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Gender Equality in Public Higher Education Institutions of Ethiopia: The Case of Science, Technology, Engineering, and Mathematics

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Abstract

Ensuring gender equality in higher education system is high on the agenda worldwide particularly in science disciplines. This study explores the problems and prospects of gender equality in public higher education institutions of Ethiopia, especially in science, technology, engineering, and mathematics. Descriptive survey and analytical research methods were used in the study. Subjects of the study consisted of university instructors, higher education institutions gender affairs officers, and female students. Gender-related policy documents were also used as sources of data. Questionnaire, interviews, and documents analyses were employed as tools of data collection. The data were analysed using mixed methods. The study revealed a serious underrepresentation of female students in science disciplines in the contemporary Ethiopian public higher learning institutions. The paper discusses both the core factors that discourage women from pursuing sciences and suggestions which may assist them join and succeed in sciences.

Keywords: gender equality, hard science, higher education, science education

The provision of higher education is a recent phenomenon in Ethiopia: the first higher education institution in Ethiopia, the University College of Addis Ababa, opened in 1950. Little progress was made in the expansion of higher education institutions until the introduction of the current education and training policy in 1994 (Leka, 2004). Following the adoption of an education and training policy (Federal Democratic Republic Government of Ethiopia, 1994), the Ethiopian Ministry of Education produced a document entitled "Higher Education System Overhaul", outlining the reform of tertiary education. Similar to the situation in other African countries, the reform's objectives are to ensure equality, access, accountability, relevance, and responsiveness to the demands of the Ethiopian people (Ashcroft, 2004). In particular, the reform process focuses on poverty reduction and promoting sustainable development in the country (Semela, 2006). Relevant to this reform have been the efforts to enhance gender equality and bridge the development gap between the various regional states, nationalities and other social groups by increasing access to higher education (Wondimu, 2004).

As part of the implementation strategies for the above reforms, the Ethiopian government designed and implemented affirmative action in 1998, which aimed to promote gender equality, especially in the universities of the country. This program includes an initial orientation for all first year female students; female-only tutorials in four subjects chosen by the students during their first academic year; a guidance and counselling service led by female professional counsellors on a one-to-one basis; peer counselling and support from senior female students; academic support from capable senior female students; and overall assertiveness training (Demise et al., 2002). In addition, this affirmative action program enables females to enrol at universities with a 0.2 grade point average less than that of males.

Furthermore, in 2008, the Ethiopian Ministry of Education came up with a new policy whereby 70% of overall university enrolment is expected to be in a science field, with the remaining 30% in the social sciences. This new enrolment policy has emerged based on Ethiopia's aim to produce more graduates in the fields of science, technology, engineering, and mathematics (hereafter STEM) to secure sustainable development in the country. However, when it comes to gender equality, this new enrolment policy may further deter Ethiopian females' participation in higher education. In support of this claim, Tsegai (2010) states "the prioritization of science and technology (70:30) that was introduced in 2008 within the educational and development policies of the country may further exclude female students unless additional actions are taken to promote their participation in these fields" (p. 86). Local studies (Bekele et al., 2007; Semela, 2010) suggest that the Ethiopian higher education system in general is ineffective when it comes to addressing gender equality in all fields of study and in STEM in particular.

While there exists an extensive body of literature on female participation in STEM in the western world, little is known about the underlying reasons why women are less interested in studying STEM in an African context. Morley et al. (2006) argue that there are limited data about the underrepresentation of female staff and students in STEM in middle and low-income countries. Hence, in this article, I aim to enhance our understanding of the key factors shaping the pattern of females' low enrolment and retention in STEM subjects in Sub-Saharan Africa, using Ethiopia as a case study. To this effect, this research attempts to answer the following questions.

- Why do most female students not study STEM in the higher education institutions of Ethiopia?
- What are the strategies in place to enhance gender equality in STEM in line with the current Ethiopian higher education enrolment policy?
- Are these strategies aligned with the explanations for the STEM gender gap?

Development of Science Education in Ethiopia and Female Participation

It is important to present an overview of the development of science education in Ethiopia before discussing Ethiopian females' participations in STEM. In Ethiopia, the launch of modern, western-type secular education in 1908 is believed to have marked the inception of science education. Nevertheless, in the first few decades following the introduction of modern education, little attention was paid to the study of science in school, as the emphasis was upon the study of languages and public administration

(Semela, 2010). However, during the reign of Haile Selassie I, science became a major component of the school curriculum, as affirmed by the opening of the Faculty of Science of the University College of Addis Ababa in 1950 (Zewde, 2002).

During the Dergue regime (1974–1991), some colleges offering diplomas in basic science disciplines, such as biology, chemistry and physics, were opened in various places in Ethiopia. In connection with the introduction of the National Democratic Revolution Program of the Dergue regime, science and technology were paid due attention based on the communist principle of shaping the 'well rounded socialist personality', though little was achieved in the education sector owing to the internal political crises and armed conflict with the opposition forces (Semela, 2010).

After the current Ethiopian government came to power in 1991, a new education and training policy, which proposed that science and technology should be one of the core aims of the national education system, was developed in 1994. To cater for the trained manpower needs of the country, a number of universities opened, offering various programs, including sciences. At present there are 32 public higher education institutions offering science education in the country.

Regarding female Ethiopian students' participation in STEM, local studies indicate a low enrolment and low retention rate in the disciplines. For instance, according to Semela (2010), in 2007/08, of the total 2208 undergraduate physics students enrolled at ten relatively well-established universities, only 175 (7.9%) were female, while the number of female graduates was 29, which accounts for only 5.7%. Bekele et al. (2007) also claim that undergraduate female students' enrolment rates at Jimma University, one of the largest universities in Ethiopia, in the period 2001–2005 in the fields of pharmacy, technology, veterinary medicine, and other sciences were 2.8%, 3.2%, 3.8%, and 9.8%, respectively. By contrast, the enrolment rates in language studies, business and economics, and social sciences were 25.2%, 26%, and 28.3%, respectively. Furthermore, as to Semela (2010), the data gathered at the national level in 2008 by the Ethiopian Ministry of Education indicated that for every 100 higher education male students, there were only seven or eight females.

Such studies may reveal the serious underrepresentation of Ethiopian females in STEM. Yet there remains no substantial research on the factors and circumstances shaping this pattern, despite policy statements that express a commitment to promoting gender equality in Ethiopia's education system particularly in STEM subjects. Hence, this study is an attempt to find out the key factors that hinder most Ethiopian women from studying STEM like their male counterparts. Furthermore, it aims at proposing strategies which may enhance women's participations in STEM subjects.

Rationale for Female Participation in STEM

To effectively promote scientific and technological advancement, it is important to ensure the participation of women across different national economic and public sectors especially in developing countries like Ethiopia. This is because empowering women in fields of studies such as STEM that have high economic returns has a number of advantages. Such women may raise healthier families, apply improved hygiene and nutritional practices, and become productive both at home and at work, thereby improving their own life as well as that of their family. Nevertheless, many adolescents, especially female

and minority students, choose not to pursue careers in STEM (Jacobs & Simpkins, 2005).

Gender equality and women's empowerment are central to the achievement of the Millennium Development Goals (UNDP, 2005). It is clearly underscored in various development programs that gender equality and women's empowerment are not only just and desirable ends in themselves, but also serve as vehicles for the achievement of all of the other Millennium Development Goals (Kabeer, 2003). Coombs (1985) contends that particularly in developing countries, the education of women holds the key to all elements on which the transformation of societies depends – population control, family health, personal hygiene, nutrition, receptivity to innovations, and educational motivation of children. Despite this, according to (Osborne et al., 2003), there is a disparity between the increasing recognition of the importance and economic utility of scientific knowledge and its cultural significance on the one hand, and on the other, the declining interest of students in general and female students in particular in pursuing science. This disparity has become a matter of considerable societal concern and debate.

Female Students' Enrolment and Retention in STEM

It might be argued that any effort which is intended to increase women participation in STEM is expected to pay equal attention to their enrolment and retention. As a public good, science education is expected to be accessible to every citizen of a nation, regardless of social and other classifications. Despite this fact, gender disparities in STEM are substantial (Fox et al., 2011).

According to Rathgeber (2003), in all parts of Africa, natural sciences and engineering are systematically rejected as attractive courses of study by women. However, very little public discussion has occurred about the low number of women engaged in STEM, and no real efforts have been made by the African university administrators to establish why females reject these fields of study (Rathgeber, 2003). In Africa, far from being encouraged to study science, females are subtly – and sometimes very directly – told repeatedly by teachers, schools, universities, and the various bureaucracies that science is not a suitable area for them to study (Rathgeber, 2003; Woodhouse & Ndongko, 1993).

As to Rathgeber (2003), this attitude tends to be replicated in the workplace. Relatively few African women hold senior academic positions in science-related subjects. This means that females who wish to pursue science have few mentors and role models. Oanda and Akudol (2010) further claim that not only are there fewer female Sub-Saharan African students enrolled in STEM, but also that their completion rates are lower compared to those of male students. Given the importance of science and technology to African development, this issue demands serious attention from the policymakers.

Key Factors that Shape Females' Choice of STEM

Many researchers who have attempted to understand why females underrepresented in STEM have suggested widely divergent explanations (Blickenstaff, 2005; Brotman & Moore, 2008; Hsu et al., 2009; Taylor et al., 2001). Nevertheless, in this study, the core factors (lack of ability, absence of awareness, gendered nature of STEM i.e. considering STEM as masculine subjects, lack of female-friendly environment, and inadequate sup-

ports from universities) that are assumed to influence most females' possibility of studying STEM are emphasized.

Lack of Ability or Lack of Academic Preparation

To join and succeed in STEM at university level, it is important for female students to prepare themselves academically from an early stage. According to Taylor et al. (2001), a student decides to become a scientist between fourth and six grades. This means that disadvantaged learners particularly females and minorities, need early interventions to motivate them to continue to study science subjects.

