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There are changes in the education system in Georgia. The National Educational Reform has started several years ago. The present study evaluates Georgian science teachers` and science student teachers` beliefs about teaching and learning. To draw a broad view about their beliefs, qualitative and quantitative instruments have been used. Generally, the assumption is that both groups mainly hold traditional beliefs about teaching and learning. However, the study reveals that differences between teachers and student teachers are noticeable. While student teachers are strong traditional in their beliefs, science teachers show tendencies toward modern beliefs. The results are discussed and the recommendation for the further development of science teacher education in Georgia is given.

Keywords: science teachers' beliefs, student teachers' beliefs, science teacher education in Georgia

INTRODUCTION

In many countries science teaching pedagogies are still dominated by a teacher-centered approach. Although constructivism is widely accepted in science education, the practice in science classrooms in a lot of cases is still dominated by the transmission oriented pedagogies of learning. This consideration is especially true for the systems in the Central and Eastern Europe which are still on their way of reform from the communist time towards modern educational systems and practices (Kapanadze, Janashia & Eilks, 2010).

Anyhow, the education reform started in 2004 in Georgia. There are changes in school system and some innovations are noticeable in teaching. A lot of trainings for in-service teachers have been delivered. The trainings focused on giving an overview about the modern teaching and learning methods in science. The majority of public school teachers were trained within the framework of the designed programs by the experts from the Ministry of Education and Sciences of Georgia. The training program was mandatory for all teachers. Nevertheless, there were no trainings for University level academic staff, who are primarily involved in the university education of student teachers. There are only EU Projects that aimed at modernization of the higher educational system. Notably, one of such externally-funded projects is Student Active Learning in Science (SALiS). SALiS aimed at innovating science teaching through a better inclusion of inquiry-based and student-active experimental learning in science classes (Kapanadze et al., 2011). SALiS members have created the modules, which aim at enabling pre- and in-service science teachers to strengthen their knowledge about

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State of the literature

- There often exists a discrepancy between the stated official language-in-education policy and the actual practice in the science classroom.
- To improve the quality of teaching and learning is very important that teacher bases on the terminology, which is used in National Curricula

Contribution of this paper to the literature

- By reviewing and synthesizing selected literature, this paper enriches the emerging knowledge base about the studies of teachers beliefs
- The paper evaluates Georgian science teachers` and science student teachers` beliefs about teaching and learning.
- This paper recommends that university science teacher education should devote continuous efforts to modify student teachers' beliefs about teaching and learning by mainly modeling constructivist teaching approaches and by clearly indicating the importance of an orientation towards Scientific Literacy for All. University science teacher educators should be obvious about the student teachers` beliefs about teaching and learning and take this knowledge as a starting point in planning their seminars and lecturers.

hands- and minds-on student learning through innovative approaches to lab-work instruction, e.g. inquiry-type strategies, open lab tasks, or cooperative learning in the lab environment (Hofstein & Mamlok-Naaman, 2008; Witteck, Most, Kienast, & Eilks, 2007).

Changes in Georgian School System

In 2004, the experts at the National Curriculum and Assessment Centre began to create the National Curricula for the Public Schools. Later they worked on the Teachers Professional Standard. The programs became outcome based. The new standards are student-oriented and based on the development of inquiry skills. This applies to the public and private schools.

The process of implementation of the National Curriculum began in 2006 with several particular changes in the content of education. Namely, learning and teaching approaches were changed fundamentally. Inquiry-based learning, discovery learning, and problem-based learning were main desired methods suggested in Science Curriculum.

Consequently, teachers' qualifications requirements were reconsidered as well. In achieving the outcomes of the National Curriculum, the Ministry approved new standards for science teachers that specifies the competencies required from science teachers.

The Ministry of Education and Science allocated a number of priorities for successful implementation of Science Curriculum. Those are:

A) Guidelines for Inquiry-based learning
B) Teachers' qualification development programs
C)Appropriate laboratories for inquiry-based learning (Slovinsky, 2012)

We know teachers are the key to success of any innovation (Anderson & Helms, 2001). The knowledge about this key-factor is missing in Georgia. Furthermore, the interest of this study is triggered by the National Educational Reform in Georgia. The results of the present study will be the first overview about the student teachers` and teachers` beliefs after 6 years of the implementation of the new science curricula and the starting point for further recommendations. Thus, the purpose of this study is to investigate Georgian science teachers` and science student teachers` beliefs about teaching and learning.

Theoretical Framework

"Teachers' beliefs" is not a new topic in science education research. Bandura (1986) stated that beliefs tend to be the best indicators of one's personal behaviour. Pajares (1992) documented the rising importance of studies inquiring teachers' behavior, because as Kobala, Graeber, Coleman, & Kemo (2000) concluded, beliefs influence all kinds of interactions between teachers and pupils. In line with ideas of Pajares (1992), we define 'beliefs' as a weak but inclusive construct which covers any mental predisposition a teacher or a student teacher holds and which affects his/her behaviour in class (Markic, Valanides, & Eilks, 2008). Those beliefs stem from personal experience, knowledge and/or social background.

