Job Satisfaction, Beliefs and Instructional Practice: The Case of Latvian and Estonian Mathematics Teachers

Anita Pipere[1], Madis Lepik[2]

[1] Institute of Sustainable Education, Daugavpils University, Daugavpils
[2] Department of Mathematics, Tallinn University, Tallinn

[1] Latvia
[2] Estonia

Correspondence: Anita Pipere. Institute of Sustainable Education, Faculty of Education and Management, Daugavpils University, Parades 1-221, 5400, Daugavpils, Latvia. E-mail: anita.pipere@du.lv

Abstract

Introduction. An effective teaching and learning environment has been identified as a factor having an impact on the functionality of school. The purpose of this study was to explore the relationship between the satisfaction level of mathematics teachers with their collaboration and recognition at school as a significant component of general job satisfaction, and their general and subject-specific beliefs about teaching and learning as well as their self-reported instructional practice.

Method. The data was collected from 9th grade mathematics teachers in Latvia (N=390) and Estonia (N=327) using scales measuring teacher job satisfaction, general beliefs on teaching/learning, beliefs about mathematics teaching/learning and regular practice in class from the questionnaire created for a larger study on mathematic teachers within the international NorBa Project.

Results. The results show significant positive inter-relationships between collaboration and recognition on the one hand and constructivist beliefs, beliefs in the constructivist-oriented process aspect of mathematics teaching and constructivist practice on the other hand. Although the influence of teachers' age and work experience was also examined, it did not appear to be significant in the context of the research. Some cultural differences between Latvian and Estonian teachers were discovered in relation to the main variables and their relationships.

Discussion. The findings of this study indicate the importance of teachers' satisfaction with the collaborative culture of schools in developing teachers' beliefs and instructional practice in line with school reforms oriented toward the ideology of constructivism. Implications for practice and directions for future research are discussed.

Keywords: collaboration, recognition, beliefs, instructional practice, constructivistic approach, traditional approach, mathematics teachers

Satisfacción en el Trabajo, Creencias y Prácticas Instruccionales: El Caso de los Profesores de Matemáticas de Letonia y Estonia

Resumen

Introducción. Un entorno eficaz de enseñanza y el aprendizaje ha sido identificado como un factor que tiene un impacto en la funcionalidad de la escuela. El propósito de este estudio fue explorar la relación entre el nivel de satisfacción de los profesores de matemáticas con su colaboración y reconocimiento en la escuela, como un componente significativo de la satisfacción laboral general, su general, y sus creencias sobre temas específicos sobre la enseñanza y el aprendizaje, así como su propia la práctica docente.

Método. Los datos fueron recogidos a partir de noveno grado los profesores de matemáticas en Letonia (N = 390) y Estonia (N = 327) mediante escalas de medición de la satisfacción del trabajo docente, las creencias generales sobre teaching-learning, las creencias sobre las matemáticas de enseñanza-aprendizaje y la práctica regular de la clase a partir del cuestionario creado para un estudio más amplio sobre los profesores matemáticos dentro del Proyecto internacional Norba.

Resultados. Los resultados muestran interrelaciones positivas significativas entre la colaboración y el reconocimiento, por un lado, y las creencias constructivistas en cuanto al proceso constructivista orientado a la enseñanza de las matemáticas y las practiceon constructivistas, por otro. Aunque la influencia de la edad de los profesores y la experiencia de trabajo también se examinó, no parecen ser importantes en el contexto de la investigación. Algunas de las diferencias culturales entre los docentes letones y estones fueron descubiertos en relación con las principales variables y sus relaciones.

Discusión. Los resultados de este estudio indican la importancia de la satisfacción con la cultura de colaboración de las escuelas en el desarrollo de los docentes, sus creencias y prácticas de instrucción, en línea con las reformas escolares orientadas al enfoque del constructivismo. Se discuten las implicaciones para la práctica y las direcciones para la investigación futura.

Palabras clave: colaboración, el reconocimiento, las creencias, prácticas de enseñanza, enfoque constructivista, el enfoque tradicional, profesorado de matemáticas.

Introduction

An effective teaching and learning environment has been identified as a factor that has an impact on the functionality of a school. The *Teaching and Learning International Survey* (TALIS) reveals that enhancing teacher collaboration beyond the simple exchange of ideas increases the effectiveness of a school. Teachers generally respond positively to appraisal and feedback. They generally agree that it improves their teaching skills and increases their job satisfaction. Teachers also point out that it significantly increases their development as a teacher. Eight out of ten teachers indicate that they have received some kind of appraisal or feedback on their work, most of which was carried out by managers or other teachers in their schools (OECD, 2009).

This study focuses on the relationships between teachers' perceptions of working conditions that determine job satisfaction (namely, school collaborative culture), teachers' general and subject-specific beliefs about teaching and learning, and their self-reported instructional practice. The study investigates the link between the teachers' satisfaction with collaboration and recognition in their school and their preference for constructivist-oriented beliefs and practice rather than traditional beliefs and practice. As part of a larger international research project on mathematics teachers' beliefs in the Baltic and Scandinavian countries, this study concentrates not only on teachers' cognition and practice connected with teaching strategies and content, but also on the more individually differentiated psychological phenomenon of job satisfaction. We want to know if teachers who are satisfied with the school collaborative culture have different beliefs about teaching and learning and therefore teach differently from those teachers who are less satisfied with collaboration and recognition in their school environment. The paper begins by exploring the main variables of study: collaboration and recognition as determinants of teachers' job satisfaction, teachers' beliefs and their instructional practice. The theory of triadic reciprocity explaining the practical connection between these variables and the cross-cultural context of study sets the stage for proposed research questions.