A number of studies suggest that in the early grades there is no significant difference between girls and boys with respect to interests in science (Baram-Tsabari & Yarden, 2011; Barton et al., 2008; Francis, 2000a). However, the interests of girls in science fall considerably behind those of boys as they progress through the grades (Barton et al., 2008; Christidou, 2011; Dawson, 2000; Evans et al., 2002). As to Sadker et al. (1997), starting from the middle school level, girls say that mathematics and science are less important and useful with respect to their career. As a result, the majority of them start college without completing four years of high school mathematics adequately. This lack of preparation serves as a 'critical filter', inhibiting most girls from entering many careers in STEM. In a similar way, most Ethiopian females loose interest in science as the grade levels increase (Zeleke, 2005).

Generally, the above notions imply that, to help Ethiopian women to enter and succeed in STEM, it is important to pay special attention to their science ability starting from the lower grades in general and in the middle grades in particular. In support of this argument, Barton et al. (2008) claim "the middle grades are a crucial time for girls in making decisions about how or if they want to follow science trajectories" (68). Similarly, drawing on Evans (1965), it could be argued that early success, resulting from ability, may give rise to interest, which in turn, leads to persistent effort, and this combined with ability is likely to culminate in success. Furthermore, according to Wyss et al. (2012), very often, students make choices in middle school that will impact their desire and ability to pursue STEM careers. Overall, the above discussions reveal the fact that there is a need for changing the way science is taught in the lower grades especially in the middle and high school levels in order to enable female students to join and succeed in STEM fields of studies at university level.

Absence of Awareness

Having a clear perception of what a field of study has to offer students may have a great bearing on their decisions in educational stream choice thereby making career choices. Many studies (Sadker et al., 1997; Tai et al., 2006; Wyss et al., 2012) suggest that students make decisions about their future career choices at the middle school level. This, in turn, may imply the fact that unless female students have adequate information about STEM as both a field of study and a career; they may join other fields of studies such as social sciences while they still have all it takes to join and succeed in STEM subjects. Concerning this claim, Wyss et al. (2012) assert that

> *In an effort to increase the number of students who will pursue STEM study and careers, we need to increase student awareness of a variety of STEM careers early on. Students who are offered this information in school will be better able to make informed decisions about their interest in STEM and better prepare for those careers* (p. 504).

Having a clear awareness about STEM may have a far reaching impact on whether women pursue it as a field of study particularly in developing countries such as Ethiopia where there is a limited possibility for students to get adequate information about the discipline they want to pursue. This lack of awareness may make a student join the social science while his/her performance is still good in hard science. This suggests the importance of raising the awareness of female students long before they make their educational stream choices.

Views of Females (STEM is Gendered)

One of the key factors that may affect female students' science career aspirations and identities is the students' self-efficacy (Glynn et al., 2007; Post et al., 1991). This means that women's self-concept and how they regard other people's perceptions of their ability may influence their educational stream choice. According to Francis (2000b), traditionally, 'the sciences', such as mathematics, science, and information technology, have been perceived as a masculine domain while, conversely, 'the arts', like languages, arts, and the humanities, have been constructed as feminine. This dualistic allocation carries a hierarchy in terms of subject status: 'the sciences' are associated with high-status traits, such as rationality and objectivity, while 'the arts' are associated with emotion and subjectivity. It is the construction of these traits as gendered which usually lead to the assignment of these subjects as either masculine or feminine (Hedlin, 2011). The same factors and experiences apply in Ethiopia regarding women's relationships to STEM. In support of this claim, the Ethiopian Ministry of Education (2009) ascertains the fact that Ethiopian females are underrepresented in STEM unlike their relatively better representation in business and economics, education, law, and health sciences.

Furthermore, according to Morley et al. (2006), there is a perception that, if a subject is 'hard', then it is unsuitable for women. The hard/soft binary thinking around academic subjects is gendered. The challenge is for women to push through what is socially accepted as 'hard'. In such a context, even capable females who can perform well in STEM may study the arts simply just to conform to the prevailing norm. Hedlin (2011, p. 449) claims that students' ongoing identity formation is of great significance with regard to how they relate to different fields of knowledge.

Educational Experiences Less Accessible to Females (Not Female-friendly)

It could be argued that the educational experiences that females encounter in science education may have a bearing on whether or not they participate in STEM. In this regard, the examples and illustrations women's experience in science classes and curricula, the teacher-centered, male-dominated mode of science education, etc., may negatively affect their inclination towards STEM. Supporting this claim, Sadker et al. (1997) state that "misrepresentations and omissions can negatively affect the self-image, goals, and philo-

sophy of girls" (p. 134). According to Christidou (2006), to foster students' interests in science, the topics taught in schools should be selected with great care. To this end, it is important to revise the existing science curricula in order to incorporate those topics which are of interest as well as relevance to the students especially for female students.

Moreover, women need positive role models for the development of positive self-esteem. Role models particularly female role models influence female students to choose sciences as field of studies as well as careers in STEM (Christidou, 2011; Evans et al., 1995; Snowman & Biehler, 2006; Wallace & Haines, 2004).

Taylor et al. (2001) assert that the application of three important models i.e. equitable teaching strategy, inquiry-based learning, and cooperative group learning may help females to pursue STEM disciplines. In other words, through equitable teaching strategy attempts are made to meet the educational needs of females and minority students in order to empower them to pursue science subjects whereas inquiry-based instruction aims at encouraging underserved students such as female students to ask critical questions and find answers through problem-solving technique. Cooperative group learning, on the other hand, may foster theme works whereby students learn from each other through reflection and experience sharing. Such practices may empower female students to enter and succeed in STEM subjects like their male counterparts.

By the same token, the use of student-centered learning experiences and teaching methods in Ethiopian science education, where females receive individualized support, apart from participating in cooperative learning, may encourage them to participate and succeed in STEM. Further, the use of gender-fair materials may encourage women to enter and succeed in science education. In sum, in order to attract Ethiopian women towards STEM, it is important to make science education female-friendly.

Lack of Adequate Support from Higher Education Institutions

Higher education institutions are expected to orient and guide students, especially disadvantaged learners, in their educational stream choice. If students are to make wise field of study choices, there is a need for orientation and guidance before as well as during the choice process by the body responsible. This means that, students particularly underserved learners are expected to be guided into those educational channels that are assumed to have better prospect and return. Furthermore, universities are expected to deliver sustainable supports especially for underserved students in order to help them complement their studies. To this end, it is important to deliver sustainable trainings especially for science teachers on how to plan, deliver and assess lessons in a student-centred manner. This strategy may motivate women to enter STEM subjects like their male counterparts.

Despite this fact, according to Semela (2010), Ethiopian university officials deter females from studying the hard sciences as an "affirmative action", imagining that this strategy will help to minimize the dropout rate for female students. Semela (2010) further claims that Ethiopian women's possibility of participating in the hard sciences in general and the physical sciences in particular is mainly discouraged at the Ethiopian higher education institutions' level. The paradox is that, as a matter of regulation, 30% of the total enrolment in all STEM subjects is reserved for female students. Of the remaining 70%, male and female students compete based on their Ethiopian National Higher Education Entrance Examination grades. According to this formula, in the science field,

the majority of females students study biology and the remaining few study chemistry. Very few study the other sciences.

Similarly, Wondimu (2004) asserts that the Ethiopian higher education institutions' officials and teachers are unconvinced of the need for affirmative action. As a result, they do not provide the necessary academic and material support for female students as outlined in the affirmative action program. This shows that, instead of helping females to study and succeed in STEM, the Ethiopian higher education institutions downplay the implementation of the gender affirmative action program.

Strategies for Enhancing Female Students' Participation in STEM

Local studies (Semela, 2010; Wondimu, 2004) suggest that Ethiopia's higher education institutions do not seem to be effectively implementing gender parity strategies. Nonetheless, many studies in other African countries reveal that their universities are successfully implementing their gender equity strategies, especially in STEM. For instance, according to Lihamba et al. (2006), at the University of Dar es Salaam, three major strategies have been used as affirmative action to increase women enrolment in the sciences. They are the Pre-entry Program, Preferential Admission Criteria and Scholarship Program. The objectives of the Pre-entry Program have been to increase the number of females in the sciences and thus increase the number of female A-level science teachers in the country. To that end, remedial courses are provided for women who have not attained the minimum academic requirements to enter the faculty of science at the university. Accordingly, those who pass the entry examination will have a chance to study STEM.

The central purpose of the Preferential Admission Criteria is to facilitate the admission of qualified female applicants to all faculties but with lower A-level grades and matriculation points than the male applicants. Hence, this strategy has been found to be effective in increasing female admissions to the University of Dar es Salaam, especially in the field of the sciences. The third strategy i.e. the Scholarship Program is intended to support needy and deserving women to pursue their studies at both the undergraduate and postgraduate levels in all fields. As to Lihamba et al. (2006), this program has been effective in attracting women to study STEM. Above all, these three strategies have stimulated a culture of responsiveness to gender equality in the university's enrolment process.

The research conducted by Kwesiga and Ssendiwala (2006) on gender equity at Makerere University also revealed the effectiveness of giving additional points to females to raise their entry to the sciences. In addition to this strategy, using scholarship to increase female enrolment in STEM was found to be successful. Gender mainstreaming, whereby attempts are made to bridge gender gaps in diverse aspects of university life, was also found to be effective in promoting gender equality in the sciences at Makerere University. In addition, Shackleton et al. (2006), through the research they conducted on gender equity in the South African universities, suggested the need for the overall transformation of the work culture and attitudes of all of the actors involved in the implementation of gender equity in STEM especially in engineering.

To sum up, the foregoing discussion highlights the existence of variations among the African universities in terms of implementing strategies to enhance women participations in STEM. It could be argued that countries such as Ethiopia may learn a lot

from other African countries whose universities have succeeded in fostering gender equality in STEM.

Methodology

This research is a case study through which attempts are made to gain a better understanding about the core factors that deter most Ethiopian women from studying STEM. To this effect, two public universities, i.e. Addis Ababa University and Adama Science and Technology University, which have relatively well-established systems particularly in STEM, were used as samples purposely. These universities were selected due to the fact that they have a relatively better institutional capacity for implementing gender equality in STEM. This, in turn, is assumed to be useful for judging the extent to which the other public universities, with less capacity, might implement gender parity in STEM.