In general there are two different ideologies that describe teachers` beliefs (van Driel et al. 2007). One end of the spectrum stands for teacher-centered (Bramald, Hardman, & Leat, 1995) or subject-matter oriented (Billig et al., 1988). The other end is personal (Shen, 1997), which has also been referred to as the student-supported (Trigwell et.al., 1994) or learner-centered (Bramald et al., 1995). After analyzing the different studies in this field and collecting the data, Markic and Eilks (2008) put the results together and suggested a spectrum as a range between traditional beliefs (transmission-oriented beliefs of learning with a focus on pure subject-matter knowledge) and modern beliefs (beliefs based on constructivistic learning, student-oriented classroom structures, and an orientation on more general educational skills, including Scientific Literacy for All).

Additionally, many studies from different countries show that secondary science teacher are more content-structure-focused, teacher-centered and less

constructivistic in comparison to student teachers for primary science (Skamp & Mueller, 2001). For German context, the research on science student teachers` beliefs about science teaching and learning is done by Markic et al. (2008). This study showed that physics student teachers hold mostly traditional beliefs. Chemistry student teachers were also traditional, but more open than physics student teachers. Biology student teachers and primary science student teachers appeared to be much more open and student-oriented. Fischler (1999) evaluated physics student teachers` beliefs in terms of thinking about their physics classes at school. They described very passive pupils and a dominant teacher. Fischler argued that the student teachers` beliefs are linked with their experiences from their school time as pupils.

The quality of science education in schools is affected by the teachers' beliefs about the curriculum design as well. Curriculum specialists have discussed about several curriculum orientations. For example, McNail (1996) identified four different curriculum orientations: academic, social reconstructionist, humanistic, and technological. Cheung and Ng (2000) gave the summary of five curriculum orientations: Academic, Cognitive Process, Society-centered, Humanistic, and Technological. Cheung and Ng (2000) found no statistically significant change in science teachers' beliefs about any of the five specific curriculum orientations when they had gained more teaching experience.

Liu and Tsai (2008) evaluated differences in college students' scientific epistemological views of a various aspects. The results indicated that the science students have less sophisticated beliefs in the theory-laden and cultural-dependent aspects of science than non-science students. They argued that students' views about the culture of science were influenced by their school science. Findings of this study suggest that much work need be done to develop students' epistemological understandings of science at the secondary and postsecondary education level. Schraw (2001) mentioned that teacher educators need a better understanding of what kind of epistemological beliefs student teachers hold and how these beliefs develop. Liu and Tsai (2008) concluded that university science educators should also be more reflective on their own epistemological beliefs and the interactions with students' beliefs in order to design instruction that can improve students' epistemological development.

However, when it comes to the educational reform (like the one in Georgia) the questions are: Are such beliefs divers and divided? Can a teacher or a student teacher hold different beliefs when it comes to learning and teaching? Are the beliefs about science teaching and learning coherent within themselves and can we talk about a belief system in this context? To answer these questions, some studies are done. Study of Minor, Onwuegbuzie, Witcher, and James (2002) shows that student teachers` beliefs are a mix of pictures about teaching and learning. In their study, student teachers support both transmissive and constructivistic beliefs about teaching at the same time. Also Chai, Hong, and Teo (2009) explored this. They described that single beliefs can appear simultaneously and might be contradictory. Samuelowicz and Bain (1992) tried to give an explanation for appearance of this. They think that teachers adapt their beliefs to a certain situation. They think that the beliefs also depend in teacher´s content matter and their view of the context. Opposite to this view, Markic and Eilks (2008) found that science student teachers` beliefs seem to be quite coherent in the case of a certain science teaching domain.

Generally, it can be said that different factors influence and shape student teachers' and teachers' beliefs. These include their learning experiences as a child in school, his/her educational background, the quality of pre-service experiences provided in the classroom, the number of opportunities for self-reflection (or the lack of) during pre-service training, and the influence of discipline-related and domain-specific subject matter training (e.g. Bean & Zulich, 1992). This includes the national educational policies, the context of cultural norms and values in the society in which the teachers work (Isikoglu, Basturk & Karaca, 2009). Furthermore, Markic and Eilks showed (2010) that there are substantial changes in chemistry student teachers` beliefs during their university teacher training program. The study shows the connection between the practical teaching experiences and the change of the beliefs as well. More precisely, Markic and Eilks evaluated that especially the first phases of the teaching experiences in school as a teacher and not as a student teacher anymore, are of crucial importance for the change of the beliefs. Also Luft (2009) described considerable changes in teachers` beliefs during the first year of teaching. This study revealed that teachers who participated in their kind of science-specific induction programs significantly abandoned teacher-centered beliefs and practices in favor of more student-supportive ones. Further, Luft (2009) showed that beliefs structures can be changed by educational programs, moving them from more teacher-centered, purely content-structured forms to more open, student-orientated contexts and methods. The structure and stage of training also seems to be of particular relevance when it comes to (prospective) teachers' beliefs.

Table 1. An overview of the scales from the qualitative part (Markic & Eilks, 2008)

	Traditional beliefs		Modern beliefs
Belief about Classroom Organization	The classroom activities are mostly teacher-centered, directed, controlled, and dominated by the teacher.	↔ -2, -1, 0, 1, 2	Classes are dominated by student activity and students are (at least partially) able to choose and control their activities.
Belief about Teaching Objectives	The focus of Science teaching is more or less exclusively focused on content learning.	↔ -2, -1, 0, 1, 2	Learning of competencies, problem solving or thinking in relevant contexts are the main focuses of teaching.
Epistemological Beliefs	Learning is passive, over-directed and controlled by dissemination of knowledge.	↔ -2, -1, 0, 1, 2	Learning is a constructivist, autonomous and self-directed activity.