Collaboration and recognition: Determinants of teachers' job satisfaction

Literature does not offer a uniform, theoretical concept of teacher job satisfaction. The recent models of teacher job satisfaction are based on three domains – actual work of teaching, the conditions of this work, and societal level factors (Dinham & Scott, 2000). This study focuses on a single aspect of job satisfaction – working conditions that develop as a result of a

school's professional culture and are implicated in the relationships between teachers as well as between teachers and their school administration. The school professional culture, namely formal and informal structures of practice, behavioural norms and teacher interactions, institutional and individual values (Liu & Kardos, 2002) are referred to in this study as collaboration among the teachers, teachers' participation in decision-making and teachers' recognition and support from administration. Workplace conditions have an effect on teachers' job satisfaction, regardless of the teachers' background or school demographics (Perie, Baker, & Whitener, 1997). However, some studies show that teachers with greater work experience are less satisfied than their less-experienced counterparts (Perie et al., 1997; Sari, 2004).

In terms of collaboration among teachers, their satisfaction level was connected with their relationships with colleagues (Zembylas & Papanastasiou, 2006). Within a collaborative practice, teaching is viewed as a process of continual, reflective inquiry and exchange of ideas with other professionals, leading to the development of a shared technical language and knowledge base (Little, 1993). Teachers' job satisfaction also refers to their power to participate in the decision-making process about teaching and learning conditions (Rice & Schneider, 1994; Zembylas & Papanastasiou, 2005). Administrative support is a workplace condition that is a significant factor in explaining different levels of teachers' job satisfaction (Perie et al., 1997; Whitener, 1997). Another important aspect of school culture is recognition from surrounding individuals that helps to affirm the teachers' sense of self (Bingham, 2001). Inadequate support from school leaders can lead to teachers leaving the profession or transferring to another school (Whitener, 1997).

Beliefs and self-reported instructional practice

In the context of this study, beliefs are broadly understood as conceptions, views, personal ideologies and values that shape teaching practice (Lepik & Pipere, 2011). It is assumed ones' beliefs influence what one does – in other words, beliefs act as a teacher's pedagogical predisposition. Belief factors shape a teacher's decisions – about appropriate teaching routines, goals to be accomplished and how teaching and learning should be presented.

Teachers' instructional beliefs appear to be cogent enough to either facilitate or slow down educational reform (Handal & Herrington, 2003). Teachers' beliefs concerning teaching and learning mathematics reflect their priorities for practice in the mathematics classroom and play a significant role in shaping patterns of instructional behaviour (Thompson, 1992). Some

research suggests that teachers' beliefs are very stable and resistant to change (Brousseau, Book, & Byers, 1988; Herrmann & Duffy, 1989). However, other surveys carried out years apart indicate that teachers' beliefs do change over a period of time (e.g., Kislenko & Lepmann, 2011). School climate, pupils' abilities, etc. play a complex, influential role in the practical implementation of teacher's beliefs creating a non-linear relationship between teachers' beliefs and their teaching practice; related studies often report inconsistencies between teachers' beliefs and their actions (Chen, 2008; Skott, 2009; Wilson & Cooney, 2002).

Teachers' pedagogical beliefs and instructional practice have been studied using the dichotomic approach to the classification of beliefs and practice (Gündoğdu, 2010; Loogma, Ruus, Talts, & Poom-Valickis, 2009; Ravitz, Becker, & Wong, 2000, etc.). Constructivist-compatible beliefs and instruction envisage that understanding arises only through prolonged engagement of the learner by relating new ideas and explanations to the learner's own existing beliefs. The ability to use a skill comes only from experiential learning that occurs when deciding how and when to use one of many diverse skills in processsing a concrete problem (Ravitz et al., 2000). Beliefs and practices of traditional transmission instruction prescribes that students learn facts and concepts and acquire understanding by internalizing their teacher's explanations or by answering questions related to a specific text. Skills are mastered through guided sequential repetition in a systematic and well-defined manner and are usually performed independent of complex applications that might involve those skills. In deferring the recent opposition to any dichotomisation (i.e., teacher-centred versus student-centred classrooms) and the appeal to the complementary view in educational discourse, the correlational design of this study proposes to use the particular belief factors identified in the analysis as if they existed as separate entities. In reality, these differentiated approaches, exposed in beliefs and self-reported practice in both general and mathematics-specific teaching and learning, are seen and used as complementary alternatives (Andrews & Sayers, 2013; Clarke, 2006) depending on the specific purpose and context of the situation.

Work environment, beliefs and practice: Triadic reciprocity

There is very little literature that deals with the relationships between teachers' collaboration and recognition at school and their beliefs and self-reported practice. However, literature does reveal internal and external factors that mediate beliefs and practice (Pajares, 1992). In this study, the theory of triarchical reciprocal determinism (Bandura, 1999) is used

to theorize about the relationships between the main variables whose bi-directional influence between the environment and the self-system is implicated in the regulation of behaviour (Bandura, 1978, 1986). Internal factors such as cognitive, affective, biological processes, behavioral patterns, and environmental influences function as interacting determinants that impact on each other bi-directionally. This trinity mutually impacts its members, determines what we believe about ourselves and affects our choices and actions (Henson, 2001).

Applying this theory to teachers' work, Gibbs (2002) suggests that there is an interaction, reciprocity, and inter-dependence of teachers' inner personal factors (cognition, emotion, biological events), teachers' behaviour, and the circumstances in which this teaching occurs. In this research, personal characteristics are represented by teachers' general and subject-specific beliefs, age, and work experience; behavioural patterns are reflected as self-reported instructional behaviour in class; environmental processes are manifested as an individual's perceived social environment – collaboration and recognition from colleagues, and the administration and cultural environment in Latvia and Estonia.

People's thoughts, feelings and beliefs affect how they behave (Bandura, 1986) or, in other words, teachers' beliefs can affect their choice of constructivist or transmissive teaching strategies. Human expectations, beliefs, emotional tendencies and cognitive competences are developed and modified by social influences that convey information and activate emotional reactions through modeling, instruction and social persuasion (Bandura, 1986). In this sense, one could assume that the schools' collaborative culture, where teachers are recognized for their work, collaborate with colleages and administration, participate in decision-making and receive administrative support, develops and modifies the teachers' beliefs and behaviour towards an innovative, constructively oriented and collaborative instructional approach. If teachers believe in constructivist ideas themselves, they are probably more willing to acknowledge other teachers and work in a collaborative manner outside of their own classroom, since people create, as well as select, their environments.

