- Opinions and beliefs are largely based on previous experiences, personal biography, initial teacher training and teaching practice

Contribution of this paper to the literature

- Most of the prospective teachers recognize the importance of active teaching methods and are mostly positive oriented toward them.
- Most of the prospective teachers are product oriented and recognize active teaching methods as a vehicle toward higher achievements that is by many recognized as the most important goal of teaching.
- Findings of educational studies on different aspect of teaching revealed in one country most probably cannot be transferred to some other country without some dose of reserve and caution. The reason is that it is not problem in transferring teaching materials or strategies but you cannot transfer teaching culture and surrounding values.

is not because they are unimportant, but because we as teacher educators, can inform at best the pre-service teachers (PSTs) about the existence of some of them and give some generic advice how to react. For example PSTs giving lectures at their teaching practice at schools or novel teachers have to accept as given school curricula, textbooks chosen by some other teachers, list of books in a school library, available equipment in school laboratories, number of computers, and their initial impact on school culture is minimal. Regarding external factors and according to Sternberg (2001), wise teacher has three possibilities:

adaptation to existing environments,
shaping of existing environments,
selection of new environments.

Internal factors, in our context, are more about what teacher brings in a classroom 'in their head'. They are a combination of personal characteristics (Šimić Šašić & Sorić 2010), gender specifics (Hudson et al. 2010), explicit and tacit knowledge (Sternberg 2001), personal theories (Fox 1983), attitudes (Guskey 1988; Osborne, Simon & Collins 2003), motivation (Skinner and Belmont 1993), self-efficacy beliefs (Bandura 1993), pedagogical content knowledge (Shulman 1986; 1987), creativity style (Kirton 1976; Šorgo, et al. 2012), culture of the country (Šorgo et al. 2011). to mention only some of them, largely based on previous experiences, personal biography, initial teacher training and teaching practice (Flores & Day 2006, Hudson et al. 2010, Caires, Almeida & Vieira 2012).

An important factor, affecting teaching and learning as an outcome, are opinions and beliefs of the teachers. Rotsa, Kelchtermans & Aelterman (2012, p. 2) concluded that

> *The interconnection between teachers' self-understanding and subjective educational theory forms the core of their personal interpretative framework: the set of cognitions and beliefs that operates as a lens through which teachers perceive their job situations, make sense of them and act in them.*

Additionally, opinions and beliefs worked as a filter to criticism and recommendations of supervisors or lecturers (Rotsa, Kelchtermans & Aelterman 2012). The problem of opinions and beliefs in transformation of teaching practices is that they are very stable and resistant to change (Donche & Van Petegem 2011). In a framework of constructivist approach (Bodner 1986; Windschitl 2002) knowledge of teacher educators about opinions held by their students can be crucial in two directions. When inappropriate they must be actively challenged to be successfully replaced and when inline with intended classroom behaviour they can be used as a vehicle toward higher achievements.

Based on assumption 'that high quality professional development will produce superior teaching in classrooms, which will, in turn, translate into higher levels of student achievement' (Supovitz & Turner 2000, p. 965) and knowing that opinions and beliefs have a central role in teachers' actions, our central research focus was in identifying some of the opinions about teaching practices of pre-service elementary and science teachers. In addition, the interest was in identifying differences between teachers from six different 'new and candidate EU countries'. This paper presents a part of a broader research with the main purpose of inquiring if the same generic teaching strategies are appropriate to be used in a group of countries or every country, or even community or school should develop their local strategies (Šorgo, Ambrožič Dolinsek et al. 2011, Šorgo, Usak et al. 2011, Šorgo et al. 2012).

The design of the study was a survey which portrays and determines the participants' general tendency and opinions on science teaching. For the purpose of this research, the following research questions were generated:

Are there differences in opinions on science teaching with respect to the country?
Is there a difference in opinions on science teaching between males and females?
Is there a difference in opinions on science teaching between pre-service elementary and science teachers?

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METHOD

Sample and sampling

Sample consisted of 1799 pre-service teachers (PSTs) (596 males, 1203 females) enrolled in various departments (elementary school teaching and science teaching) at selected universities in Croatia, Czech Republic, Lithuania, Slovakia, Slovenia and Turkey (Šorgo et al. 2012).

The questionnaire was compiled in English language and later translated into the Croatian, Czech, Lithuanian, Slovakian, Slovenian and Turkish languages. Original and translated version in each country was checked by university staff proficient in both languages.