Table 2. The description of each dimension for the scientific epistemological beliefs (Tsai & Liu, 2005)

	Description	
Dimension	**Constructivist-oriented view**	**Empiricist or positivist-aligned view**
Role of the Social Negotiation (SN)	The development of science relies on communications and negotiations among scientist	Science is a process of individual exploration, mainly depending on personal efforts.
Invented and Creative Nature of Science (IC)	Students understand that scientific reality is invented	Students understand that scientific reality is rather discovered
Changing and Tentative Feature of Science Knowledge (CT)	Scientific knowledge is always changing and its status is tentative	Science provides the truth of the nature

Due to the recently launched educational reform in Georgia, there are some changes in science education and science teacher education. On the other hand, science education is quite a novelty in Georgia. There is a lack of significant studies and researchers in this field are very few. It is evident that an educational reform can only succeed if (student) teachers` beliefs are taken into account. This study, therefore, serves the purpose to explore the research question about the situation in Georgia when it comes to science (student) teachers` beliefs. Based on the results, the study will shed a light on which direction the educational reform has been gone till now. Additionally, the results can inform us, if there is a need to suggest change in the ideas behind the Georgian educational reform.

METHODS

To answer the research question in this study and generate the data base for characterizing Georgian science student teachers' and science teachers` beliefs we used different instruments: one qualitative and three quantitative. The different dimensions evaluated by the various tools are separate, independent areas of beliefs. As a consequence, the beliefs were first analyzed individually (see also Törner, 1996).

Qualitative Study

In the qualitative part, the participants were instructed to draw themselves as science teachers in a typical classroom situation and to answer four open questions. This idea is taken from the 'Draw-A-Science-Teacher-Test Checklist' (DASTT-C) by Thomas, Pedersen, and Finson (2001) supplemented with questions about teaching objectives, and prior activities (Markic et al., 2008). The data analysis pattern was developed by the beginning steps of the Grounded Theory as described in Markic et al. (2008). The core category is the range between the predominance of more traditional and more modern teaching orientation. More modern in this case means in line with actual educational theory. Three five-step scales were developed focusing on 1) Beliefs about Classroom Organization, 2) Beliefs about Teaching Objectives and 3) Epistemological Beliefs. The validity of the data was achieved through independent rating and searching for inter-subjective agreement (Swanborn, 1996). The short description of the three categories is given in Table 1.

Quantitative Studies

A) Beliefs about Teacher- / Student – Centeredness

The first quantitative study is an original version of the questionnaire used in a qualitative study. The central idea of the 'Draw-A-Science-Teacher-Test Checklist' (DASTT-C) as developed by Thomas et al. (2001) is to ask teachers to spontaneously draw themselves and their students in a typical science teaching situation. DASTT-C asks the participants the question 'How do you see yourself as a teacher?' The drawing is accompanied by two open questions, which ask for a description of the teacher's and the students' activities in that situation.

Thomas et al. (2001) developed a rating scale based on a 13-point checklist of teacher- and student-centered attributes in three areas (teacher, students, and environment). Each of the 13 attributes within the three sections is scored with 1 or 0 representing the presence or absence of the respective attribute. Total scores range from 0 to 13. Scores between 0-4 indicate student-centered teaching and scores between 7 and 13 teacher-centered teaching approach, while for scores 5 or 6 no decision should be made.

All the science (student) teachers' drawings were independently rated by two researchers according to the checklist. The inter-rater reliability was sufficiently high ($\varkappa$=0,70; 85,3%). In those few cases of disagreement, the data was jointly handled by the two researchers and a joint score was negotiated through inter-subjective agreement as discussed by Swanborn (1996).

B) Scientific Epistemological Beliefs

The second quantitative study focuses on Georgian science (student) teachers` scientific epistemological beliefs. The study is based on a multidimensional Likert-questionnaire developed by Liu and Tsai (2008). The dimensions cover the issues related to the epistemology of science proposed by Ryan and Aikenhead (1992) and Lederman et al. (2002). Furthermore the instrument placed an emphasis on the cultural impacts on the development of science (Liu & Tsai, 2008). The dimension are: (i) Role of the Social Negotiation (SN), (ii) Invented and Creative Nature of Science (IC), (iii) Theory-laden Explanation (TL), (iv) Cultural Impacts (CU) and (v) Changing and Tentative Feature of Science Knowledge (CT). Because of the poor values of Cronbach`s α only the results for the dimensions Role of the Social Negotiation, Invented and Creative Nature of Science and Changing and Tentative Feature of Science Knowledge will be discussed here. The short description of the scales is presented in Table 2.

The questionnaire contains 18 items (SN=7, IC=5, CT=6). The items are rated on a six-point scale – from 1 (strongly disagree) to 6 (strongly agree). The data was interpreted by calculating mean scores, standard deviations, and missing values. The Pearson correlations and t-tests between the scales were explored as well. All data analysis was performed using SPSS 16.0G for Windows.