The data sources were female students, heads of the gender offices, and selected instructors from the two universities. Moreover, gender-related policy documents were also used as sources of information. Both STEM major and social science major third year female undergraduate students were taken as the target of the study. According to the current Ethiopian university education policy, most social science major students finish their undergraduate studies at the end of their third year. So, third year female students were targeted, taking their seniority and level of maturity into account. The assumption was that the data gathered from such students were most likely to yield better results because these students are more mature and able to discuss their circumstances.

Data were gathered using questionnaires, interviews and documentary analysis. A questionnaire was used to gather data from female students at the two universities. The items on the questionnaire were both closed-ended and open-ended. The former were prepared in a Likert-scale with five options (strongly disagree, disagree, undecided, agree, strongly agree) with the intention of obtaining objective responses through ensuring relatively better flexibility in the checking of each item, whereas the latter gave the respondents full freedom to express their feelings. In the closed-ended items, each of the five core factors (lack of ability, absence of awareness, gendered nature of STEM, lack of female-friendly environment, and lack of adequate support from universities) that may deter women from studying STEM was systematically repeated twice to check the consistency of the respondents' responses. Thus, the first and sixth items were framed based on lack of ability, the second and seventh items were set based on absence of awareness, the third and eighth items were prepared in line with gendered nature of STEM, the fourth and ninth items were designed to address lack of female-friendly environment whereas items number five and ten were framed to analyse whether Ethiopian universities provide adequate supports to females in order to help them complete their studies (Table 1).

After preparing the questionnaire, a pilot study was undertaken. In this regard, the questionnaire was administered to a sample consisting of 160 (half STEM majors and half social science majors) female students, randomly selected from the universe of the study. The appropriateness of the items on the questionnaire, i.e. whether they solicit the intended data and the intelligibility of the wording, was judged based on the responses of the respondents and then improvements were made accordingly. Finally, the questionnaire was administered to 380 sample female students that were taken from the two

streams to compare their opinions. STEM students were included in the sample, although they have already chosen STEM as their major, so they may explain why they are still there. Out of the total respondents, 320 filled out the paper questionnaire correctly and returned it, i.e. with the response rate of 84.21%.

To obtain additional information to the data provided by the respondents on the questionnaire, semi-structured interviews were conducted as tools of data collection with the heads of the gender offices of the universities, two instructors (one from each university), and four female students (two from each university) selected using purposive sampling technique.

The questionnaire and interview questions were designed in a way in which they complement each other. In other words, the content of the interviews followed that of the questionnaire, and thus was crosschecked with the questionnaire responses. In general, the contents and focuses of the questionnaire and interviews emphasized the five key factors that shape women inclinations towards STEM subjects.

The quantitative data collected through the closed-ended items on the questionnaire were computed using percentages. In so doing, the five-point scale was reduced to a three-point one to make the data tabulation process more intelligible in terms of presenting the results concisely. To this end, the values for 'fully disagree' and 'disagree' were combined, as were those for 'agree' and 'fully agree', while the values for 'undecided' were treated separately. Therefore, the forthcoming results and discussion is based on the three-point scale table. Nevertheless, the data gathered using the open-ended questionnaire items, interviews, and documentary analysis were analysed qualitatively. Generally, mixed methods (Creswell, 2014; Creswell & Plano Clark, 2011) were employed in analysing the data.

Regarding the research ethics, before the necessary data were collected from the respondents and informants, they were informed about the research objectives and procedures to be followed, and their consent was obtained. Further, anonymity was maintained throughout the research activities.

Results and Discussions

In this section, the data gathered from the questionnaires, interviews and documentary analysis are presented and analysed.

Table 1
Female Students' Responses to the Closed-Ended Items of the Questionnaire (n = 320)

	Items	Respondents' field of studies	Proportion of female students in each category					
			Disagree		Undecided		Agree	
			N	%	N	%	N	%
1	2	3	4	5	6	7	8	9
1	Most Ethiopian higher education institutions' female students do not pursue science, technology, engineering, and mathematics due to inadequate preliminary knowledge.	STEM major	24	15	12	7.5	124	77.5
		Social science major	10	6.25	6	3.75	144	90

Sequel to Table 1 see on p. 13.

Sequel to Table 1.

2	I had got adequate awareness about the field of study I'm pursuing now long before I joined this university.	STEM major	12	7.5	4	2.5	144	90
		Social science major	16	10	8	5	136	85
3	I feel most Ethiopian female students do not join hard sciences because of poor self-concept.	STEM major	28	17.5	12	7.5	120	75
		Social science major	12	7.5	8	5	140	87.5
4	I think the existence of limited number of female instructors in hard sciences makes most female students not to join the fields.	STEM major	32	20	12	7.5	116	72.5
		Social science major	16	10	6	3.75	138	86.25
5	My university is making all its best to make the learning environment favourable for female students in relation to 'the 70% science and 30% social science program' in order to help them complete their studies.	STEM major	128	80	14	8.75	18	11.25
		Social science major	136	85	8	5	16	10
6	Most Ethiopian female students show little interest towards hard sciences due to lack of academic preparation starting from the lower grades.	STEM major	32	20	8	5	120	75
		Social science major	20	12.5	4	2.5	136	85
7	I have got a clear understanding of the differences between social and natural science field of studies starting from the lower grades.	STEM major	12	7.5	6	3.75	142	88.75
		Social science major	24	15	10	6.25	126	78.75
8	Most Ethiopian female students do not join hard sciences because of their threating nature.	STEM major	40	25	12	7.5	108	67.5
		Social science major	24	15	4	2.5	132	82.5
9	The way through which hard sciences are taught in schools makes most Ethiopian females not to join them as fields of studies.	STEM major	40	25	16	10	104	65
		Social science major	16	10	8	5	136	85
10	The sustainable supports that I have got from my university in connection to 'affirmative action program' helped me to succeed in the subject I'm studying now.	STEM major	140	87.5	4	2.5	16	10
		Social science major	132	82.5	10	6.25	18	11.25

Source: Survey data

Note: n = number of respondents

In the table above, the first item deals with the question of whether most female Ethiopian students fail to engage in STEM due to inadequate preliminary knowledge. Regarding this, 77.5% of the female STEM major and 90% of female social science major agreed with the statement. Furthermore, 75% of STEM major and 85% of social science major said that most Ethiopian female students show little interest towards hard sciences due to lack of academic preparation starting from the lower grades. This means that most of the respondents from the two universities think that most Ethiopian women do not study STEM due to lack of ability.

This, on the other hand, raises another question, i.e. why do the majority of STEM female respondents agree that a lack of ability prevents most women from studying STEM? This might be due to the respondents thinking that the number of female students in STEM is negligible compared to that studying social sciences and/or they might consider themselves as having adequate background knowledge that helped them to study STEM, despite the existence of this problem. According to Zeleke (2005), students who are not equipped with a sound knowledge of mathematical concepts in the lower grades will certainly struggle greatly when studying mathematics and related courses in later grades.

Furthermore, in response to the interview question, 'Why didn't you study a hard science?', a female social science major commented "*I am not very good at doing calculations. So, I didn't dare to study one of the disciplines that require such ability. In short, I am not a person meant for hard sciences*."

On the other hand, a STEM major, when asked 'Why did you choose science as your field of study unlike the majority of Ethiopian female students?' commented: "*I chose science because of my good background in the discipline. I really like mathematics and physics, starting from the lower grades so I haven't been influenced by the rumour I heard about the difficulty of the field I'm studying now*."

The above two responses show how much the students' background affects their decisions when choosing which subject to study at university. In connection with this argument, Charles (2011) claims that "career aspirations are influenced by beliefs about ourselves, i.e. what am I good at and what will I enjoy doing" (p. 25).

Another female social science major student, when asked 'If you had been offered a scholarship to study hard sciences at university, would you have done so?', commented "*no, I wouldn't. I know I'll benefit from the scholarship, but I was not ready to pursue such disciplines, starting from the lower grades*." The above response may indicate the long trajectory that either paves or blocks the way for females to participate and succeed in STEM. As such, the decision to pursue STEM as an educational stream starts while the students are still at secondary school.

In response to the statement, 'I had got adequate awareness about the field of study I'm pursuing now long before I joined this university', 90% of the STEM majors and 85% of the social science majors (see Table 1 above) agreed. Similarly, 88.75% of the STEM majors and 78.75% of the social science majors reported that they have got a clear understanding of the differences between social and natural science field of studies starting from the lower grades. This implies that 'lack of awareness' is not deterring most female Ethiopian students from studying STEM subjects. The social science majors might have agreed with this statement due to the fact that they had got the awareness that STEM subjects are not suitable to them so that they joined social science subjects based on their awareness.

Concerning self-concept, 75% of the STEM majors and 87.5% of the social science majors thought that the majority of female students avoided studying hard sciences because of a poor self-concept. In addition, 67.5% of STEM major and 82.5% of social science major respondents agreed that most Ethiopian female students do not join hard sciences because of their threating nature. Here, the STEM majors might have responded similarly to the social science majors, due to the fact that, unlike the majority of Ethiopian females, they might have the self-confidence to study STEM and/or they might have got such opinion due to their experience and knowledge about the problem.

Generally, the responses of the sample female students revealed that most female Ethiopian students do not pursue STEM due to a poor self-concept about their expectation of succeeding in the field. According to Morley et al. (2006), a fear of mathematics is often reported by students and academics as a reason for many females' reluctance to study STEM. Mathematics is a powerful educational filter or gatekeeper to the sciences that remains gendered in many societies.