The questionnaire was administrated in a paper and pencil form to the participants in the summer semester of 2010 - 2011 academic year. Participation was voluntary based and anonymity of the participants was guaranteed. Questionnaires were administered by the teaching staff. Collected data were filled in spreadsheet files of each country and merged in a master-file used for later statistical analyses. Initial data were cleared and items with large missing parts were removed from the pool.

Distribution of the participants across to the countries is as follows; Croatia 165 (9.2%), Czech Republic 458 (25.5%), Lithuania 427(23.7%), Slovakia 103 (5.7%), Slovenia 310 (17.2%), and Turkey 336 (18.7%). Of all the participants, 962 (53.5%) were pre-service elementary school teachers and 837 (46.5%) were PSTs of science or different science subjects (Biology, Chemistry, Physics). Ratio between elementary school teachers and science teachers varies between countries as follows: Croatia 127 (77.0%): 38 (23.0%); Czech Republic 267 (58.3 %): 191 (41.7%), Lithuania 180 (42.2%): 247 (57.8%); Slovakia - only pre-service science teachers were in sample, Slovenia 143 (45.1%): 167 (53.9%), and Turkey 245 (72.9%): 91 (27.1%).

Data collection instrument

To address the research interest 'Opinions on Science Teaching Questionnaire' (22 items instrument) was assembled by the authors of the study. Statements were affirmative and follow the instruction 'In order to better understand what you think and feel about teaching, please respond to each of the following statements'. Response format is 1 = Not at all true; 2 = Hardly true; 3 = Moderately true; 4 = Exactly true. An example of such statements is: 'Asking questions should be allowed only after the teacher invites the students to ask'. Full list of items is shown in Table 1 and Appendix.

Data analysis

Prior to further analysis, data set was firstly subjected to descriptive statistics for checking missing cases and outliers. Additionally, data were checked for normality using Kolmogorov – Smirnoff test at a 0.05 significance level. All the variables do not meet assumption of normal distribution, which allowed testing differences with non-parametric tests. Kruskal-Wallis and Mann-Whitney tests were used (Erceg-Hurn & Mirosevich, 2008). Reliability of the questionnaires was calculated by using Cronbach's alpha. The value of 'alpha = 0.85' for the entire scale is satisfactory (Nunnaly, 1978). The values of Cronbach's alpha for the dimension ranged between 0.61 – 0.80. These values are generally accepted in educational research (e.g. Dhinda & Chung 2003).

Exploratory factorial analysis was performed. Principal component analysis with Varimax Rotation and Kaiser Normalization was used. Prior to the analysis Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.91) and Barlet's test of sphericity (Approx. Chi-Square = 7886,5; df = 231; $p < 0.0001$) were used to check data suitability for further analysis. Due to not normal distribution of some items, the results from principal component analysis should be considered with caution (Basto & Pereira 2012).

Differences in frequencies of PSTs' answers between countries, gender and study track were examined. In the Appendix 1, p-values of nonparametric tests are presented.

Correspondence Analysis (CA) (Hill 1973) ordination was applied to the teachers' opinions on science teaching matrix. The intention was to provide a visual representation of differences to the teachers' opinions on science teaching dependence between clustering of answers (Figure 1) different countries (Figure 2), study track (Figure 3) and gender (Figure 4). For analysis data which did not have all the answers were excluded. From 1799 samples, 1727 samples were used. The ordination methods (CA) and visualization of their results were carried out using the Canoco and CanoDraw programs (ter Braak & Šmilauer 2002). Other statistics were calculated by SPSS 19.0.

RESULTS

Results are presented in a form of tables and figures.

Exploratory factorial analysis and component matrix

Results of principal component analysis and ordination diagram for the whole sample are presented in Table 1 and Figure 1. Three factors were revealed. The first factor (8 items; Cronbach's alpha = 0.80) was

named 'Active teaching methods and students' participation', the second factor (8 items; Cronbach's alpha = 0.67) was named 'Importance of explicit knowledge', and the third factor (6 items; Cronbach's alpha = 0.61) was named "Pedagogy and culture".