C) Beliefs toward the Nature of Good Education

The third quantitative questionnaire is about to assess the general orientation and objectives of education, the nature of the educational content, and desirable way of knowledge acquisition (Hermans, Van Braak, & Van Keer 2008). The beliefs are measured on two dimensions. The first dimension is Transmissive Beliefs (TB) which assess the extent to which respondents believe education serves external goals and is outcome oriented with a closed curriculum. The second dimension represents Development Beliefs (DB) and determines to what degree education should be oriented towards broad and individual development, be process oriented with an open curriculum, and to what degree knowledge should be acquired through construction (students are active participants in and contributors to their own development). The questionnaire contains of 18 items (9 items per dimension). The items can be rated on a six-point scale – from 1 (strongly disagree) to 6 (strongly agree). The data was interpreted by calculating mean scores, standard deviations, and missing values. The Pearson correlations and t-tests between the scales were explored as well. All data handling was performed using SPSS 16.0G for Windows.

Sample

Different science teachers and science student teachers in Georgia participated in the study. The teachers are from different parts of Georgia (e.g Batumi in the west or Telavi in the east). The participants were from state and private schools. They got the questionnaires during the working day, and they returned completed ones on the same day, or the day after. 46 science teachers participated in the study. In addition, 32 science student teachers from different universities participated in the study as well. Within both groups there is a strong dominance of female participants. This represents the situation in Georgia. When it comes to student teachers they are at the beginning of 20-ies and have no experience. The teachers are mainly older than 40 and thus, have 15 and more years of experience in teaching science. Table 3 presents some of the characteristics of both groups.

Table 3. Characteristics of the participant in the present study

Characteristic		Student Teachers (N=32)	Teachers (N=46)
Sex	**Male**	4 (12,5 %)	2 (4,3 %)
	Female	28 (87,5 %)	44 (95,7 %)
Age	**20 to 29**	32 (100 %)	2 (4,3 %)
	30 to 39	0 (0%)	5 (10,9 %)
	40 to 49	0 (0%)	20 (43,5 %)
	50 to 59	0 (0%)	13 (28,3 %)
	60 and more	0 (0%)	6 (13,0 %)
Experience (years)	**1 to 5**	0 (0%)	4 (9,1 %)
	5 to 15	0 (0%)	18 (40,9 %)
	15 and more	0 (0%)	24 (50,0 %)

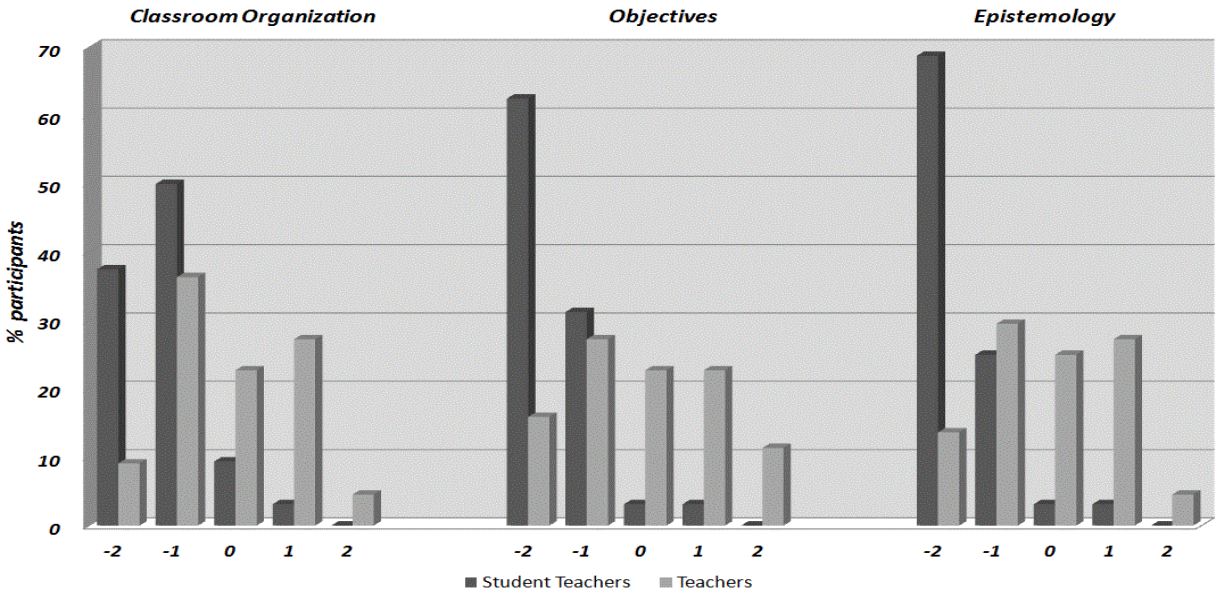

Figure 1. Results for a qualitative study for the groups of Georgian science teachers and science student teachers