Furthermore, the same table examines whether or not the existence of limited number of female instructors in hard sciences deters most females from studying these fields. Accordingly, 72.5% of the STEM majors and 86.25% of the social science major respondents indicated that they think that a lack of female role models in STEM subjects affects most Ethiopian females' inclination to study this field. Similarly, 65% of the STEM majors and 85% of the social science majors reported that the way through which hard sciences are taught in Ethiopian schools makes most females not to join them as fields of studies. The STEM majors might have developed such an opinion due to the fact that they study the discipline regardless of this problem because of their prior experience as well as ability in STEM and/or they might have taken into account what the majority of female students feel regarding the impact of the absence of female-friendly approach in the teaching of science in the Ethiopian context. Semela (2006) argues that "there are abundant theoretical and empirical supports regarding the positive effect of women role models on young female students to follow in their footsteps in all spheres including succeeding in tertiary institutions" (p. 84).

In general, this means that the educational experiences of Ethiopian female students are not female-friendly, as they are designed in many respects for males. With regard to this notion, in response to the interview question, 'Why didn't you choose one of the pure sciences when you started at university?', a social science major responded "*I think such fields of study require lots of hard work, especially in laboratories. I think that such work isn't female-friendly. I even think that science instructors favour male students.*"

In response to the interview question 'How do you think that STEM instructors could improve female students' participations in their classes?', one instructor commented "*teachers who teach sciences should be equipped with the ability and skills to use active learning in their respective courses. This, amongst other things, will enable the teachers to provide individualized support, particularly for female students.*"

In response to the opinion 'my university is making all its best to make the learning environment favourable for female students in relation to the 70% science and 30% social science program in order to help them successfully complete their studies,' 80% of the STEM majors and 85% of the social science majors responded negatively (see Table 1 above). Furthermore, 87.5% of STEM major and 82.5% of social science major respondents reported that they have not got sustainable supports from their respective university in connection to 'affirmative action program'.

However, the question arises: why do the STEM majors share a similar opinion with the social science majors? This might be because they have already got all what it takes to study and succeed in STEM despite the absence of a conducive learning environment in Ethiopian universities and/or they might have placed themselves in the shoes of the majority of women regarding STEM as an educational stream choice. Generally, the above notions may show that absence of a well-established, gender-based strategy in Ethiopian higher learning institutions is one of the factors that deters the majority of women from studying hard sciences.

In response to the interview question 'What do you think is the core problem with the strategy employed in Ethiopian universities to create gender equality in the hard sciences?', one instructor commented:

> *First of all, I do not think that there is a specific strategy to increase the participation of female students in the sciences. But the core problem of the current gender affirmative action program is the incompatibility of the time at which the students actually choose their fields of study and when the support is provided. Students choose their major at the end of their general education (at the end of grade 10), i.e. before they start university, whereas the support services are provided during the first year of university study.*

In addition, when asked the question 'What strategies could be used to improve the participation of female students in STEM?', one head of the gender office stated "*gender issues should be given due attention at the various educational levels particularly in university administration. The administration should pay special attention to females' participation in the sciences by designing strategies that attract females to the disciplines.*" Moreover, when asked 'What do you regard as the role of the gender office in promoting female students' participation in STEM in Ethiopian universities?', one gender officer responded "*except for the conventional affirmative action introduced some years ago, there is no specific strategy in use for fostering female students' participation in the sciences in the current Ethiopian higher education institutions' context.*" The above responses illustrate the absence of a clear strategy to enhance female students' participations in STEM, in line with the 70% STEM and 30% social science university enrolment policy of Ethiopia.

When it comes to the results for the open-ended questionnaire items, in response to the question 'Why do you think that the majority of female Ethiopian students show little interest in studying the hard sciences?', most of the respondents reported a lack of ability and readiness starting from the lower grades, a poor self-concept, socio-cultural gender stereotypes, and the lack of a concrete support system in the higher learning institutions. In addition, 'What strategies could be used to attract female students to study the hard sciences?' was the other core question asked on the open-ended part of the questionnaire. In response to this question, the respondents noted raising the awareness of female students, creating a conducive learning environment for female students, raising the gender awareness of STEM instructors to help them treat female students fairly, and arranging sustainable awareness raising program for the entire university community as key strategies.

Furthermore, the analysis of the higher learning institutions' policy documents revealed the existence of rules and regulations concerning the harassment and violence of female students together with other rules and regulations. Nevertheless, there is no strategy incorporated into the documents to attract female students to study STEM in line with the current university enrolment policy in Ethiopia. This, in turn, suggests that, let alone aligning the strategies with the explanations for the STEM gender gap, there is no strategy in place for enhancing females' participations in STEM in the contemporary Ethiopian universities.

Summary and Conclusions

Ethiopia, like the other developing nations in the world, wishes to promote its sustainable development, particularly via science education. To realize this objective, the role of the universities in producing and supplying trained manpower for the different sectors, especially STEM, is decisive. Ensuring sustainable development without the participation of women in the various sectors of STEM is likely to be impossible. In this regard, if possible, it is important to avoid gender disparity or, failing that, to minimize the gap.

However, this study revealed that there is a wide gender gap between students' participations in STEM in contemporary Ethiopia. That means that most women are reluctant to study STEM even though the current university enrolment policy of the country more than ever favours these fields of studies.

The prominent factors which lead to the general lack of interest in the hard sciences among most females are their inadequate preliminary knowledge and academic preparation, their poor self-concept, the persistent effects of socio-cultural gender stereotypes, the existence of science educational experiences that do not welcome women, and the absence of adequate support systems in the Ethiopian universities. Further, the study revealed that there is no strategy in place for increasing the participation of females' in STEM in Ethiopian universities. In other words, apart from the affirmative action program introduced in 1998, no new strategy has been introduced to increase the participation of women in STEM in connection to the introduction in 2008 of the 70% STEM and 30% social sciences university enrolment policy.

Hence, to improve the participation of women in STEM, early intervention is important. To this end, it is necessary to improve the background and capacity of female students particularly in the sciences, beginning from the lower grades. To do so, amongst other things, assigning competent teachers who can effectively teach sciences at the lower grade levels is very important. Moreover, to improve the self-concepts of females, amongst other things, it is important to design the textbooks of the sciences in gender-sensitive manner (Dawson, 2000). Furthermore, it is important to use strategies like providing scholarships or financial subsidies to competent but needy female students to attract them to study STEM. To promote this scholarship program, it is important to work in collaboration with fund raising organizations such as the Carnegie Foundation, the Swedish International Development Agency, and others that finance female students' education.

In addition, it is relevant to design a system in which female students can attend bridging courses that can compensate for their high school science background, particularly in mathematics, before starting university. This strategy may encourage females to study STEM. Moreover, after the students start to study STEM, in addition to what they learn on the regular program, it is advisable to provide them with enrichment courses. The bridging courses together with the supplementary courses will serve as scaffolding, particularly for those female students who start to study STEM with the minimum requirements to finish their studies. In addition, it is wise to arrange training which focuses on life skills education in general and coping skills in particular side by side with the other courses.

Furthermore, it is important to establish a concrete support system to train, orient, guide, and regularly counsel female students, especially those who study STEM, to believe

in their talents and ability, and develop positive self-concepts. To this end, it is important to improve the awareness and attitude of the university officials and instructors through organising sustainable training programs which focus on changing the existing work into conducive learning environment.

Lastly, at the classroom level, it is important to transform the present teacher-centred mode of delivery of courses into an interactive learning environment (Kelly, 2000). In particular, it is crucial to train STEM teachers on how to create conducive learning environment for female students such as treating them in a friendly manner and addressing different learning styles. Moreover, it is advisable to raise the awareness of science instructors on how to make laboratory procedures more student-friendly so that female students can participate on an equal footing with their male counterparts. The above suggestions may also have implications to reduce gender disparity in other fields of studies.

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Academic Library as the Space for the Development of Future Specialists' Competence

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Abstract

The article discloses the value of academic library. This value is deriving from the university purpose to prepare students to be able to deal with the increasing the flow of information in the society (Owusu – Ansah, 2001). Research was carried out in Utena University of applied science. First-year students (n = 140) made 48,3% of the sample, and third-year students (n = 150) – 51,7% of the investigated sample; males – 33,8% (n=98), and females – 66,2% (n=192). The conditions of academic library as student and future specialist empowered environment are validated: communicational, physical, pragmatic. The interpretation of research data disclosed that the academic library as learning environment and as environment which is empower the student to a professional qualification less or more improve future specialist professional, academically and as a personality. The future development of specialist competence effectiveness criteria can be considered as the nature of those experiences, which causes him to preparation for examinations and various settlements, preparation of projects and the search for the global academic community material created a topic of interest. The nature of experiences can reduce the educational impact of library. While improving learning environments are necessary to guide students with higher academic achievement and those who are spending more time in the library view.

Keywords: academic library, future specialist training, information literacy, experiences in the library

Western European and global tendencies focus our attention on the reality of the professional education of future specialists at higher education institutions in Lithuania. Since orientation towards effective activity on the working place is one of the features of the modern educational paradigm, students during their studies should develop in every possible way, i.e. both academically, professionally, and as personalities (Holmes, Hooper, 2000; Salmi, 2002). However in Lithuania, it is stated that the system of the education of specialists is practically not adapted to the needs of life-long learning, and the contents of the curriculum is insufficiently oriented towards the development of critical thinking, problem-solving, and informational literacy competences (OECD, 2002, Ilisko, Igatjeva, Micule, 2010; Salite, 2008). The level and the extent of the development of the global information society requires an educational response that would be focused

on the usage of information rather than on the application of information technologies, i.e. there is a greater need for developing informational literacy rather than informational technological literacy (Johnston, Webber, 2003). In this context, emphasis is placed on the educational (and learning) environments (Lipinskienė, 2002; Prosser, Ramsden, 2003; Lea et al., 2003). Thus, attention is shifted to the library as a constituent part of the learning and educational environment of higher school (Jiao, Onwuegbuzie, 1999; Owusu-Ansah, 2001; Thompson et al., 2003; Jucevičienė, Tautkevičienė, 2004), which value, according to Owusu-Ansah (2001), stems from the higher schools aspiration to educate and train students who would be able to function in the society, and especially solve the problems that they may encounter.