The ordination diagram (CA) (Figure 1) is showing the distribution of 22 questions from 1727 samples, and 19 % of variance is explained by both axes. Names of variables are presented in Table 1 and Appendix. The first horizontal axis (Eigenvalue for the Axis 1 = 0.15) comprises a continuum of opinions on a scale between disagreements with the statement (vi4) 'Field-work is better to be avoided due to possible risks and injuries' and agreements with the statement (vi20) 'The role of homework is in better remembering what was learned in the lessons'. The second vertical axis (Eigenvalue for the

Table 1. Frequencies of the answers and factor loadings of three factors (F1 – F3). NT = Not at all true; HT = Hardly true; MT = Moderately true; ET = Exactly true.

No	Statement	N	NT	HT	MT	ET	F 1 Alpha = 0.80	F 2 Alpha = 0.67	F 3 Alpha = 0.61
vi4	Field-work is better to be avoided due to possible risks and injuries.	1798	**768** **42.7**	572 31.8	343 19.1	115 6.4	0.68		
vi9	Laboratory work is better to be avoided due to possible risks and injuries.	1798	**902** **50.2**	617 34.3	198 11.0	81 4.5	0.67		
vi15	Students should accept teacher's opinions.	1797	418 23.3	499 27.8	**621** **34.6**	259 14.4	0.66		
vi13	Students are not experts so their role in lesson planning should be minimized.	1797	603 33.5	**769** **42.8**	350 19.5	75 4.2	0.64		
vi14	Students learn the best if they are following teacher explanations in silence.	1797	**778** **43.3**	511 28.4	345 19.2	163 9.1	0.64		
vi21	Themes which can conflict student's worldviews should be avoided (e. g. Evolution).	1798	**725** **40.3**	630 35.0	337 18.7	106 5.9	0.53		
vi12	Problem-based teaching takes too much time and brings to less knowledge.	1795	521 29.0	**765** **42.6**	419 23.3	90 5.0	0.53		
vi8	It is a shame if teacher does not know the answer to student's question.	1799	**606** **33.7**	570 31.7	383 21.3	240 13.3	0.39		
vi20	The role of homework is in better remembering what was learned in the lessons.	1795	106 5.9	317 17.7	**812** **45.2**	560 31.2		0.72	
vi19	The most important role of teaching is providing students with skills to maximize their achievement in final examinations.	1792	182 10.2	522 29.1	**678** **37.7**	410 22.9		0.72	
vi2	Computers are a prerequisite of good teaching.	1799	280 15.6	610 33.9	**670** **37.2**	239 13.3		0.71	
vi1	Asking questions should be allowed only after teacher invites students to ask.	1798	**749** **41.7**	545 30.3	380 21.1	124 6.9		0.53	
vi16	Students should learn primarily from notes taken during the lesson.	1798	359 20.0	**650** **36.2**	601 33.4	188 10.5		0.53	
vi18	The last word in a classroom is always of the teacher.	1793	462 25.8	**519** **28.9**	512 28.5	300 16.7		0.50	
vi17	Teachers should avoid controversial themes where no clear answer is provided.	1798	480 26.7	**756** **42.0**	417 23.2	145 8.1		0.41	
vi11	Primary role of laboratory work is to confirm concepts and explanations given by the teacher.	1795	269 15.0	612 34.1	**645** **35.9**	269 15.0		0.37	
vi22	There is no place for religiosity in a classroom in science lessons.	1773	505 28.1	**629** **35.5**	388 21.9	251 14.2			0.67
vi7	Homework should be assigned only on rare occasions.	1796	543 30.2	**717** **39.9**	404 22.5	123 7.3			0.52
vi5	Good knowledge of content is more important than knowledge of pedagogy/didactics.	1799	278 15.5	**686** **38.2**	611 34.0	220 12.3			0.50
vi6	Group work does not bring better achievements of teaching.	1799	**711** **39.5**	658 36.6	316 17.6	114 6.3			0.47
vi3	Emotions have nothing in common with good science teaching.	1794	576 32.1	**682** **38.0**	389 21.7	147 8.2			0.40
vi10	Only what can be measured should be taught.	1798	**812** **45.2**	650 36.2	255 14.2	81 4.5			0.32

Axis 2 = 0.12) comprises a continuum between disagreements with the statement (vi22) 'There is no place for religiosity in a classroom in science lessons' and agreement with the statement (vi15) 'Students should accept teacher's opinions'. Axis 1 most probably resembles 'student centred' – 'teacher centred' orientation, and the axis 2 is most probably 'public expectancy scale', where school is regarded as a place where students should be educated in line with major culture of the society toward the highest achievements.