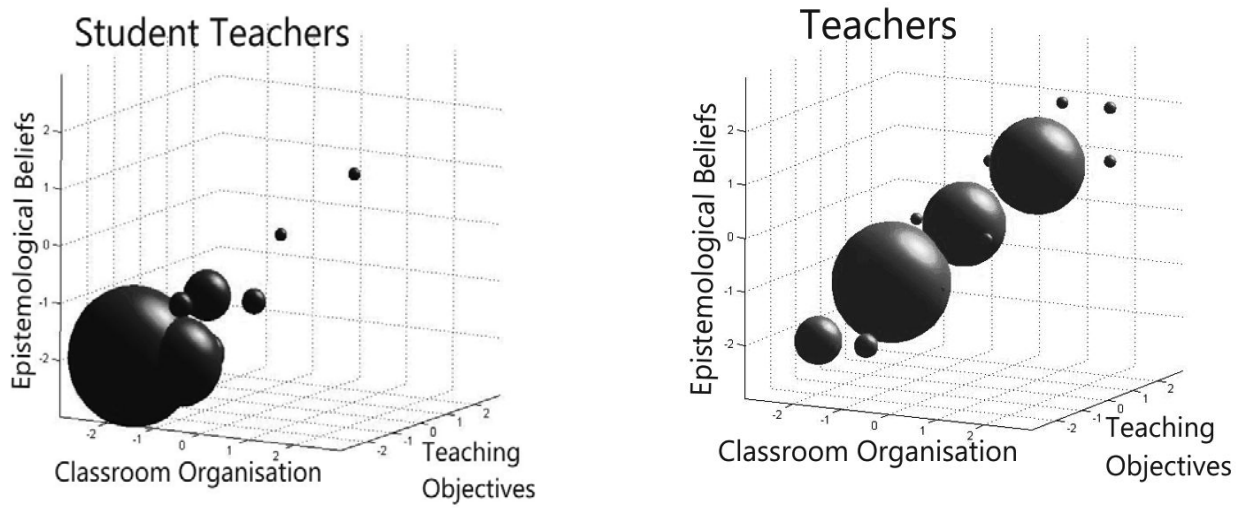

Figure 2. Results for a qualitative study for the groups of Georgian science teachers and science student teachers (3D-diagram)

According to the characteristics of the sample groups of participants, it can be claimed that the sample is not a representative one. Those are not all of the science student teachers and science teacher in Georgia. However, both groups are not special in any meaning. Looking at the whole population of the Georgian science student teachers and science teachers, the both groups could be any groups of science student teachers and science teachers in Georgia.

RESULTS

Qualitative Study

The results of the qualitative study for both groups are presented in Figure 1. The results suggest that Georgian science student teachers and science teachers hold more traditional beliefs in all three categories. The tendency to the left side of the diagram is strong for all three categories for both groups. However, there are some differences between the two groups.

From the Figure 1, it is clear that student teachers in Georgia hold more traditional beliefs about science teaching and learning comparing to Georgian science teachers. This is especially true when it comes to the Epistemological Beliefs as a very high majority of student teachers in this sample (about 70%) sees learning as a receptive process. The beliefs of Georgian teachers for this category are more heterogeneous when it comes to learning and teaching. Almost the same number of teachers holds the traditional idea about learning as well as the modern one. The same situation is to be seen in the categories about Classroom Organization and Teaching Objectives. On the other side, here is to say that Georgian science student teachers in this study concerning the both categories are more or less traditionally oriented. Especially, in the category about the Classroom Organization almost the same percentage of the student teachers gets the rating in "-2" and in "-1".

Another important aspect of the data is related to interpreting the combinations of the data represented by the three qualitative categories. If a teacher has similar classifications in each of the three categories, then the combination of the codes will appear along or near the diagonal from (-2/-2/-2) to (2/2/2) (room diagonal). The 3D-representations are shown in Figure 2. The closer a (student) teacher's code combination approaches the lower, left, front most part of the three dimensional plot, the more traditional the beliefs are. The nearer a code combination comes to the upper, right, hindmost corner of the diagram, the more the student teacher's beliefs fall in line with modern educational theory.

From the diagrams in Figure 2 the similarities and differences between the groups are obvious to be observed. In both of the groups is the code combination for the three categories near to the room diagonal of the diagram. Starting from this point, we can say that the beliefs concerning the three categories are connected to each other.