The analysis of general studies of school culture (Firestone & Seashore Louis, 1999; Levine & Lezotte, 1990; Peterson & Brietzke, 1994; Schein, 1992) shows that a strong collaborative culture fosters school effectiveness and productivity. It improves collegial activities that stimulate communication and problem solving practices, promotes successful change and behavior and focuses more on what is important and of value. Collaboration encourages a

climate that is amenable to new perspectives and attitudes (Gable & Manning, 1997). Also, professional development is unlikely to flourish in the absence of moral support because teachers will be reluctant to try new ideas (for instance, the constructivist approach to teaching and learning), fearing the consequences of failure (Hargreaves, 1995).

Studies demonstrate the positive impact of a collaboratively oriented school professional culture, both on the professional development of individual teachers and progressive changes at all levels of school. The confidence that comes with collegial sharing and support leads to a greater readiness to experiment and take risks, and a commitment to continuous improvement among teachers (Hargreaves, 1994). Collaborative cultures provide substantial and meaningful settings in which teachers develop knowledge, a powerful sense of efficacy, and a deep connection to fellow educators, parents, and students. Teaching expertise can grow from a process of enquiry through experimentation, reflection, analysis and benefits from an exchange with others engaged in a similar process (Becker & Riel, 1999).

Exhibiting a collaborative role rather than a classroom focus and working in schools exhibiting a professional culture, teachers were more likely to engage in constructivist teaching practices – Becker and Riel (1999). Collaboratively oriented teachers were more likely to report recent changes in their teaching towards constructivist practice. Teachers in schools with a traditional culture of individual teachers engaging in private practice, were more likely to emphasize curriculum coverage, knowledge transmission, and skills practice through direct instruction. Teachers engaged in collaborative professional activities and enlarging the knowledge base among their colleagues were more likely to encourage their students to work collaboratively and take part in knowledge construction.

Therefore, it should be asked if there is a relationship between a teachers' satisfaction with the schools' collaborative culture (as perceived in the school's professional environment) on the one hand and teachers' constructively oriented beliefs and practices on the other hand, since there is some evidence that engagement in the school's collaborative culture, which in essence is based on constructivist ideas, could (a) be transmitted to teachers' beliefs and practice, (b) create a support environment for sharing new ideas and risk taking, and (c) form a commitment to continuous professional growth.

Cross-cultural comparisons

Associations between the individual background, the school context, teachers' beliefs and practices and the learning environment are consistently found in a large number of countries (OECD, 2009). The context for this study is two Baltic countries that recently completed the transitional process to a free market economy. The Baltic region has not yet been sufficiently described in social science studies in terms of the subtle processes within the educational system that are related to teachers' work. After the dissolution of the Soviet Union in the early 1990s, both Latvia and Estonia launched disjunctive school reforms to disengage from the Soviet school system and subsequently join the common European education area. The new standards in Latvian and Estonian education were mainly developed according to constructivist learning approaches.

In a large international survey that investigated improvements in the school system from 1995 to 2007 (Mourshed, Chikioke, & Barber, 2010), Latvia was identified as a "sustained improver" in relation to registered significant, sustained and widespread student outcome gains. At the same time, studies about factors that have an impact on teachers' job satisfaction in Latvia and Estonia point to several problems. A recent study (Austers, Golubeva, & Strode, 2007) showed that teachers in Latvia, irrespective of language of instruction, stage of education and subject, all report the obvious symptoms of burnout syndrome. The results of TALIS 2008 indicate that Estonian teachers' self-efficacy and satisfaction with their work are considerably lower by international comparison (Loogma, Keskküla, & Roosipõld, 2010). According to recent studies (ESF, 2007), the status of the teaching profession has decreased in both countries during the last 10 years. High salaries and career opportunities have attracted both students and educated mathematics teachers to the private sector, instead of schools. Those remaining in the profession have had to adapt to less motivated students (Bebriša, Ieviņa, & Krastiņa, 2007) and to a series of new curricula.

The TALIS-study indicated that Estonia is one of the countries with strong support for constructivist teaching beliefs (Loogma et al., 2009). Although teachers' beliefs in Latvia are oriented towards constructivism, both primary and secondary teachers put the teacher at the center of the educational experience in classroom practice reports (Pipere, 2005).

Working conditions and cultures differ to some extent between Estonia and Latvia. Therefore, it would be appropriate to examine some of the possible differences in the relationship between collaboration and recognition at school, teachers' beliefs and instructional prac-

tice in these different contexts, noting the nuances in cultural, historical, economic background and educational systems. In other words, following Zembylas and Papanastasiou (2005) we may ask whether this relationship is somewhat "culturally sensitive".

The problem and the purpose of the study

Since very few research studies have explicitly explored the relationship between teachers' satisfaction, beliefs, and instructional practice, the researchers propose to conduct an investigation that explores this relationship in an international context. Therefore, the purpose of this study is to explore the relationships between the mathematics teachers' satisfaction with collaboration and recognition at school, their general and subject-specific beliefs about teaching and learning, and their self-reported instructional practice in a sample of Estonian and Latvian teachers. Specifically, it seeks to ascertain:

(1) What relationships exist between the teachers' level of satisfaction with collaboration and recognition on the one hand and general beliefs about teaching and learning, beliefs about mathematics teaching and learning and regular practice on the other hand?

(2) What relationships exist between the teachers' collaboration and recognition at school and their age and length of professional experience?

(3) What differences exist between the samples of Estonian and Latvian teachers, in terms of the main variables of the study and their relationships?

Method

Participants and procedure

The data was collected from 7-9th grade mathematics teachers in Estonia (n=327) and Latvia (n=390); 161 schools from Estonia and 97 schools from Latvia were involved. The Estonian sample consisted of teachers from 15 regions while the Latvian sample represented teachers from all 5 regions of Latvia. The joint sample from both countries (N=717) was made up of teachers aged 25 to 77 years and the major age group ranged from 40 to 59 years with a length of service from 1 to 44 years (M=23). The largest group of teachers had more than 19 years of work experience. The majority of the sample had either a Bachelor or Master degree, majoring in mathematics. The vast majority of the teachers were females, a statistic that mirrors the gender distribution among mathematics teachers in these countries.