Differences in Opinions between Pre-Service Teachers from Different Countries

Differences in opinions between pre-service teachers (PSTs) from different countries can be recognized in Figure 2. Differences are statistically significant in all cases except for the item 'Emotions have nothing in common with good science teaching' (Appendix). 19% of variance is explained by both axes. Eigenvalue for Axis 1 = 0.15 and for Axis 2 =

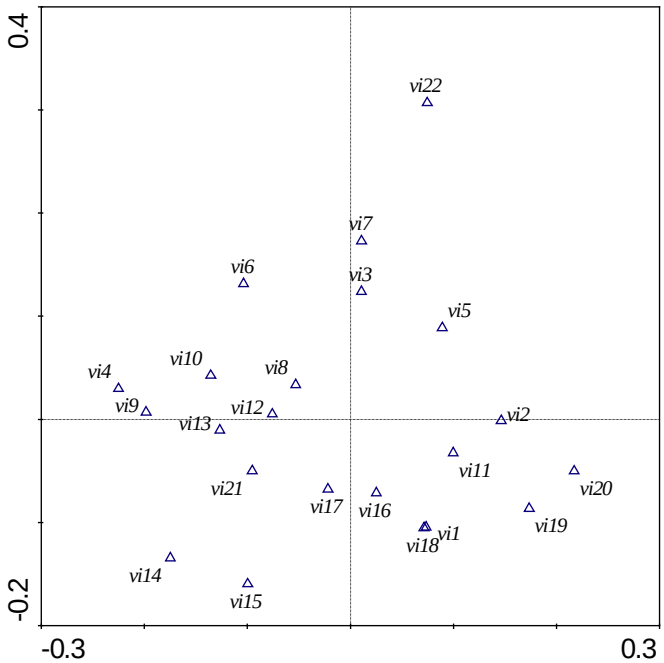

Figure 1. The ordination diagram (CA) of the distribution of 22 questions

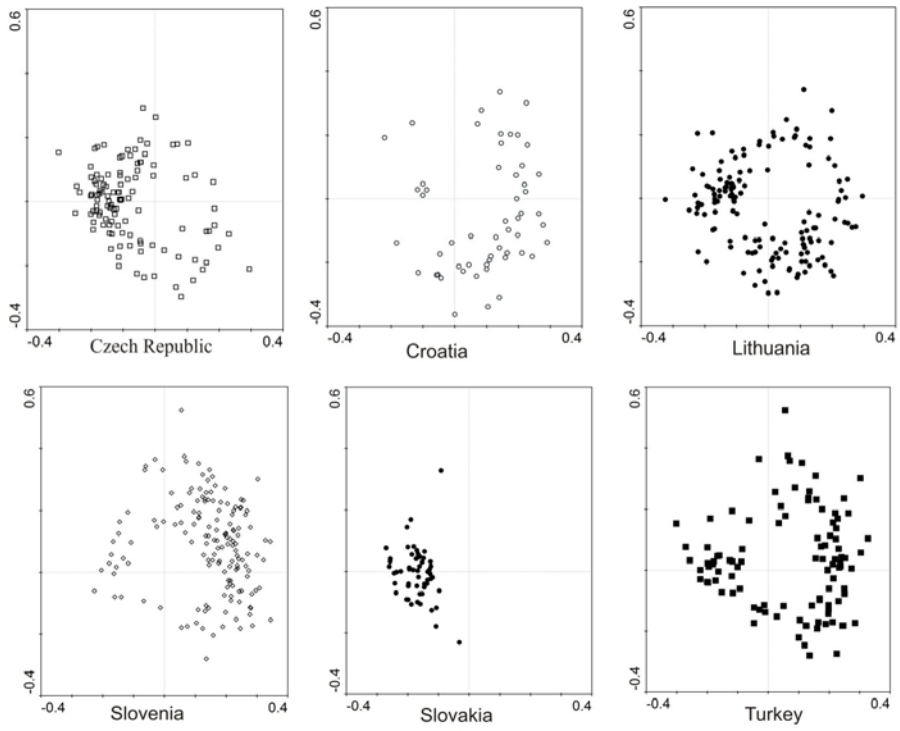

Figure 2. Samples from Czech Republic, Croatia, Lithuania, Slovenia, Slovakia and Turkey in the CA ordination diagram (matrix with 22 questions and 1727 samples).