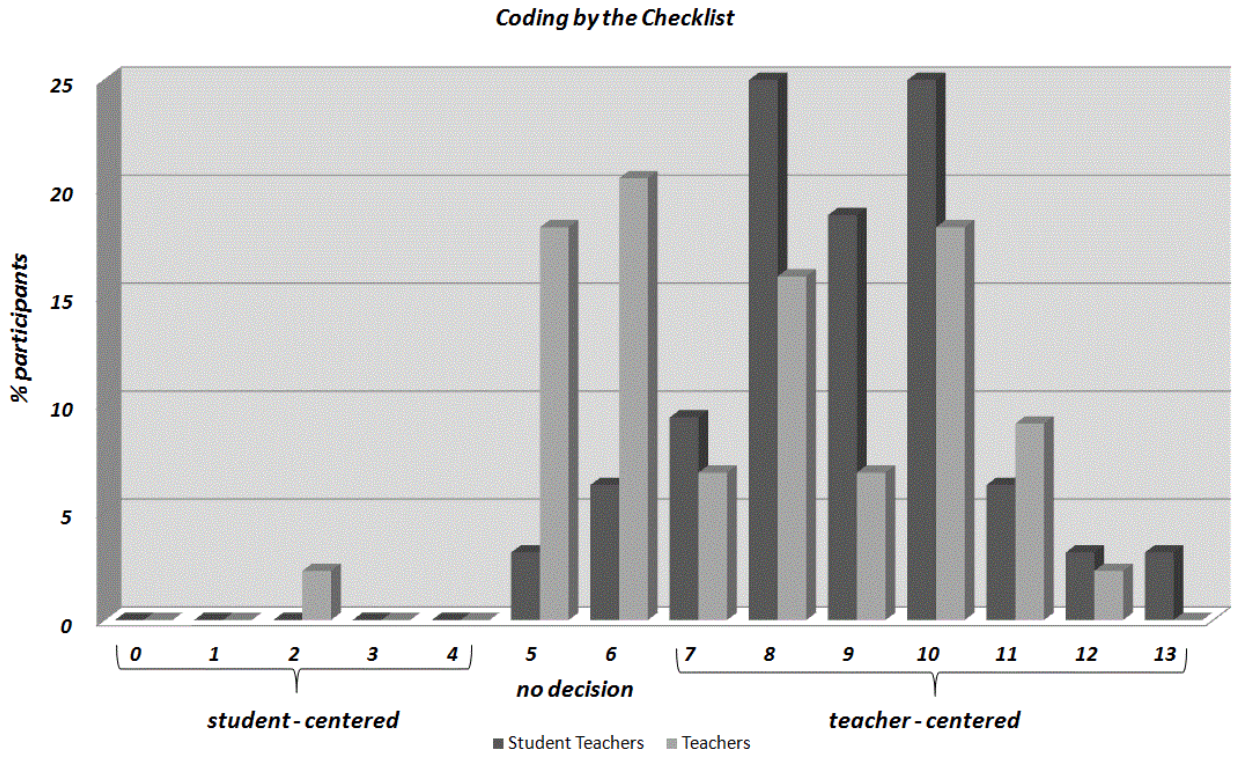

Figure 3. Results for a DASTT-C for the groups of Georgian science teachers and science student teachers

On the other side, it is apparent to notice that almost all of the code combination for the student teachers is in the left, lower, front part of the diagram. Thus, almost all of the student teachers hold traditional beliefs when it comes to teaching and learning. Looking to the diagram on the right side, the situation is different. The code combinations of the teachers are more spread along the room diagonal. We can say that almost the same number of teachers has a code combination in the left, front, lower part of the diagram as in the right, back, upper part of the diagram. Finally, the science teachers in Georgia hold traditional and modern beliefs about teaching and learning in almost the same number. The small tendency towards traditional is to observe, but it is not significant.

Quantitative Studies

A) Beliefs about Teacher-/Student-Centeredness

The diagram in the Figure 3 presents the results from the first qualitative study evaluated by the instrument and the checklist by Thomas et al. (2001).

The results presented in the Figure 3 show that in general the Georgian science teachers and student teachers hold a diversity of beliefs about teaching and learning when it comes to student-/teacher-centeredness. It has been revealed that in both groups the participants got mainly the rating that is higher than 5. The ratings less than 5 are only to be found in the group of teachers but also here the number of the teachers with rating lower than 5 is very low. However, it is also clearly noticeable that science teachers in this study got higher rating then the student teachers. The science teachers in this study got mainly the code between 8 and 10. The ratings of student teachers in this group are mainly in the spectrum between 5 and 10.

To portray a better overview of the results, the presentation of the data is given according to the three scales recommended by Thomas et al. (2001). Figure 4 shows that student teachers are clearly holding teacher-centered beliefs when it comes to science teaching and learning. More than 90% of student teacher got the rating indicating teacher-centeredness. In general, it is also the same to be said about teachers. However, in this group "only" 60 % got the rating that stands for teacher-centeredness. The good news is that almost 40% the teachers are somewhere between student- and teacher-centeredness when it comes to their beliefs about science teaching and learning.

B) Scientific Epistemological Beliefs

As mentioned before because of the invalid results in Cronbach`s α value we will follow up with the three dimensions: (i) Role of the Social Negotiation (SN), (ii) Invented and Creative Nature of Science (IC), and (iii) Changing and Tentative Feature of Science Knowledge (CT).

Table 4 indicates that the results for both groups are similar. The differences between the mean scores of both groups across the three dimensions are not statistically significant. On the other hand, the differences between the mean score for the three scales within the groups are statistically significant. However, general observation is that in both groups the mean scores in all the cases are higher than the mean score of