The data collection was completed in Estonia and Latvia in the autumn and winter of 2010/2011. Informative e-mails were sent to schools throughout both countries inviting teachers to participate in the survey. In Latvia, teachers who accepted the invitation received the necessary instructions with the survey, which they filled out and returned by e-mail. The response rate was approximately 95%. In Estonia, head-teachers from the schools that accepted the invitation received the paper-based surveys with the necessary instructions and distributed them among the teachers. Teachers filled them out and returned them. The respondents' identity and records were kept confidential. The response rate was about 85%. Participants received a certificate of participation.

Instrument

For the international NorBa Project, a questionnaire was created to study mathematics teachers. This seven-module questionnaire was developed to describe teachers': (1) overall job satisfaction; (2) beliefs about teaching and learning in general and specifically in mathematics; and (3) perceptions of the textbooks used and their own classroom practices (Lepik & Pipere, 2011).

The data for this research was collected using four newly developed self-evaluation scales measuring teachers' *overall job satisfaction, general beliefs on teaching and learning, beliefs on mathematics teaching and learning,* and *regular practice in class.* The following is a short description of the construction of these scales and examples of items; the response scales will also be presented.

Teachers' overall job satisfaction (TOJS).This scale included 13 Likert-type items about teachers' job satisfaction connected with external and internal factors and related to colleagues (2), working conditions (2), responsibility (2), work itself (2), recognition (2), perceived administrative support (1), satisfaction with teaching career (1) and coping with job-related stress (1). After an extensive search of relevant literature, these items were adapted from Teacher Burnout Scale (TBS, Seidman & Zager, 1987), the questionnaire of US teachers' job satisfaction by Perie et al. (1997) and Teacher Job Satisfaction Questionnaire (TJSQ, Lester, 1987). The authors of TJSQ and TBS report good reliability and validity indices for the original instruments. The component of remuneration was excluded because in several studies there was a weak relationship between teacher job satisfaction and salary and benefits (Menon, Papanastasiou, & Zembylas, 2008; Perie et al., 1997). Advancement, Security and

Attitudes toward students (from the TJSQ and TBS) were omitted because they were less relevant to the aims of study. Teachers responded using a 5-point scale (1=fully disagree… 5=fully agree).

Teachers' general beliefs on teaching and learning (GBTL). General beliefs were measured by 16 Likert-type items about certain teaching approaches identified as typical for a constructivist (or non-constructivist) teaching approach (e.g., The teacher should direct students in a way that allows them to make their own discoveries or instruction should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly). These Likert-type items consisted of the following: *transmission approach* (4), *comprehension and transference* (4), *independent discovery* (3), *connection with real life* (2), *self-regulated learning* (3). The sources for this scale were: the TALIS Teacher Questionnaire: Teaching Practices, Beliefs and Attitudes Module (OECD, 2001); Indicators of Engaged Learning (EL, Jones, Valdez, Nowakowski, & Rasmussen, 1995); University/Constructivist Learning Environment Survey (UCLES/CLES, Taylor, Fraser, & Fisher, 1997); Constructivist Teaching Inventory (CTI, Greer, Hudson, & Wiersma, 1999); and Expert Science Teaching Educational Evaluation Model (ESTEEM, Burry-Stock, 1995). Teachers responded using a 5-point scale (1=fully disagree… 5=fully agree).

Teachers' beliefs on mathematics teaching and learning (BMTL). This 26 Likert-type item scale consisted of items connected to three aspects (Dionne, 1984; Ernest, 1991): (1) Traditional perception - learning mathematics is understood by using rules and formulas, mastering procedural skills, (2) Formalist perception - learning mathematics means writing proofs, using a precise, rigorous language and unifying concepts, (3) Constructivist perception learning mathematics means developing thinking processes, building rules and formulas from experience of reality. These three notions are often denoted as the "toolbox aspect" (e.g., In a math lesson, there should be more emphasis on the practice phase than on the introductory and explanatory phase), "system aspect" (e.g., Working with exact proof forms is an essential objective of mathematics teaching), and "process aspect" (e.g., Pupils should have an opportunity to independently develop their mathematical knowledge). In addition, they are often used when characterising mathematical beliefs (Liljedahl, Rösken, & Rolka, 2007; Pehkonen & Lepmann, 1994). Teachers responded using a 5-point scale (1=fully disagree… 5=fully agree).

Regular practice at class (RPC). This scale, adopted from the TIMSS study (Mullis, Martin, Gonzalez, & Chrostowski, 2004), included 8 Likert-type items investigating how often teachers ask their students to engage in certain classroom practices. Two of these items were related to the traditional approach (e.g., Memorize formulas and procedures), five items coincided with the constructivist orientation (e.g., Work together in small groups) and one item was related to IT usage (Work with computers or graphical calculators). Teachers responded using a 4 point scale: 1=never, 2=some lessons, 3=about half the lessons, 4=(almost) every lesson.

For this study, the research was planned jointly by researchers from different cultures and conducted at the same time in several cultures using the so-called 'joint-development-concurrent' model (Dujykes & Rokkan, 1954; Osborn, 2004). After the creation of the questionnaire in English, the cross-national team adapted it to the respective languages ensuring the linguistic, functional, and cultural equivalence (Peña, 2007). A piloting of the questionnaire was carried out in participating countries in the spring of 2010; the total number of respondents was approximately 60. The questionnaire was revised in the light of teachers' responses and reliability calculations. Several items were removed or re-phrased. The theoretical background, development and structure of the entire questionnaire are all described more thoroughly in our previous paper (Lepik & Pipere, 2011).

Statistical Analysis

Consistent with the research questions, statistical data analysis included the Principal Component Analysis with Varimax rotation, correlation analysis using two-tail Spearman correlation coefficients, the Mann-Whitney Test of Difference, and a test of the statistical significance of the difference between correlation coefficients.