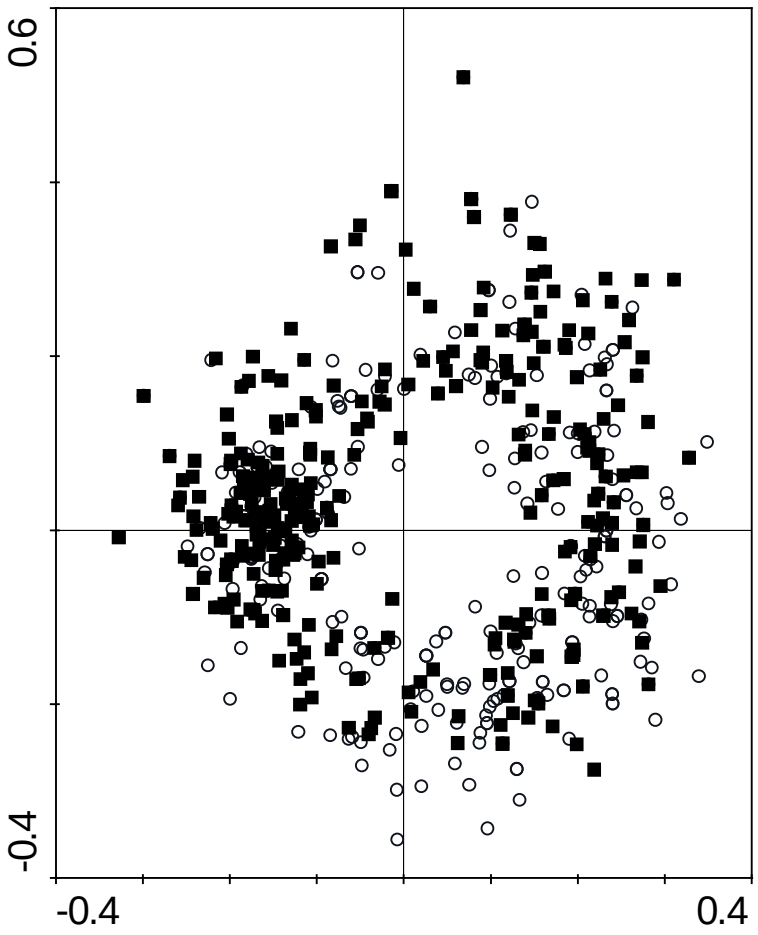

Figure 3. Results of correspondence analysis for differences in opinions between pre-service elementary and science teachers. Legend: empty circle – primary school teachers; black square – elementary and secondary school teachers.

0.12. The shown samples have the highest weight.

Differences in opinions between pre-service elementary and science teachers

Differences between pre-service elementary and science teachers (Figure 3) are smaller than differences between countries. Statistically significant differences were found in 14 of 22 items (Appendix). Eigenvalues for Axis 1 = 0.15, and for Axis 2 = 0.12. 19 % of variances are explained by both axes. The shown samples have the highest weight.

Differences in opinions between pre-service elementary and science teachers based on gender

Differences between male and female teachers (Figure 4) are smaller than differences between countries and study track. Statistically significant differences were found in 12 of 22 items (Appendix). Eigenvalues for Axis 1 = 0.15, and for Axis 2 = 0.12. 19 % of variance is explained by both axes. The shown samples have the highest weight.

Differences in factors between PSTs from different countries, gender and study track

Four factors were initially extracted explaining 43.4 % of variance and leaving more than half of variance unexplained, showing complexity of teaching and individual diversity of combinations of opinions. Clustering of opinions can be recognized in Figure 1. Due to factor loadings of items to more than one factor after detailed analysis three factors (Table 1) were formed with satisfactory reliability.

Factor1: Active teaching methods and students' participation

The first factor (Table 1) comprises 8 items (Cronbach's alpha = 0.80). From the frequencies of answers it can be recognized a dominant view that students should have active role in teaching – learning process, and student centred perspective. The highest loading to the factor adds rejection of the statements that 'Field work is better to be avoided due to possible risks and injuries', where only 6.4% of PSTs believe that this is exactly true, followed by the statement 'Laboratory work is better to be avoided due to possible risks and injuries' where the percentage is even lower (4.5%).

Differences between PSTs coming from different countries (Table 1, Table 2) are statistically significant (Kruskal-Wallis test: H (df =5, N= 1787) =347.98; p <0.0001) except between Croatian and Slovenian, Croatian and Turkish and Lithuanian and Czech PSTs.