This means that the task of higher shools is to provide resources for research and learning, since specialists and scientists have to know how to find and to select suitable information to be able to answer the questions and solve the problems that may arise in a changing environment; in addition to that, they need to know how to satisfy their expectations in a world with steadily increasing amount of information. This aspect of student education could be guaranteed by the best-prepared specialists of the academic community – the specialists of academic libraries. Thus, an academic library must be reorganized with the aim of creation such an institution that, besides the storage functions, would acquire the status of the learning field. Such position confirms that an academic library has reached new borders when speaking about its role in developing students' intellectual experience. This new role cannot be presented as only a part of the aim or mission of the library. Here it must be emphasized that the specific situation of a library, as well as its aims in general, typical of such situation, must stem from the experience of higher education (Owusu-Ansah, 2001). This show that an academic library and, most importantly, its specialists as the experts in the access to global information, its evaluators, analyzers, and managers, have potential possibilities for educating future specialists. For this reason, in the physical space there must be cooperation between librarians, scientists, and students, collaborating in the circulation of information useful for these partnership-bound participants of the educational and learning environment (Jucevičienė, Tautkevičienė, 2004).

The presented statements substantiate the relevance of the study and conditions the situation where higher education institutions of countries in transition experience the need for the analysis of purposive educational environments that would allow for the more effective and versatile academic, professional, and personal development of students.

The aim of the study was set: to determine students' approach to the conditions of the library as a learning environment, and to disclose the associations of this approach with the duration of studies, time spent in the library, and students' achievements.

Materials and Methods

Participants

The sample comprised 290 first- and third-year students from the Utena university of applied science. First-year students (n = 140) made 48,3% of the sample, and third-year students (n = 150) – 51,7% of the investigated sample. In the aspect of sex, the distribution of the participants of the study was the following: males – 33,8% (n=98), and females – 66,2% (n=192).

Methods

The attitude of the inquired students of the Utena university of applied science towards the conditions of the academic library as a learning environment was evaluated according to our self-designed questionnaire that consisted of five blocks. In each block, a combination of closed and open questions, and statements were presented. The first block – the block of social-demographical questions – consisted of the following independent variables: the subjects' age, sex, and year of studies. The questions of the second block were designed for the determination of achievement of the studies (a retrospective survey of the subjects' mean marks for the previous examination session). By including this question block into the questionnaire, we wanted to determine whether achievements in studies are related to the subjects' attitude to the conditions of a library as a learning environment.

The third block consists of the characteristics of a student as a reader. The characteristics were meant to identify what is typical of students as readers. The block consisted of the following questions: *Are you a reader of any library? Which libraries' services are you using? How much time do you spend in a library (per week, per month, per term)? How do you react when other people offer you to get acquainted with newest information on the studied topic in books, newspapers, or journals?* In addition to that, they were asked to evaluate they ability to search for information on the topic of interest; the evaluation should be performed using a 10-point scale (1 point – unable to search for information; 10 points – perfectly able to search for information).

The fourth block of questions was designed to determine the way students evaluate the conditions of library as a learning environment. In order to perform this task, the scale of the semantic differential was used. The scale consisted of 12 pairs of statements that name the manifestations of the conditions of a learning environment. The manifestations were coded on a scale from -2 to +2 (the most negative or positive evaluation). Having summed up the evaluation scores for each statement, mean score was calculated. The distribution was determined using factorial analysis; in addition to that the reliability and internal coherence of the statements of the scale were verified.

The factorial analysis of the questions from the aforementioned block allowed for the identification of three generalized types of conditions: *the communication, physical, and pragmatic ones.* The presented types explained 61.7% of the distribution of the manifestations of the conditions of the library as a learning environment: the first type – 24.48%, the second type – 20.14%, and the third type – 17.08%.

The verification of the internal coherence and reliability of the essential features of each type yielded sufficient values of Cronbach-alpha and determination coefficients: for the type of the communication conditions of the learning environment – $\alpha = 0.69$ ($r = 0.43$-0.59); for the type of physical conditions - $\alpha = 0.71$ ($r = 0.44$-0.56); and for the type of practical conditions - $\alpha = 0.63$ ($r = 0.39$-0.51).

The fifth block was designed to evaluate the aims of students' visits to the academic library. In this block, 38 statements were formulated as dependent variables of the study. The evaluation of the answers to the statements was performed using 5-point Likert scale: *totally agree– agree – do not know – disagree – strongly disagree*.

Research Procedures

Students' inquiry was performed during the spring term of 2012/2013 academic year. The inquiry followed ethical and legal principles of research, and was based on the benevolence of the subjects. Students filled the questionnaires during seminar meetings. This activity was coordinated with the teacher in charge of the seminars. The filling of the questionnaires took 45 minutes. The inquiry during the seminars was performed by one of the researchers who explained to the students the aim of the study, presented the instruction on the filling of the questionnaire, and provided information on in anonymity of the findings of the study. In addition to that, the subjects were asked to answer the questions honestly and individually.

Statistical Analysis

The analysis of the obtained findings was performed using statistical data processing methods: Student's (t) and Chi-square ($\chi 2$) criteria, Mann-Whitney U test for the evaluation of the reliability of the differences in the findings of the study, Cronbach-alpha and determination coefficients for the determination of the reliability and internal coherence of the scale statements.

Research Results

The general mean of the examination session in the investigated students in 10-point scale was 7.63 ± 0.69. The academic achievements of third-year students were higher: the mean of the evaluation of their examination session was 7.92 ± 0.11, while that of first-year students was 7.53 ± 0.12 ($p<0.05$).

It is noteworthy that the absolute majority of the subjects (91.4% of first-year students, and 94.6% of third-year students) visited only the academic library of their higher educational institution. In this aspect of the study, more visitors of the academic library were among females (94.3% and 81.2%; $p<0.05$). Students' answers to the question about their reaction to somebody's proposal to get acquainted with the newest literature on the studied topic show that a greater part of the respondents (43.4%) fathomed the proposition and tried to go to the library. Another part of the respondents (33.2%) were less inclined to apply to other people, somewhat less (11.7%) of them bought the recommended source of information, and the smallest part (3.5%) of the subjects ignored the proposition because they thought that it was a triviality. Somewhat more (9.2%) of the subjects indicated other ways of reacting towards such propositions, for instance: *I find the information that interests me by myself through the sources that are familiar to me; I do not think this is the most important thing;* or *I listen to the proposition but do nothing*.

Students were inquired about how highly (on a 10-point scale) they would evaluate their ability to perform the search for information on the topic of interest. The findings showed that the mean evaluation of this competence was 6.93 ± 0.2 points. The results of this test showed that females, compared to males, more highly evaluated their competence in this field: their mean rank value was 89.1, while in males – 71.6 ($p<0.05$).

The mean duration of time per week spent in the library among the investigated students was 1.69 ± 0.12 hours, per month – 6.89 ± 0.63 hours, and per term – 23.1 ± 2.14

hours. The comparison of findings with relation to the year of studies showed that first-year students spent more time in the library, compared to third-year students (first-year students spent, on the average, 28.4 ± 2.9 hours in the library per term, while third-year students – 14.3 ± 2.1 hours per term; $p<0.001$). This was typical for both males and females. The comparison of the time spent in the library with the mean evaluation of the last examination session showed that there was a tendency that those who study better spend more time in the academic library.

The subjects' answers to the fourth block of the questionnaire showed how they evaluated the conditions of the academic library as a learning environment. The findings showed that the majority of students chose the following characteristic of the library: this is a source of knowledge (mean evaluation – 1.34 ± 0.09) where precise information can be obtained (1.09 ± 0.06). It is noteworthy that over one-half of the subjects (60.2%) chose the definition of the library as a working environment, whereas 18.3% of the subjects chose the characteristic of the library as a somniferous environment. It should also be emphasized that, among the presented evaluations of the library, 49.6% of the respondents defined the library as an environment with polite service.

It is noteworthy that 58.9% of the respondents highly evaluated the professional level of the library staff – 1.4 ± 0.11. The lowest evaluations were obtained for rational order – 0.85 ± 0.09, clear instructions – 0.7 ± 0.12, and fast service – 0.57 ± 0.08.

The questions of the fifth block allowed for the identification of two groups of students: those who study in the library (prepare for examinations and other tests) and those who only drop by (to change books or to make copies). Comparative data analysis showed that more critical evaluations of the manifestations of the conditions of the library as a learning environment were presented by students who come to the library to change books or to make copies (Table 1).

Table 1
The Distribution of the Evaluations of the Library Conditions in Groups of Students

Factors derived from the evaluations of the manifestations of library conditions	Rank means in groups of students (Mann-Whitney (U) test)		Significance level, p
	Those studying in the library	Those dropping by in the library	
Communicational conditions	51.74	33.29	0.001
Physical conditions	49.1	34.3	0.01
Pragmatic conditions	54.47	31.8	0.001

The study revealed an association between the communicational conditions of the library as a learning environment and the students' academic achievements (Table 2).

Table 2
The Manifestation of the Communicational Conditions in the Library In Relation to Students' Academic Achievements (%)

Communicational conditions	Academic achievements		Reliability of differences p
	Up to 8 points	8 to 10 points	
Rude service	4.4	9.5	0.05
Slow service	15.6	27.9	0.05
Unclear usage rules	13.7	25.1	0.05

The data presented in the table show that the higher the student's achievements, the more critical is his/her evaluation of the communicational conditions of the library as a learning environment.

The fifth block of questions was designed to reveal the aims of students' visits to the library, as well as their opinion about the physical conditions of the library as a learning environment. Answers to the questions were evaluated only by the following variants: *totally agree or agree with the statement,* and *strongly disagree or disagree with the statement.* According to the findings of the study, the greatest proportion of the subjects (94.3%) indicated that they make copies of the needed material in the library, take books for a report, and also read newspapers or journals (47.5%). Less frequently student come to the library to prepare for lectures and examinations (respectively, 36.2% and 24.2% of positive answers). This is because the subjects more frequently prepared for the examinations at home (76.3%). It is noteworthy that first-year students more frequently, compared to third-year students, agreed with the statements that they prepared for examinations or tests in the library (respectively, 63.4% and 41.3%; $p<0.005$).