Results

Factor analysis

In order to reveal the factor structure of created scales, the data from the joint sample of both countries was subjected to the Principal Component Analysis (PCA) with Varimax rotation. Applying the PCA with Varimax rotation to the 13 items of TOJS, the best solution

was found in the three-component structure eliminating 4 items with multiple loadings and low communalities and re-coding one item (KMO>.79, Bartlett's test of sphericity χ2 (78) = 1344.48, *p* < .000). The three-component solution explained a total of 55.6% of the variance, with Component 1 contributing 25.6% and Component 2 contributing 15.5%. The first factor was labeled as *Collaboration and recognition* (α=.70), the second factor was labeled as *Enjoyment* (α=.47), while the third factor was named – *Routine and stress* (α=.43) (see Table 1). For the purposes of this study, only the factor of Collaboration and Recognition (external factor) will be used in further analysis since the teachers' overall job satisfaction seems to have the best explanation – 25.6% from variance by collaboration and recognition from administration and it is also the most consistent factor with the highest alpha value. The low internal reliability of two other components could be explained with a small number of items within each component. Factor analysis conducted on separate samples of Estonian and Latvian teachers revealed an identical factor structure.

Table 1. **Factor Loadings for Principal Component Analysis With Varimax Rotation of Items from Teachers' Overall Job Satisfaction**

Item	*Collabo-ration and recognition*	*Enjoy-ment*	*Routine and stress*
Teachers in our school have a big influence in making important school decisions and designing school policy	**.69**	.19	.00
In our school, staff members are recognized for a job well done	**.67**	.29	.00
There is a great deal of cooperative activity among the staff	**.66**	.00	.00
I know that the administrators are ready to help me with classroom problems, should they arise	**.66**	.23	.00
I sometimes do not get collaboration from the people I work with	**-.65**	.25	.00
Teaching encourages me to be creative	.14	**.81**	.00
I look forward to each teaching day	.16	**.68**	-.21
My physical illnesses may be related to the stress in this job	-.19	.00	**.81**
The work of a teacher consists of routine activities	.00	-.17	**.76**

Note. Factor loadings >.40 are in boldface

The 16 items of GBTL were subjected to PCA using the data from the joint sample. The best solution was found in the three-component structure when eliminating one item (KMO>.76, Bartlett's test of sphericity χ2 (120) = 1520.17, *p* < .000). The three-component solution explained a total of 40.7% of the variance, with Component 1 contributing 17.2%

and Component 2 contributing 12.5%. The first factor was labeled as *Constructivist approach* (α=.67), the second factor was labeled as *Traditional approach* (α=.60), while the third factor was named – *Reasoning and thinking skills* (α=.43). For the purposes of this study, only the factors *Constructivist approach* and *Traditional approach* will be used in further analysis because of having the highest percentage of variance and internal consistency. Factor analysis conducted on separate samples of Estonian and Latvian teachers revealed an almost identical factor structure in both countries.

For the 26 items of BMTL submited to PCA, the best solution was found in the three-component structure when eliminating 7 items with multiple loadings and low communalities (KMO>.81, Bartlett's test of sphericity χ2 (325) = 3248,09, $p < .000$). The three-component solution explained a total of 38.9% of the variance, with Component 1 contributing 15.5% and Component 2 contributing 13.1%. The first factor was labeled as *Process aspect* (α=72.), the second factor was labeled as *Toolbox aspect* (α=.67), while the third factor was named – *Proofs* (α=.59). Factor analysis conducted on separate samples of Estonian and Latvian teachers revealed an identical factor structure. Because of the small number of items in the RPC scale, it was decided not to conduct the PCA on this scale but use intercorrelations with single items of this scale.

Correlation analysis

In order to interpret the relationships between the teachers' satisfaction with collaboration and recognition on the one hand and teachers' pedagogical beliefs as well as beliefs about mathematics teaching on other hand, correlation analysis was conducted using two-tail Spearman correlation coefficients (see Table 2).

Table 2. **Summary of Intercorrelations, Means and Standard Deviations for Factors of the Teachers' Satisfaction with Collaboration and Recognition, Pedagogical Beliefs, Beliefs in Mathematics Teaching in the Joint Sample of Mathematic Teachers (N=717)**

Factors	1	2	3	4	5	6	M	SD
1.Collaboration & recognition	-	.18**	-.01	.14**.	.03	.03	3.87	.66
2. Constructivist approach		-	-.07	58**	.07	26**	4.30	.44
3. Traditional approach			-	-.04	.51**	.16**	3.30	.69
4. Process aspect				-	.12**	.25**	4.17	.46
5. Toolbox aspect					-	.30**	3.37	.59
6. Proofs						-	3.36	.73

** p<0.01

As the data in Table 2 suggests, there is a small but statistically significant correlation between the collaboration and recognition and beliefs in the constructivist approach both in general and in subject pedagogics. No significant correlations were found between collaboration and recognition and traditional approach (and proofs) in general and subject pedagogics. Large correlations were discovered between the elements of constructivism in general and subject-specific teaching approaches as well as between the elements of the traditional approach in general and subject-specific teaching approaches. Interestingly, elements connected with proofs correlated with all general and subject-specific teaching approaches.

Statistically significant Spearman correlation coefficients between the general factor of teachers' collaboration and recognition and teachers' regular practice in class (RPC) were found in the case of the relationship between mathematics and students' daily lives ($r_s(715)=.12$, p<0.01), work in small groups ($r_s(715) =.12$, p<0.01), and work in an investigative manner ($r_s(715)=.10$, p<0.01) – all three items related to constructivist approach. None of the traditionally oriented items of regular practice, including the use of computers while teaching mathematics, had a significant correlation with the factor of collaboration and recognition. No significant correlations were found between the teachers' age or work experience and the general factor of collaboration and recognition.

Cross-cultural differences

The descriptive statistics and differences between the data from Estonian and Latvian teachers regarding the teachers' satisfaction with collaboration and recognition, pedagogical beliefs and beliefs in mathematics teaching are shown in Table 3.