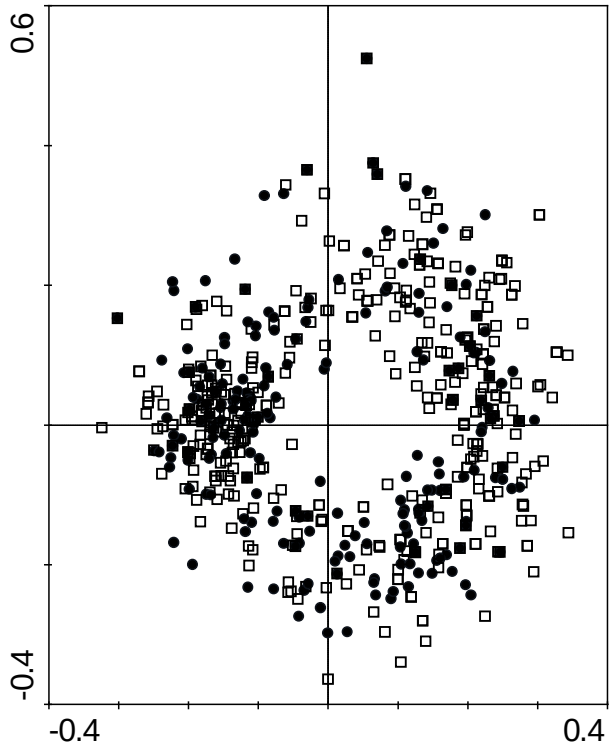

Figure 4. Samples from male and female in the CA ordination diagram (matrix with 22 questions and 1727 samples). Legend: black circle – male; empty square –female.

Table 2. Difference between countries for the first (F1= VI4 + VI9 + VI15 + VI13 +VI14 + VI21 + VI12 + VI8), the second (F2 = VI20 + VI19 +VI2 +VI1+ VI16 +VI18 +VI17 + VI11), and the third factor (F3= VI22 + VI7 + VI5 + VI6 + VI3 + VI10).

	Factor 1			**Factor 2**			**Factor 3**		
	N	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**
Croatia	155	14.28	4.15	152	18.96	4.27	153	10.96	3.42
Czech Republic	458	17.44	3.49	458	19.38	3.20	458	12.65	2.77
Slovenia	309	13.00	4.54	305	19.07	4.42	288	12.38	3.02
Lithuania	427	17.42	4.95	427	21.41	4.00	427	13.17	3.64
Slovakia	103	19.56	2.98	103	17.97	3.19	103	13.75	2.52
Turkey	335	14.56	4.75	332	18.44	4.17	331	11.69	2.90
Total	1787	15.98	4.76	1777	19.52	4.06	1760	12.47	3.19

From the results it can be concluded that Slovenian, Croatian and Turkish teachers are more enthusiastic in recognition of the importance of active role of students and active teaching strategies than Lithuanian, Czech and Slovakian PSTs at the other end.

Differences between males (N = 596; M = 16.76; SD = 4.89) and females (N = 1191; M = 15.59; SD = 4.65) are statistically significant (Mann Whitney U = 311475.0; $p < 0.0001$), showing that females rate active work higher.

Differences between pre-service elementary (N = 952; M = 15.55; SD = 4.42) and science teachers (N = 835; M = 16.46; SD = 5.09) are statistically significant (Mann Whitney U = 356012.5; $p < 0.0001$), showing that elementary teachers rate active work higher.

Factor 2: Importance of explicit knowledge

The second factor (Table 1) comprises 8 items (Cronbach's alpha = 0.67) on opinions oriented toward higher knowledge achievements. Even 75.4 % of PSTs think that it is exactly or moderately true that 'The role of homework is in better remembering what was learned in lessons' and 60.6% that 'The most important role of teaching is providing students with skills to maximize their achievement in final examinations', showing that teachers' opinions are predetermined toward giving major importance to measurable and recital knowledge.

Table 3. P values (2-tailed) of multiple comparisons between countries on the third factor. (Kruskal-Wallis test: H (5, N= 1760) =94.24 p < 0.001). Statistically non significant p-values are bolded.