It was also determined that when a student does no know where to find important information, he/she most frequently applies to the library staff (90.4%), the teachers (85.2%), and friends (76.4%). A part of students (32.8%) thought that the library had a good information search system. Somewhat less of them (21.7%) indicated that the library equipment guaranteed access to the global information resources. It is noteworthy that a small percentage of the subjects (31.0%) stated that the library had the newest textbooks and teaching/learning means, and 42.1% of the subjects indicated that the ordering of publications from other libraries was not good. It was also found that the library had sufficient number of workplaces (58.7%), but as many as 67.3% of the respondents thought that the number of computerized workplaces was insufficient.

Discussion

The aim of the study was to determine the students' attitude to the conditions of a library as a learning environment, and to reveal the associations of this attitude with the duration of studies, time spent at the library, and students' achievements.

The study showed that students who spend more time in the library more positively evaluated the pragmatic conditions of the library as a learning environment, i.e. the application of modern information technologies and acquisition of newest literature. It was found that first-year students spend more time in the library, and thus we tend to think that they more positively, compared to third-year students, evaluate the aforementioned condition of the library as a learning environment. It is noteworthy that the study revealed associations between the aims of visits to the library and the duration of time spent there. It emerged that more first-year students, compared to third-year students, use the library for the preparation for examinations. It show that first-year students, compared to senior students, more identify with their higher educational institution, which is understandable since they are only starting their studies, while third-year students, according to the employment data, are more concerned with their professional activity.

Investigations by other researchers show that students are not satisfied with libraries as learning environments: for instance, some think that the area of the library should be increased since the library is becoming too small for storing all necessary sources of information (Arostegui, 2005), others (more than one-half of graduates) state that the

number of books available in the library is insufficient, and their contents does not correspond to the variety of subjects of studies (Valiuškevičiūtė et al., 2005). On the other hand, the quality of the evaluated object depends on people's experience and interests (Wholey, 2001): if positive experience is acquired, a positive attitude is formed, and a decision is made that the evaluated object has reached high quality. However, if the majority state that a certain object is valuable, then it is really of a better quality than in case when only a minority of people see its advantages.

The study showed that students with higher academic achievements more frequently negatively evaluated the conditions of the library as a learning environment. Here we will ground our evaluations on the description of the personal competence of informational literacy presented by the American Association of Libraries (Owusu-Ansah, 2001). There it is stated that informational literacy is a person's ability to learn, which means that a person is familiar with the ways of the organization of information, is able to find the necessary information and knows how to use it; such person is ready for life-long learning, since he/she can always find information necessary for the performance of a certain task. Studies performed by other scientists show that the improvement in academic achievements entails the improvement of such informational literacy skills as the ability to find, to evaluate, to use, and to render information stored in different forms and media (Herring, 1998). It is noteworthy that the competence of informational literacy is analyzed together with library competence, computer and technological literacy, and ethical norms, as well as with critical thinking and communicational skills. We tend to think that the level of informational literacy in those who study successfully allows them to negatively evaluate the communicational conditions of the library as a learning environment.

Students who spend less time in the library and have lower academic achievements present negative evaluations of the pragmatic conditions of the library (i.e. newest literature or modern technologies). In this case one can discuss the studies on avoidance of visiting the library presented in scientific literature (Jiao and Onwuegbuzie, 1997; 1999). It is stated that libraries are less frequently visited by the groups of academic youth who experience various fears in such environment, the studies of these authors show that first-year students who visited an academic library for the first time, described their experiences and impressions used the word "fear" or its equivalents rather often, and the adjectives "stunned", "surprised", "baffled", "insecure", and "lost" were used most frequently. Mellon (1986) who performed the study called such feelings of students "library anxiety". The researcher determined that students who have library-associated fears are characterized by the following:

- They have a low evaluation of their abilities to use the services provided by the library;
- They experience shame and try to hide their inability to use library services;
- They think that their inability to use library services may become evident once they apply to the librarian.

Such people frequently think not only about their insufficient skills in using library services, compared to other students, but also that such drawback must be hidden as a source of difficulty. For this reason students frequently avoid asking questions to library personnel or other students for fear that their ignorance may be disclosed. Such avoidance may condition worse results of studies (Jiao and Onwuegbuzie, 1999). The described form of fear arising when a person comes to the library or is preparing to use its services

most commonly manifests itself through negative emotions such as tension, scruple, insecurity, helplessness, self-defeating thoughts, and mental disorganization.

Students with worse academic achievements less frequently visit the library. Hence a question arises – *maybe their achievements are worse because they do not use one of the learning environments that provides access to global information?* For instance, Jiao and Onwuegbuzie (1997), using Bostick *Library Anxiety Scale,* deermined a significant negative association between library anxiety and frequency of visits to the library, i.e. students with high levels of library anxiety less frequently use the library compared to their less anxious colleagues. In other words, library anxiety impedes students' usage of library services to the extent that would be needed.

The study on the aims of visits to the library showed that less than one-half of the subjects used the library to prepare for various control tests and to perform the assigned tasks. Such results may be explained by the peculiarities of the studying process. According to the classical paradigm of education and training of specialists (which still predominates in higher educational institutions), students who learn and reproduce the information and assignments presented by the teacher learn more successfully (Riksaasen, 2001). Therefore we tend to think that students are not interested in deeper investigation of the ways the problems they analyze are solved in the world, and the ways the issues they study are discussed on the global level.

The interpretation of the findings of the study showed that an academic library as both the learning environment and an environment that empowers students for striving for professional qualification more or less improves future specialists both professionally, academically, and as personalities. The criterion of the effectiveness of the development of future specialists' competence may be considered to be the character of the experiences caused by preparations for examinations and various tests, preparation of projects, and the search for material created by the global academic community on the topic of interest. The character of such experiences may weaken the educational effect of the library. The improvement of learning environments should be based on the opinion of students who have better academic achievements and spend more time in the library.

Conclusions

The findings of the research on students' experiences while in the library show that the educational role of a library in the education and training of future specialists is weakened by the communicational conditions of the library, especially such manifestations of these conditions as rude and slow service, and unclear usage rules. Students with better academic achievements presented a more critical evaluation of the aforementioned manifestations of the communicational conditions. They like as first-year students spent more time in the library. It is noteworthy that students who rarely use the services of the library were more frequently dissatisfied with the library staff's working culture.

The analysis of the subjects' evaluations of the academic library showed that students present best evaluations of such variables of the pragmatic conditions of the library as the source of knowledge (precise information may be obtained here), and a place for independent studies; the variable of the communicational conditions – the professional level of the personnel – was also evaluated positively. Poorer evaluations were presented concerning the manifestations of the pragmatic conditions of the library – newest literature and modern technologies, and concerning the manifestation of the physical conditions of the library – comfortable workplaces.

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The Future Architects' Attitude towards Innovations in the Context of Sustainable Development

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Abstract

The architectural innovations are becoming more and more important in the economic and social development and in the quality improvement of people's lives. Sometimes, however, the implementation of innovative projects can lead to negative consequences. The development of any innovation should be based on a comprehensive analysis of their implementation's consequences. Therefore, developing a responsible of the future architects' attitude to innovations is extremely important for achieving a qualitatively new level of training of future architects to ensure sustainable development. This article presents the results of a research that investigated the social values of future architects and their attitude towards innovation.

Keywords: sustainable development, innovation, social values, responsibility, professional ethics

Today Russia is introducing new approaches to education in high school, educational stereotypes are changing, and professional activity is becoming more and more complicated. While training the future specialists, we should think about the professional component of their education in the first place (Andreas & Strannegård, 2014). This is absolutely true. It is essential that our graduates are truly professional. However, the attitude to knowledge and innovation and the ability to use them in different situations, the values and ethical aspects of the evaluation of innovations, in our opinion, are crucial for the formation of a true professional and for the sustainable development of the educational system in general. Nevertheless, not all the educational institutions have the necessary social, technical and scientific basis that promotes understanding, evaluation and acceptance (or non-acceptance) of the innovation processes (Artemeva, 2012).

Typically, innovations are developed and intruded in order to improve the quality of life. However, the possibility of negative consequences is not always taken into account. For example, such negative consequences as environmental, demographic and cultural problems are not taken into consideration. Any innovation has its own carriers, its own social basis. The development of the society depends on the younger generation in general and on each young person individually. However, at present a large number of classes, especially the humanities in technical universities, are considered to be studied by the

students on their own, which reduces the possibility of deep analysis of various situations, including psychological and educational problems (Abedalaziz, 2012). But valuable moral self-determination problems of students do not become less important (Veselova, 2012). They take on special significance in the direction of sustainable development in education (Salīte, Gedžūne, & Gedžūne, 2009). Therefore, in our opinion, the need to examine the attitudes of the students towards innovation processes appears.

The term "innovation" is of Latin origin. The Romans understood innovation as "change" and "renewal" in the broad sense of the word. Innovation is a concept with a broad content, including the economic, engineering, philosophical, psychological and social category (Yushkov, 2008). Innovation in general can be seen as a person's ability to perceive, extract, refine and intrude new and original ideas (Yagolkovsky, 2010).

Native and foreign psychologists conducted theoretical and empirical studies of various aspects of innovation (Autio, Kenney, Mustar, Siegel, & Wright, 2014; Kirton, 2003; Plotinskiy, 2001; Sovetova, 2000; Yagolkovsky, 2010) and others. The result of their work suggests multifactorial nature of innovation and the need for a comprehensive opinion of psychological preparedness of the different social groups of citizens to different kinds of innovation, including social.

One of the components of this opinion is to assess one's own system of values.

The values are included in the structure of personality and are in essence the core of its orientation, defining ideology and moral positions. The system of values is formed by the end of high school. It becomes different after serious changes in a person's life. When these changes do not appear, the system of values demonstrates the relative stability, predetermining the degree of complexity of people's inclusion in different social situation or culture, as well as the depth of this inclusion. In some cases it does not hinder, and sometimes it even facilitates the human's adaptation to changes in one's life, but in other cases it can make the adaptation much more complicated.