Table 3. **Descriptive Statistics and Mann-Whitney Test of Difference in the Samples of Estonian (n=327) and Latvian (n =390) Teachers**

Factors	Estonian teachers		Latvian teachers		U
	M	SD	M	SD	
Collaboration & recognition	3.81	.66	3.92	.66	.034**
Constructivist approach	4.31	.43	4.29	.44	.359
Traditional approach	3.39	.61	3.22	.74	.002**
Process aspect	4.18	.44	4.17	.48	.752
Toolbox aspect	3.49	.56	3.27	.59	.000**
Proofs	3.43	.72	3.29	.74	.003**

** Significance is calculated using Monte Carlo Sig. (2-tailed); 99% Confidence Interval

As the data show, both in Estonia and Latvia, teachers had higher scores for constructivist-oriented beliefs than those for traditional beliefs about teaching. The statistically significant differences are observable regarding the teachers' satisfaction with collaboration and recognition where Latvian teachers report the higher scores. Also, even bigger differences were traceable in terms of teachers' beliefs. Estonian teachers were more partial to the traditional approach in their pedagogical beliefs and toward 'toolbox' and 'proofs' aspects in their beliefs about mathematics teaching. At the same time, no differences were found in constructivist-oriented general and subject-oriented beliefs for teachers in both countries. Teachers from both countries tend to strongly support these claims.

Regarding the regular teachers' practice in class, out of 8 items of RPC, the Mann-Whitney Test of Difference showed statistically significant differences in 7 of these items. Only one item "Apply facts, concepts and procedures to solve routine problems" was evaluated as being implemented equally often in both countries. Estonian teachers ask students to memorize formulas and procedures more often, while at the same time they ask their students to work on problems for which there is no obvious method of solution. They also allow students to decide their own procedures for solving complex problems more often than Latvian teachers. Latvian teachers are more likely to ask students to relate what they are learning in mathematics to their daily lives, to work together in small groups and to work in an investigative manner.

When calculating the statistically significant difference between the correlation coefficients for the data from Estonian and Latvian samples (z_{obs}), no significant differences were found for the correlations between the teachers' collaboration and recognition, pedagogical and subject-specific beliefs and instructional practice.

Discussion

The findings of this study indicate the importance of teachers' satisfaction with a schools' collaborative culture in developing teachers' beliefs and instructional practice in line with school reforms that are oriented toward the ideology of constructivism. The correlation does not imply causation and the theory of triadic reciprocity in the context of the presented study suggests bi-directional relationships between satisfaction with the school environment and teachers' beliefs and practice. However, it is evident that in the case of formal school system teachers, it is possible that more teachers may be products of their environment rather

than producers. According to Bandura (1997) the relative contribution of each of the constituent classes of influences depends on the activities, circumstances, and sociostructural constraints and opportunities. School environment could be perceived as being constructed but at the same time, could also be perceived as an imposed environment for teachers. As such, it could naturally be viewed as influencing teachers' beliefs and practice.

The teachers' survey of overall job satisfaction in Latvia and Estonia showed that collaboration and recognition from the administration appeared as the factor with the highest variance and internal consistency and as such it was used in the study. The strongest and the most reliable factor from the scale of TOJS coincided with Perie et al. (1997) findings that the "most satisfied" teachers viewed their schools as supportive, safe, autonomous environments where they are recognized for a job well done, where their administration is supportive and caring, where they participate in making important school decisions, where principals frequently discuss instructional practices with teachers, and where there is significant cooperation among the staff.

The results show weak, though significant, positive relationships between the teachers' satisfaction with collaboration and recognition on the one hand and constructivist beliefs, beliefs in the constructivist-oriented process aspect of mathematics teaching and constructivist practice on the other hand and agree with Hargreaves (1995), Becker and Riel (1999) and the findings from the OECD (2009). Statistically significant correlations were not found between the teachers' satisfaction with collaboration and recognition and their traditional beliefs.

The statement by (Handal, 2003, p.48) that "very often the traditional nature of educational systems makes it difficult for teachers to enact their espoused progressive beliefs" is implicated in the reciprocal link between the cognitive processes, environment, and behaviour. Obviously, this was not the case in our study in which relationships were also found between the teachers' satisfaction with the collaborative culture in their school and the enactment of their espoused beliefs that aligned with the constructivistic approach. Identically, as in the case with traditional beliefs, traditional practice also appeared unrelated to the teachers' satisfaction with collaboration and recognition.

Contrary to the prior findings by Perie et al. (1997) and Sari (2004), no significant correlations were found between teachers' age, work experience and the general factor of

teachers' satisfaction with collaboration and recognition. However, in this study, only one aspect of teachers' job satisfaction was analysed. Probably, the perception of collaboration and recognition is less individually differentiated and is a more school-based microculture factor that teachers of different ages have in common when working at a particular school.

Also, the cross-cultural differences unveiled in this study are in line with the above-mentioned findings – Latvian teachers emerged as a little more satisfied with collaboration and recognition and correspondingly they scored significantly lower on traditional general pedagogical and subject-specific beliefs. Similarly, with respect to teachers' instructional practice, Latvian teachers appeared to be more constructivist oriented in relation to several items. This invites further investigation in accordance with the already existing critique on pathways and barriers in translating constructivist beliefs and practice into student performance.

However, the identical factor structure of all variables of study and lack of difference between the correlation coeficients repeatedly (Lepik & Pipere, 2011) proves the concept of relative similarities in mathematic teachers beliefs, practice and related factors in the two culturally similar post-Soviet neighbouring countries. Furthermore, no significant differences were found in the correlations in both countries between teachers' satisfaction with collaboration and recognition, pedagogical and subject-specific beliefs and instructional practice.

Unlike some demographic and teachers' personality variables, the school professional culture can be influenced in the framework of school reforms or improvement. The educational policy-makers, administrators, and practitioners should remember that indoctrination of "progressive" reform-oriented ideologies forced on the teachers from their external environment outside the school or even imposed by a bureaucratically oriented school administration will not succeed if teachers at the school level are not satisfied with the professional culture within the school.