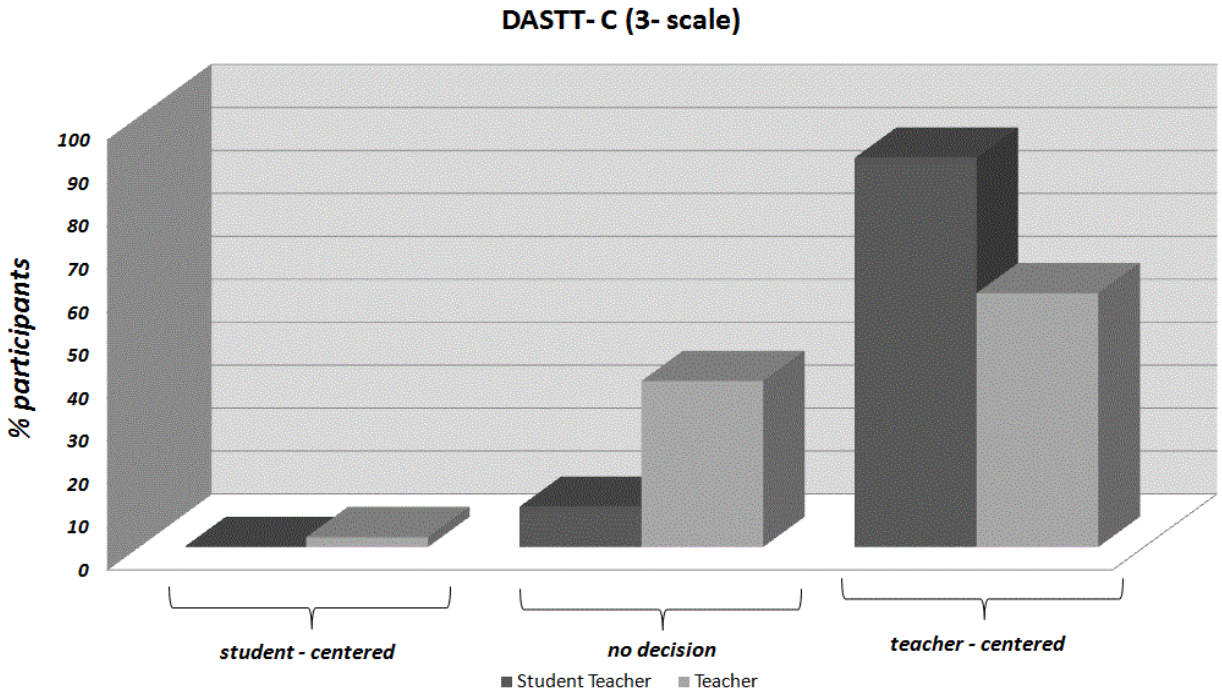

Figure 4. Results for a DASTT-C for the groups of Georgian science teachers and science student teachers (3Scale)

Table 4. Results for the scientific epistemological beliefs for Georgian science teachers and science student teachers

		Student Teachers	Teachers
Role of social negotiation	**Mean Score**	4,59	4,68
	Standard Deviation	0,68	0,49
	Cronbach`s α	.72	.48
Invented and creative nature of science	**Mean Score**	4,44	4,45
	Standard Deviation	0,80	0,70
	Cronbach`s α	.71	.69
Change and tentative feature of science knowledge	**Mean Score**	4,69	4,67
	Standard Deviation	0,63	0,73
	Cronbach`s α	.63	.73

Table 5. Results for the beliefs about the nature of good education for Georgian science teachers and science student teachers

		Student Teachers	Teachers
Transmissive Dimension	**Mean Score**	4,61	4,70
	Standard Deviation	0,76	0,72
	Cronbach`s α	.77	.72
Developmental Dimension	**Mean Score**	4,82	4,88
	Standard Deviation	0,63	0,48
	Cronbach`s α	.66	.60

the 6-step scale. This means that science teachers and science student teachers hold more empiricist or positivist-aligned beliefs when it comes to epistemology.

Looking at the scale about Role of Social Negotiation, science teachers believe that science is a process of individual exploration, mainly depending on personal efforts. The student teachers believe the same, however not as strong as teachers. This difference is not statistically significant. When it comes to the Invented and Creative Nature of Science, the science teachers and science student teachers believe similarly in the notion that students understand that scientific reality is rather discovered.

The only dimension where student teachers got the higher mean score is Changing and Tentative Feature of Science Knowledge. However, this has been noted to be a small difference that is not statistically significant. The general assumption is that science teachers and student teachers hold the belief that science provides the truth of the nature.

While analyzing the correlations between the scales in both groups, the statistically significant moderate positive correlation has been found between the scales Invented and Creative Nature of Science and Change and Tentative Feature of Science Knowledge. All other correlations are quite weak and not statistically significant.

C) Beliefs toward the Nature of Good Education

The results obtained from the second Liker-questionnaire are presented in Table 5. The results generally indicate that in both dimensions teachers have the higher mean score than student teachers in which the differences are not statistically significant while the differences between the scales within a group are statistically significant.

The results are above the middle of the 6-step scale. Thus, science teachers and science student teachers hold more modern beliefs when it comes to the Nature of Good Education. Considering the Transmissive Beliefs both groups have a high loading on the belief that education serves external goals and is outcome oriented with a closed curriculum. Additionally, both group hold the higher loading in the belief (DB) that education should be oriented towards broad and individual development, be a process oriented with an open curriculum, and knowledge should be acquired through construction (students are active participants in and contributors to their own development).

Looking at the correlation between the two dimensions, the results demonstrate that there is a moderate correlation in both groups (ST: r=.48**; T: r= .53**). This finding on the positive correlation allows us to observe that both dimensions belong to the same beliefs system.