	Czech Republic	Slovenia	Lithuania	Slovakia	Turkey
Croatia	0.000	0.000	0.000	0.000	**0.12**
Czech Republic		**1.000**	**1.000**	0.004	0.000
Slovenia			**0.23**	0.000	**0.10**
Lithuania				**0.09**	0.000
Slovakia					0.000

Differences between PSTs coming from different countries on the second factor (Table 1, Table 2) are statistically significant (Kruskal-Wallis test: H (df =5, N= 1777) =129.92 p <0.0001), yet only Lithuanian PSTs are statistically different from PSTs from all other countries. They are potentially the most authoritative future teachers in relation to teachers coming from other countries. Other difference is between Czech and Slovakian PSTs at the p = 0.02 level.

Differences between males (N = 593, M = 20.50; SD = 4.31) and females (N = 1184; M = 19.03; SD = 4.31) are statistically significant (Mann Whitney U = 280326.5; p < 0.0001) showing greater tendency toward product oriented teaching of male PSTs.

Differences between pre-service elementary (N = 946; M = 19.26; SD = 3.99) and science teachers (N = 831; M = 19.82; SD = 4.13) are statistically significant (Mann Whitney U = 359290.0; p = 0.02) but small.

Factor 3: Pedagogy and culture

The third factor (Table 1) is comprised of 6 items (Cronbach's alpha = 0.61). A combination of items consists of disagreements with provided statements. The highest loading is added by the total or partial disagreement with a statement 'There is no place for religiosity in a classroom in science lessons' probably connecting pedagogy with a personal worldview and a view, that school is not only the place for gaining knowledge but also an institution which should form students' personality.

Differences between PSTs coming from different countries on the third factor (Table 1, Table 2) are statistically significant (Kruskal-Wallis test: H (df =5, N= 1760) = 94.24, p < 0.0001). Differences and similarities between countries are hard to interpret, and are most probably connected with cultural differences and personal worldviews as a consequence of different teaching learning cultures in different countries. Because of complexity of relations p values are presented in Table 3.

Differences between males (N= 593; M = 12.94; SD = 3.53) and females (N = 1167; M = 12.23; SD = 2.98) are statistically significant (Mann Whitney U = 312119.0; p < 0.001) but small.

Differences between pre-service elementary (N = 930; M = 11.84; SD = 2.98) and science teachers (N = 830; M = 13.18; SD = 3.28) are statistically significant (Mann Whitney U = 295436.0; p < 0.0001), showing greater openness to a non-scientific issues among future elementary teachers.

DISCUSSION

From the results revealed in the present study some conclusions can be outlined. The first conclusion extracted from the factorial analysis is that regarding their opinions, PSTs are in somehow conflicting situation between what is taught at the Universities (idealistic view) and their first hand experiences of their previous schooling (realistic view). The first factor shows that they value active teaching methods high and recognize central role of students in a process of science teaching. But, on the other hand, instructions by their opinions must be oriented toward high achievements and high standards in authoritative teacher centred approach, as can be recognized with high level of agreement with the statement 'Primary role of laboratory work is to confirm the concepts and explanations given by a teacher'. This could be explained that students are learning at faculties during their pedagogic/didactics courses about benefits of active teaching methods and their positive effects. The finding goes in line with the results of number of studies where gained during the teacher trainings at the faculties (e. g. Supovitz & Turner 2000, Ivanuš-Grmek & Javornik Krečič 2008, Opfer & Pedder, 2011, Bilgin, Karakuyu & Ay, 2015) influence teachers' future career. But on the other hand, it can be explained by pre-service teachers' orientation towards high achievements, high standards of their personal experience in the school system (Hudson et al. 2010) and their knowledge about importance of high stake exams at the end of different stages of education (Ivanuš-Grmek & Javornik Krečič 2004). Blending of the teacher centred and student centred style of instruction, a similar finding was revealed in a qualitative study on a sample of Bulgarian science teachers (Tafrova-Grigorova et al. 2012). In another study the finding was that despite the courses, pre-service science teachers hold teacher centred beliefs (Taskin-Can 2011). The third factor comprises the idea that school is not only a place of teaching and learning content, but a place for education. The third factor goes more in line with the first factor and is most probably

connected with personal theories of teaching (Kagan 1992; Kreber 2010) and somehow contradicting the second factor that teaching must be product oriented, what can be assigned in some level to external societal factors (Koutrouba 2012). In combination with all three factors it was possible to construct a ghost teacher. Such teacher, constructed from the study, recognizes the importance of active, student-centred practices with respect to values of the society, both in content and values, but will teach with high achievements in mind and teacher centred practice as a vehicle toward success.