Some limitations of the present study should be mentioned: Firstly, it is a limited generalization of the results in other European countries because of the specific historical and socio-economic context of these two Baltic countries. Secondly, the vast majority of the sample in Latvia and Estonia was female. This could be seen as a limitation in any attempt to extrapolate the results from this study to countries where males are more involved in the teach-

ing profession. Also, the use of self-reporting methods about instructional practice could be perceived as a limiting factor.

Further research in a framework of NorBa project will be related to finalizing the data collection and analysis in other project countries, in order to extend the scope of relevant cross-cultural comparisons. It would be interesting to compare the results of this Estonian and Latvian study with the results in Scandinavian countries that have a more distinctive cultural and educational context.

Acknowledgements

References

Andrews, P., & Sayers, J. (2013). Comparative studies of mathematics teaching: Does the means of analysis determine the outcome? *ZDM, 45*(1), 133-144.

Austers, I., Golubeva, M., & Strode, I. (2007). *Skolotāju tolerances barometrs* [Barometer of teachers' tolerance]. Riga: Providus.

Bandura, A. (1978). The self-system in reciprocal determinism. *American Psychologist*, *33*, 344-358.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewook Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.

Bandura, A. (1999). A social cognitive theory of personality. In L.Pervin & O.John (Ed.), *Handbook of personality* (pp.154-196). New York: Guilford Publications.

Bebriša, I., Ieviņa, I., & Krastiņa, L. (2007). *Skolēnu atbiršana pamatskolās Problēmas risinājumi* [Attrition in elementary schools: Solutions for the problem]. Baltic Institute of Social Sciences.

Becker, H.J., & Riel, M.M. (1999). *Teacher professionalism and the emergence of constructivist-compatible pedagogies.* Center for Research on Information Technology and Organizations. University of California, Irvine and University of Minnesota.

Bingham, C. (2001). *Schools of recognition.* Oxford: Rowman & Littlefield.

Brousseau, B.A, Book, C., & Byers, J.L. (1988). Teacher beliefs and the cultures of teaching. *Journal of Teacher Education, 36*(6), 33-39.

Burry-Stock, J.A. (1995). *Expert Science Teaching Evaluation Model (ESTEEM): Theory, development, and research* (1st ed.). Kalamazoo, MI: CREATE, Western Michigan University.

Chen, C.-H. (2008). Why do teachers not practice what they believe regarding technology integration? *The Journal of Educational Research*, *102*(1), 65-75.

Clarke, D. (2006). Using international research to contest prevalent oppositional dichotomies. *ZDM, 38*(5), 376-387.

Dinham, S., & Scott, C. (2000). Moving into the third, outer domain of teacher satisfaction. *Journal of Educational Administration, 38*, 379-396.

Dionne, J. (1984). *The perception of mathematics among elementary school teachers.* Proceedings of the sixth annual meeting of the PME-NA (pp. 223-228). Madison: University of Wiskonsin.

Dujykes, H. C. J., & Rokkan, S. (1954). Organizational aspects of cross national social research. *Journal of Social Issues*, *10*, 8-24.

Ernest, P. (1991). *The philosophy of mathematics education.* The Falmer Press: London.

ESF. (2007). *The status of teaching profession and ways to improve it as perceived by various target groups.* Executive summary of ESF Project "Creating a methodological network of teachers' in-service training". Rīga: Comperio Ltd, INVITE Consultations Ltd.

Firestone, W., & Seashore Louis, K. (1999). Schools as cultures. In J.Murphy & K.Seashore Louis (Eds.), *Handbook of research on educational administration* (pp. 297-322). American Educational Research Association, San Francisco: Jossey-Bass.

Gable, R.A., & Manning, M.L. (1997). The role of teacher collaboration in school reform. *Childhood Education, 73*(4), 219-223.

Gibbs, C.J. (2002). *Effective teaching: Exercising self-efficacy and thought control of action.* Auckland University of Technology, New Zealand, Annual Conference of the British Educational Research Association Exeter England.

Greer, M., Hudson, L., & Wiersma, W. (1999). *The constructivist teaching inventory: A new instrument for assessing constructivist teaching practices in the elementary grades.* Paper presented at the Annual Meeting of the AERA.

Gündoğdu, K. (2010). The effect of constructivist instruction on prospective teachers' attitudes toward human rights education. *Electronic Journal of Research in Educational Psychology*, *8*(1), 333-352.

Handal, B. (2003). Teachers' mathematical beliefs: A review. *The Mathematics Educator*, *13*(2), 47-57.

Handal, B., & Herrington, T. (2003). Mathematics teachers' beliefs and curriculum reform. *Mathematics Education Research Journal*, *15*(1), 59-69.

Hargreaves, A. (1994). *Changing teachers, changing times.* New York: Teachers' College Press.

Hargreaves, D.H. (1995). School culture, school effectiveness and school improvement. *School Effectiveness and School Improvement*, *6*(1), 23-46.

Henson, R.K. (January 26, 2001). *Teacher self-efficacy: Substantive implications and measurement dilemmas.* Invited keynote address given at the annual meeting of the Educational Research Exchange, Texas A&M University, College Station, Texas.

Herrmann, B.A., & Duffy, G.G. (1989). *Relationships between teachers' conceptual understandings, teacher responsiveness, and student outcomes: Two exploratory studies in teacher education settings.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco. Herrmann & Duffy.

Jones, B.F., Valdez, G., Nowakowski, J., & Rasmussen, C. (1995). *Plugging in: Choosing and using educational technology.* North Central Regional Educational Laboratory.

Kislenko, K., & Lepmann, L. (2011). Changes in teachers' approach, teaching mathematics in Estonian schools (1990-2010). *Teacher Education, 16*(1), 42-49.

Lepik, M., & Pipere, A. (2011). Baltic-Nordic comparative study on mathematics teachers' beliefs: Designing research instrument to describe the beliefs and practices of mathematics teachers. *Acta Paedagogica Vilnensia*, *27*,115-123.

Lester, P.E. (1987). Development and factor analysis of the teacher job satisfaction questionnaire (TJSQ). *Educational and Psychological Measurement*, *47*(1), 223-233.