In our research, we relied on the concept of social values, which was defined by Godlinik (2001) this way:

> *Social values are material and social objects, which are significant for the individual, the social community and the society in general, the spiritual human activity and its results; socially approved and shared by most people's idea of what is good, what justice, patriotism, romantic love, friendship and so on are. They are not the subjects to doubt as they serve as standards, ideal for all people; the pedagogical process is aiming at their formation* (p.127).

Research Objectives

The main goal of our research is to study the attitude of future architects towards innovation.

The research was held in two phases:

- The value orientations of the students of the architectural faculty of St. Petersburg State University of Architecture and Civil Engineering were researched in the first stage;
- The attitude of students towards innovation was researched in the second stage.

Method

The respondents of the study – the 4th year students of St. Petersburg State University of Architecture and Civil Engineering, Faculty of Architecture, altogether 84 people aged 19 to 25 years, including 45 boys and 39 girls.

The research methods:

- modified inquirer that detects the value orientations by Mikael Gornyi (Artemeva, 2012);
- the evaluation method of the attitude towards innovations (Artemeva, 2012);
- the interview, which was given the task to briefly describe the experience of scanned material and to analyse the possible consequences of the introduction of these innovative achievements (Artemeva, 2012);
- conversation and methods of mathematical statistics.

Research Findings

According to the analysis of the data, one can see that the main priorities for the students (both girls and boys) are family (68%) and freedom (38%).

Family serves as a bulwark of security and happiness. Family can make one feel both safe and truly free. It should be noted that the orientation of modern students are changing from the free relationship to the creation of family.

The result for the second position (freedom) was predicted for us. Throughout this research, we expected to get a standard answer, which is given by the respondents in democratic countries – 40% of the respondents choose freedom as a priority. Our data are very similar – 38% of the respondents and the second position in the rating.

But the values that stand in the third position are different for the young men and women. Girls choose security as a value (28%). For the young men, wealth (32%) plays an important role in their life.

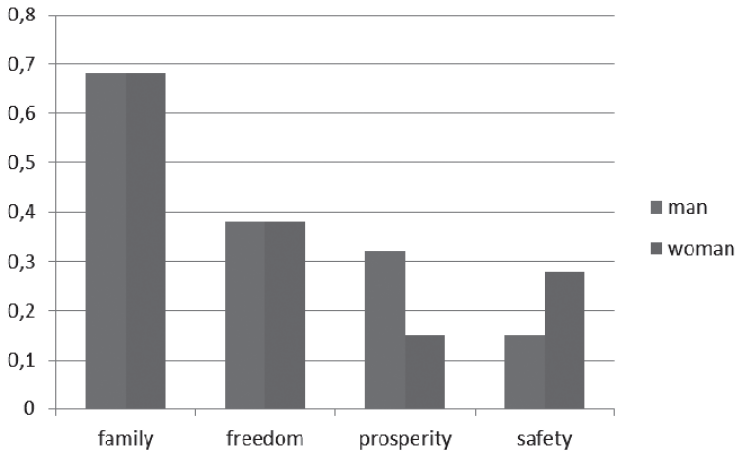

Figure 1. The top values of the students of Saint-Petersburg State University of Architecture and Civil Engineering

We should note that the students of St. Petersburg State University of Architecture and Civil Engineering consider such values as democracy and power to be at the bottom.

Almost half of the respondents (49%) showed their willingness to leave the country. It is interesting that our results are almost the same compared with the results of the research by Lesovichenko (2008), which was held in STU and with the results of research which are carried out by author (Artemeva, 2012). The only exception is the indicators of family values.

Thus, we can see that students of all universities face the same the moral problems. But the question how to solve them still does not have an exact answer.

Therefore, we lead the second phase of the research – the study of the students' attitudes towards innovations.

We used the method of evaluation of the attitude towards innovations (Artemeva, 2012; Artemeva, 2013) aimed at studying the preferred changes, identification of causes of different attitudes to innovation and determination of the motives of innovative behaviour.

The study revealed a difference in students' preferences to the changes that take place in different spheres of life and work.

Thus, young men believe that the changes are quite necessary in science (40.3%) in their personal aspirations and personal growth (33.3%), in changes of the existing situation in the country (21.3%). Girls feel that changes are necessary in a career in the first place (49.9%), in the second place – in one's own development (education, spiritual growth, cultural development) (28%), and only after that – the changes in the family (20.7 %), in an aids and appliances (10.7%) (The areas in which it is necessary to make changes, according to the opinion of the respondents).

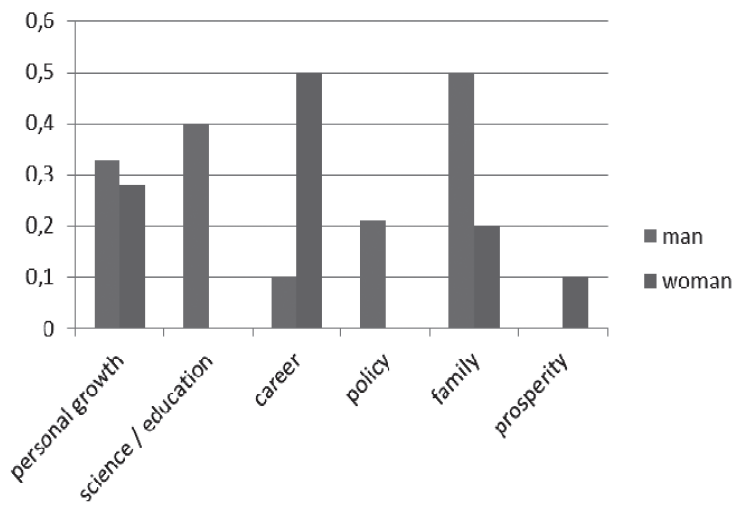

Figure 2. Areas in which it is necessary to make changes, according to the opinion of the respondents

Respondents also identified in which areas of their lives they are making changes themselves. The girls tolerate changes in personal growth (50%) in the first place, in the second place – the changes in the working process (37.5%), and in third place – the changes in the relationship between people, including family (12.5%). Young men identified the following preferences: building a career (53.3%), making changes in their lifes (39.3%), and also personal growth and perception of the world (16.7%).

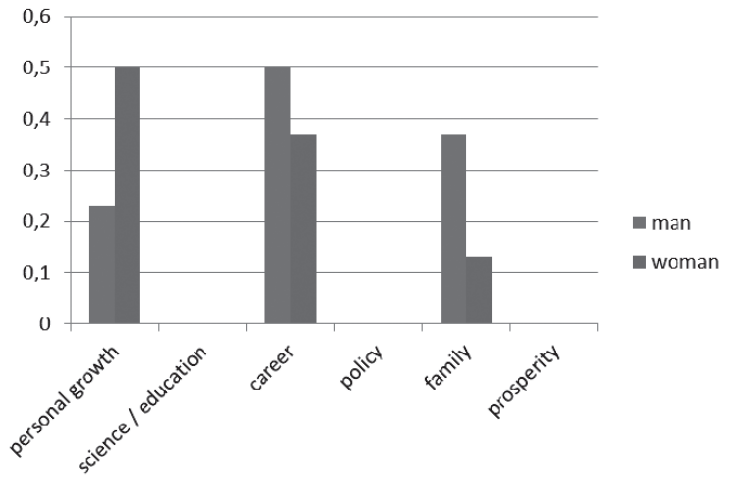

Figure 3. Spheres of life in which the respondents are making the necessary changes themselves

The main motives of innovative behaviour are the desire for a personal growth (51.5%), the desire to build a career and to be a qualified specialist (22.4%), the interest in life and science (20.3%).

The part of the students surveyed (16.7%) expressed a passively negative attitude to innovation. Also, respondents do not believe they need to change something, because it is not known what it may lead to.

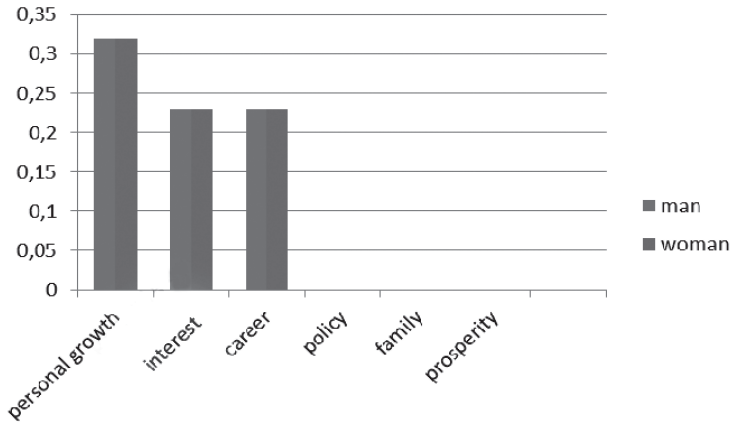

Figure 4. Motives of the innovative behaviour of the students of the architectural faculty of St. Petersburg State University of Architecture and Civil Engineering

The present study was aimed to study the attitude of future architects towards innovation. Overall, the majority of participants (77.8%) expressed a positive attitude both to changes in the world in general and its separate components – the enrichment of the culture of the country, prolonging of the life, the increase of comfort, the realiSation of the abilities of gifted individuals. The results of this research to further strengthen our earlier studies (Artemeva, 2012).

Conclusion

Some value orientations of the students of the architectural faculty of St. Petersburg State University of Architecture and Civil Engineering and their attitudes to innovation were identified in this study.

According to our previous theoretical (Ganz, 2009; Highsmith, 2009, Patton, 2011) and experimental (Artemeva, 2013) studies, it is possible to highlight the following major factors, which influence the innovation process:

1) a knowledge aspect;
2) a responsibility aspect;
3) a branch factor;
4) a social aspect;
5) a personal aspect.

But this research shows that future architects show importance a knowledge aspect, social and personal aspect. The branch factor and the aspect of responsibility are not that important for them.