DISCUSSIONS

The recent study illustrates that Georgian science student teacher and science teacher hold different beliefs when it comes to science teaching and learning. In general, both groups hold mainly traditional beliefs characterized by teacher-centeredness, receptive learning and content-oriented teaching, students understand that scientific reality is rather discovered. Nevertheless, the results demonstrate that there are obvious differences between the two groups. While science student teachers are mainly strongly traditional in their beliefs about science teaching and learning, Georgian science teachers in this study show more or less stronger tendencies towards modern beliefs. As mentioned before, the sample of both science student teachers and science teachers in this study is not representative and those are not all teachers and science teachers in Georgia. On the other side, this sample is not special in any way. Thus, some general discussions and interpretations are allowed.

The National Reform in Education was started in 2004. The new school curricula were piloted and implemented in all public schools from 2006. For the successful implementation of the new curricula several trainings were conducted for teachers. The National Curriculum and Assessment Center of the Ministry of Education and Science in Georgia ensured special preparation of trainees, who conducted the trainings for in-service teachers in Georgia. However, the new curriculum in science is inquiry-based and the main part of it is to promote the development of Scientific Literacy. In addition to the training programs, teaching materials were prepared for teachers for better implementation of this new curriculum. During the teacher training, different hands-on activities and new teaching methods and approaches were presented. On the other hand, there are no noticeable changes implemented in the university science teacher education program. This might be a reason of the differences in the results between the science student teachers and science teachers.

According to the study results, the picture of science student teachers` beliefs about teaching and learning is not satisfactory. The beliefs are more or less strongly traditional. Student teachers` beliefs should be changed more into modern direction during their teacher education program (Markic & Eilks, 2010). The reform in high education is also started in Georgia, unfortunately, not all Georgian universities offer new courses. At the moment, there are no sufficient equipped laboratories in universities for the practical courses. Ilia State University and Akaki Tsereteli Kutaisi State University, in the framework of SALiS, opened equipped science laboratories with modern technologies. SALiS also designed science education courses that were piloted in these laboratories for student teachers for elementary and secondary school. These courses are implemented from September 2012. The present study and SALiS intervention program serve to rethink more active reform in the science teacher education program and to suggest inquiry-based courses in other Georgian universities. Pursuing change in the program would mean that more practical and inquiry-based courses are offered during the university teacher education program. Furthermore, the form of the seminars and the lectures should be changed. Seminars should be designed and lecturers should be prepared for more student-centered instruction but also oriented on the reflection of the own beliefs and experiences. Last but not least, it appears that it is also necessary to retrain university science educators. The first question that we should think about is: how well prepared are university science teacher educators for the new changes? Are they familiar with the new teaching methods and research in this field? Furthermore: is there a possibility for universities in Georgia to offer new courses and laboratory work that are based on new European standards without any extra foundation? University science teacher education should devote continuous efforts to modify student teachers' beliefs about teaching and learning by mainly modeling constructivist teaching approaches and by clearly indicating the importance of an orientation towards Scientific Literacy for All. University science teacher educators should be obvious about the student teachers` beliefs about teaching and learning and take this knowledge as a starting point in planning their seminars and lecturers. Finally, it is to think about the practical experience during the science teacher education program at the university. The combination between seminars and practical experience at school should be given. Doing so, Georgian science student teachers would have the experience to try the ideas and methods they learned at the university. Besides, the connection to science teachers is established as well. From the present study, we can see that science teachers in Georgia are going into modern beliefs about teaching and learning.

Interpreting and analyzing the results of the present study, we can evaluate the success of the National Educational Reform in Georgia. It emerges that Georgian science teachers did adopt the ideas of the National Educational Reform in their beliefs. Science teachers` beliefs about teaching and learning are not fully on the modern side, but represents the first step towards this promising direction. In other words, the launch of the Educational Reform was successful and it needs to continue for better preparation of science teachers in Georgia.

Furthermore, science educators should not stop with these results and see it as an ultimate success of the Reform. The direction is right, but the ultimate aim and

target have not been reached yet. The support for the science teachers should be stronger. All of the science teachers got an overview about the new teaching and learning methods. However, the question is about the knowledge and ability to apply the ideas and methods into classroom. Thus, the Reform should be continuous in giving support for the implementation of those ideas that are given in seminars and lecturers for science teachers in practice. Furthermore, the planners should think about the Continuous Professional Development (Mamlok-Naaman & Eilks, 2012). Science teacher programs should not discontinue at this point. More workshops should be conducted where science teachers have the opportunity to reflect on their practice and problems that they have while implementing the learned ideas and methods. While excelling the reform and planning agenda for science education in Georgia, more trainings and activities in this direction are needed.

The first international Conference in Science Education in Georgia was held in August, 2012 at Ilia State University which was the final conference of the project SALiS. Eight workshops were delivered by the European science educators for the Georgian teachers and educators from different Georgian universities. The recommendation is to organize more science teacher conferences, discussions on modern teaching and learning technologies, about the experiences and results in the classroom. Furthermore, stimulating more support among teachers is advantageous as well. Science teachers can visit and observe each others' lessons and reflect on it. This way, science teachers can get peer feedback from their colleagues and reflect on their own beliefs and their own practice. Also, the exchange of experience and materials is possible as well. This could be a way of cooperative support between two or within a group of teachers at one school. Such a strategy might support the transformation of science teachers' beliefs from traditional to modern.

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