Levine, D.U., & Lezotte, L.W. (1990). *Unusually effective schools: A review and analysis of research and practice*. Madison, WI: National Center for Effective Schools Research and Development.

Liljedahl, P., Rösken, B., & Rolka, K. (2007). Analyzing the changing mathematical beliefs of preservice elementary school teachers. In K. Hoskonen & M.S. Hannula (Eds.), *Current state of research on mathematical beliefs XII* (pp.71-82). University of Helsinki.

Little, J. (1993). Teachers' professional development in a climate of educational reform. *Educational Evaluation and Policy Analysis, 15*(2), 129-151.

Liu, E., & Kardos, S.M. (2002). *Hiring and professional culture in New Jersey schools.* Cambridge: Project on the Next Generation of Teachers at the Harvard Graduate School of Education.

Loogma, K., Kesküla, E., & Roosipõld, A. (2010). The transformation of the teaching profession in Estonia: Changes in professionalism. In J.Mikk, M.Veisson, & P.Luik (Eds.), *Teacher's personality and professionalism* (pp.11-30). Frankfurt am Main, Germany: Peter Lang.

Loogma, K., Ruus, V.-R., Talts, L., & Poom-Valickis, K. (2009). Õpetaja professionaalsus ning tõhusama õpetamis-ja õppimiskeskkonna loomine, OECD rahvusvahelise õpetamise ja õppimise uuringu TALIS tulemused [Teacher's professionalism and development of effective teaching and learning environment]. Tallinn University.

Menon, M., Papanastasiou, E., & Zembylas, M. (2008). Examining the relationship of job satisfaction to teacher and organisational variables: Evidence from Cyprus. *International Studies in Educational Administration*, *36*(3), 75-86.

Mourshed, M., Chikioke, C., & Barber, M. (2010). *How the worlds most improved school systems keep getting better.* McKinsey & Co.

Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., & Chrostowski, S.J. (2004). *TIMSS 2003 International Mathematics Report: Findings from IEA's trends in international mathematics*

and science study at the fourth and eighth grades. TIMSS & PIRLS International Study Center, Boston College.

OECD (2001). *Teaching practices, beliefs and attitudes module, Teaching and Learning International Survey* (TALIS).

OECD (2009). *Creating effective teaching and learning environments: First results from TALIS*. Paris: OECD Publishing.

Osborn, M. (2004). New methodologies for comparative research? Establishing 'constants' and 'contexts' in educational experience. *Oxford Review of Education, 30*(2), 265-285.

Pajares, M.F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, *62*(3), 307-332.

Pehkonen, E., & Lepmann, L. (1994). Teachers' conceptions about mathematics teaching in comparison (Estonia-Finland), In M.Ahtee & E.Pehkonen (Eds.), *Constructivist viewpoints for school teaching and learning in mathematics and science* (pp. 105-110). University of Helsinki, Dept. of Teacher Education, Research Report 131.

Peña, E. D. (2007). Lost in translation: Methodological considerations in cross-cultural research. *Child Development, 78*(4), 1255-1264.

Perie, M., Baker, D., & Whitener, S.D. (1997). *Job satisfaction among America's teachers: Effects of workplace conditions, background characteristics and teacher compensation.* U.S. Dept. of Education, Office of Educational Research and Improvement.

Peterson, K.D., & Brietzke, R. (1994). *Building collaborative cultures: Seeking ways to reshape urban schools.* Oak Brook, IL: North Central Regional Educational Laboratory.

Pipere, A. (2005). Primary and secondary teachers: Beliefs and performance related self-perceptions about engaged learning. *Baltic Journal of Psychology*, *6,* 32-44.

Ravitz, J.L., Becker, H.J., & Wong, Y.T. (2000). *Constructivist-compatible beliefs and practices among U.S. teachers. Teaching, learning, and computing: 1998 National Survey*. Center for Research on Information Technology and Organizations, University of California, Irvine and University of Minnesota.

Rice, E.M., & Schneider, G.T. (1994). A decade of teacher empowerment: An empirical analysis of teacher involvement in decision-making, 1980-1991. *Journal of Educational Administration, 32*(1), 43-58.

Sari, H. (2004). An analysis of burnout and job satisfaction among Turkish special school headteachers and teachers, and the factors effecting their burnout and job satisfaction. *Educational Studies*, *30*(3), 291-306.

Schein, E. (1992). *Organizational culture and leadership.* San Francisco: Jossey-Bass.

Seidman, S.A., & Zager, J. (1986-1987). The Teacher Burnout Scale. *Educational Research Quarterly*, *11*(1), 26-33.

Skott, J. (2009). Contextualising the notion of 'belief enactment'. *Journal of Mathematics Teacher Education, 12*, 27-46.

Taylor, P.C., Fraser, B.J., & Fisher, D.L. (1997). Monitoring constructivist-learning environments. *International Journal of Science Education*, *459*, 414-419.

Thompson, A.G. (1992). Teachers' beliefs and conceptions. In D.A.Grouws (Ed.), *Handbook of research on mathematics learning and teaching* (pp.127-146). New York: Macmillan.

Whitener, S.D. (1997). *Characteristics of stayers, movers, and leavers: Results from the teacher followup survey, 1994-95.* Washington, DC: National Center for Education Statistics, U.S. Dept. of Education, Office of Educational Research and Improvement.

Wilson, M., & Cooney, T.J. (2002). Mathematics teachers' change and development. The role of beliefs. In G.C.Leder, E.Pehkonen, & G.Törner (Eds.), *Beliefs: A hidden variable in mathematics education?* (pp.127-148). Kluwer Academic Publishers.

Zembylas, M., & Papanastasiou, E. C. (2005). Modeling teacher empowerment: The role of job satisfaction. *Educational Research and Evaluation*, *11*(5), 433-459.

Zembylas, M., & Papanastasiou, E.C. (2006). Sources of teacher job satisfaction and dissatisfaction in Cyprus. *Compare: A Journal of Comparative Education*, *36*(2), 229-247.

[This page intentionally left blank]