The answers to all three research questions (Are there differences in opinions on science teaching with respect to the country? Is there a difference in opinions on science teaching between males and females? Is there a difference in opinions on science teaching between pre-service elementary and science teachers?) are yes. Differences between teachers from different countries are greater than differences between gender or study track. The finding leads to the conclusion, that the most important factor in recognizing the importance of different views on good teaching is rooted in a school culture and values (Opfer & Pedder 2011), culture of the society (Allum et al. 2008) and personal belief system (Kagan, 1992; Kreber, 2010) which is changed to more pragmatic and less idealistic approach to teaching during the practice (Bartholomew, Moeed & Anderson, 2011, Bartholomew, Anderson. & Moeed, 2012).

From the results of the study we can conclude, that the results from the studies on different aspects of teaching learning revealed in one country most probably cannot be transferred to some other country without some dose of reserve and caution. The reason is that it is not a problem in transferring teaching materials or strategies but you cannot transfer teaching culture and surrounding values.

CONCLUSSIONS

From the study several conclusions can be outlined:

Most of the prospective teachers recognize the importance of active teaching methods and are mostly positive oriented toward them. Differences between genders, study track are statistically significant. The differences are the greatest between the countries.

Most of the prospective teachers are product oriented and recognize active teaching methods as a vehicle toward higher achievements, that is by many recognized as the most important goal of teaching. As in the previous case the greatest differences can be assigned to the country of origin.

Most of the prospective teachers are not against the inclusion of non-scientific issues in science education. The greatest differences can be assigned to the country of origin.

From the results of the study we can conclude that results from studies on different aspect of teaching learning revealed in one county most probably cannot be transferred to some other country without some dose of reserve and caution. The reason is that it is not problem in transferring teaching materials or strategies but you cannot transfer teaching culture and surrounding values.

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Appendix: P-values of statistical differences between answers of teachers from different countries, gender, and study track

No	Statement	Country (K-W)[a]	Gender (M-W)[b]	Study track (M-W)[b]
vi1	Asking questions should be allowed only after teacher invites students to ask.	0.000	0.005	**0.763**
vi2	Computers are a prerequisite of good teaching.	0.000	0.000	0.003
vi3	Emotions have nothing in common with good science teaching.	**0.126**	**0.216**	0.022
vi4	Field-work is better to be avoided due to possible risks and injuries.	0.000	**0.046**	**0.143**
vi5	Good knowledge of content is more important than knowledge of pedagogy/didactics.	0.000	0.000	0.000
vi6	Group work does not bring better achievements of teaching.	0.000	**0.262**	0.000
vi7	Homework should be assigned only on rare occasions.	0.000	**0.08**	0.000
vi8	It is a shame if teacher does not know the answer to the student's question.	0.000	**0.785**	**0.729**
vi9	Laboratory work is better to be avoided due to possible risks and injuries.	0.000	**0.102**	**0.335**
vi10	Only what can be measured should be taught.	0.000	0.000	0.000
vi11	Primary role of laboratory work is to confirm concepts and explanations given by the teacher.	0.000	0.000	0.000
vi12	Problem-based teaching takes too much time and brings to less knowledge.	0.000	0.000	0.000
vi13	Students are not experts so their role in lesson planning should be minimized.	0.000	**0.054**	0.000
vi14	Students learn the best if they are following teacher explanations in silence.	0.000	0.000	0.000
vi15	Students should accept teacher's opinions.	0.000	0.028	**0.694**
vi16	Students should learn primarily from notes taken during the lesson.	0.000	**0.571**	**0.087**
vi17	Teachers should avoid controversial themes where no clear answer is provided.	0.000	0.000	0.025
vi18	The last word in a classroom is always of the teacher.	0.000	0.001	0.003
vi19	The most important role of teaching is providing students with skills to maximize their achievement in final examinations.	0.000	0.000	0.061
vi20	The role of homework is in better remembering what was learned in the lessons.	0.000	**0.288**	0.000
vi21	Themes which can conflict student's worldviews should be avoided (e. g. Evolution).	0.000	0.000	0.039
vi22	There is no place for religiosity in a classroom in science lessons.	0.000	**0.910**	0.000

[a]Kruskal-Wallis
[b]Mann-Whithey U-test