We consider this fact as a dangerous one. Architects are in many respects responsible for the environment, including the safety of the existence of mankind in general and each person separately, in other words, they influence a sustainable development of the society in general vigorously.

Thus, in our opinion, architectural education should include a study of epy innovation activity, epy understanding of professional responsibility for the society in general, and for the clients, colleagues and the organization in particular. The data, which were obtained, are included in a curriculum of elective course "The psychology of creativity" (Artemeva, 2013). We consider it as one more step to the creation of sustainable development of higher education.

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A Case Study of ESD Implementation: Signs of Sustainable Leadership

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Abstract

This article presents a case study of two schools that were identified as a result of UNESCO associated schools survey as cases of sustainable leadership and governance. The aim of the study is to present the two cases that were crystalized in the survey carried out at end of the United Nations' *Decade of Education for Sustainable Development* (2005–2014). Prior to the in-depth study of two schools, the authors have carried out a survey of the heads and deputy heads of 26 UNSECO associated schools in Latvia on how schools are succeeding in improving educational outcomes, school development, cooperation with multiple stakeholders, and innovation. The authors have carried out semi structured interviews with the heads and deputy heads of two schools on the following questions: *How has ESD updated and improved educational purposes and outcomes in your school? Does ESD improve test scores and/or achieve other desired outcomes? How does ESD help to improve and enrich school curriculum development in your school? How does ESD guide students to have the knowledge, skills and values to care for and solve the sustainable development issues that arise in your school? How does ESD help to strengthen the partnerships between schools and other stakeholders, including the surrounding community? How does ESD promote innovation in the teaching-learning conceptual framework?*

Keywords: sustainable leadership, value-based education, wise leadership

In a number of significant international documents (UNESCO, 2005; UNESCO, 2006; UNESCO, 2010) it has been recognized that education plays a crucial role in achieving sustainable development by promoting values and attitudes required for positive social transformation. In the DESD conference in Nagoya in 2014 it has been emphasized that full implementation of sustainability is needed in school curriculum, both in the context and in pedagogical approaches (UNESCO, 2014). Particular emphasis was payed to quality insurance that aims at improving teaching and learning. Enhancement of quality insurance is based on systematic thinking and continuous improvement (Holm, Sammalisto, Grindstead, Vuorisalo, 2015). As many authors (Cameron & Quinn, 2006; Schein, 2004, Sterling, 2005; Iliško, Skrinda, Mičule, 2014) assert, in order for the sustainability to become a whole school approach, the change of a culture of school is needed next to methods, tools and approaches. This includes changes in values and ways of thinking.

Numerous research has been written on sustainable leadership in pursuing a vision of a sustainable school (Duignan & Bezzina, 2006; Hargreaves & Fink, 2007) that is grounded in a shared vison, decision making by acknowledging people's potential. It requires a paradigm shift and a system approach to meet the demands of changing school. Sustainable leadership in this article is defined as a long term strategy of the development of school based on moral purpose and ensuring education for all, characterized by such features as: having passion for continuous improvement, keeping sound balance between the best of the past tradition and innovations, thinking in terms of process, fostering the involvement of the whole team of the school members, developing strategic measures for ensuring success, and building school-community partnership (Davies, 2007; Hargreaves & Fink, 2007; Epstein, Galindo, Sheldon, 2011).

The Sample and The Procedure of the Study

The study consists of two phases. The first phase includes electronic questioning of the school leaders on ESD in curriculum building, how schools pursue innovative practice and sustainable pedagogical approaches. The second phase of research includes a detailed analysis of case studies of two schools that succeeded in implementing sustainability agenda on the level of whole school policy in different ways.

The authors have carried out an electronic survey of the heads and the deputy heads of 26 UNESCO associated schools in Latvia, the response rate was 19 schools out of 26 inquired. As a result of this survey, two schools were identified as cases of good practice for integrating the idea of sustainability is school curricula and everyday practice. The devotion of the schools' administration to the idea of sustainability of those two schools has made both schools in different ways competitive and recognizable. One of the chosen schools has relatively new and enthusiastic staff members who are willing to create a collective knowledge. Their efforts result in successful collective action. This school is flexible in reviewing and renewing goals, structures and practices, if needed. The second school is known in the community as a school that works intensively on implementing inclusive policy for all children. The deputy head of this school holds a belief that all children can learn and believe in providing adequate learning challenges for learning. Both schools have similar goals and intentions though their structures and histories are different. If the first school is more of an elite school and is oriented to reach high achievements, simultaneously by preserving open culture of sustainability, the other school does not demonstrate such a high culture of academic achievements, though it is inclusive of children from different social, ethnic, cultural and language backgrounds. It sets a priority of developing social skills and a value system of learners, as well as demonstrates its potential for sustainability.

Research Findings

This survey of the leaders of UNESCO associated schools found that there is no universal formula to define sustainability. Instead, there are various definitions and contextualized interpretations of the term by the heads and the deputy heads of the schools. Diverse responses of the school leaders on integration of sustainability in schools allow the conclusion that the school leaders have a fuzzy understanding of what education for sustainable education is. Therefore, it is essential to understand this concept in its

widest scope as an all-encompassing concept. Majority of school leaders pursue sustainability by emphasizing mostly its ecological dimension. 'While school administrators had a difficulty to define sustainability, they had no difficulty to identify what is unsustainable in the societies, like, inefficient use of energy, lack of natural resources, pollution, consumerism, etc. They lack a clear definition of sustainability. Particular emphases of electronic survey of school administrators was placed on such aspects, as educational purposes and aims informed by the ESD, innovative practice in schools, cooperation with multiple stakeholders and a curriculum development related to ESD.

How can ESD Update and Question Traditional Perceptions of Quality and Better Outcomes?

As it was responded by many heads of the schools that the aim of an education is quality education. "*Schools should prepare the student for the requirements of a job market and to encourage them to live with a responsibility in everyday situations and in harmony with the environment*"; to develop students' skills that enable them to find a solution in any situation. Many school leaders admitted that schools are trying their best to improve the outcomes of education by putting emphases not only on cognitive aspects of teaching but also on developing a spiritual part of a person who treats the surrounding world, people, and cultural heritage with sensitivity, care, and respect.

Some leaders of schools expressed a strong conviction that ESD aims to put its emphases on inclusive education, embracing the needs of all children and adding a value dimension to the educational aim. Many leaders defined an educated person as the one who is competitive in a job market and lives in harmony with oneself and a surrounding world. The aim of education set with an ESD perspective in mind puts an emphasis on the purpose rather than on the outcomes of formal learning process.

How do ESD Help to Improve and Enrich School Curriculum Development in Your School?

The curriculum puts more emphasis on the upbringing and value aspects in teaching. ESD improves curriculum by transforming it in a more integral and a holistic way. Many efforts have been made in this regards and a holistic and integrated view on a curriculum has been implemented at the kindergarten stage so far, though much has been left undone on the secondary school level. ESD can improve curriculum by integrating sustainability in all subject areas of education. Interdisciplinary and integrated reforms towards curriculum can foster creative thinking in the educational process what will lead to new ways of teaching and learning which still is a vision to be reached for many schools.

The heads of the UNESCO associated school have sketched the work to be done: So far, ESD is integrated into the curriculum in a very fragmented way. Though, it shouldn't be viewed as an add on subject but should be organically embedded throughout the whole curriculum. For example, "*we cannot view an issue of sustainable lifestyle as a part of nature studies only, but it should be seen as an integral part of the whole school policy, reflected in both, formal and informal aspects of education in schools.*" As a desired ideal, pronounced by many school leaders, is inclusion of an ESD aspect in all curriculum subject areas with an emphasis on cognitive, emotional and spiritual dimensions in teaching. The work to be done as envisioned by many school leaders, is a

reduction of standardization, placing more emphases on such values as respect of students' culture, well-being, and the needs of all students' abilities. They expressed the need to enrich curriculum by such ESD issues as tolerance, environmental issues, multicultural issues and cultural heritage more.

How do ESD Guide Students to Have the Knowledge, Skills and Values to Care for and Solve the Sustainable Development Issues that will Arise in Their Lifetime in Your School?

Re-orienting curriculum and school practice towards a more sustainable curriculum has never been an easy task (Hargreaves & Fink, 2006; McKeown, 2002). Curriculum outcomes encompass knowledge, skills, values, and perspectives of the environmental, social, and economic aspects that comprise sustainability. The attempts to integrate sustainability issues into the curriculum as a rule are initiated by the enthusiastic administrators and very few teachers.

As seen by many school administrators, education for ESD is value-based education, focused on forming students' attitude towards the world, oneself and others, as well as building their understanding about the sustainable environment; involving them in sustaining and maintaining it.

ESD offers innovative educational content that allows students to acquire and to understand local and global processes; ESD develops students' respect for nature, other people and cultures; it teaches students to respect the viewpoints of people from different cultures, religions, social backgrounds and teaches them about what sustainability is in practice: about a sustainable life style and understanding of evils of consumerisms.

As the best practice mentioned by the school leaders, is that along with the academic knowledge, schools should teach values of tolerance towards diverse cultures and languages, as well as responsibility. Among the virtues taught are care towards the surrounding environment, support of a sustainable life style, issues of environmental protection, and conservation of natural resources. The school equips students with basic academic knowledge in all subject areas, as well as develops a sense of both local and global responsibility, anticipatory thinking; builds recognition of global interdependence, and interconnectedness.

A desired practice in building a curriculum, as mentioned by the school leaders, is teaching integrated and interconnected understanding of global ecological, economic, cultural changes that embrace values of sustainable development. This will allow one to find creative solutions to current global crises. Also, the curriculum needs to address an issue of pupils' consumption patterns more. Students of all age groups need to develop responsible attitudes towards the environment.

ESD fosters outreach to a local community and ensures a modernization of schools in all subject areas. It was expressed as a desirable idea to invite more quest speakers in schools who are professional on the issues of sustainability.

How do ESD Strengthen the Partnerships between Schools and Other Stakeholders, Including the Surrounding Community?

Education for ESD motivates students to participate in a community – outreach activities, and involves them actively in the community activities. Schools have established

close cooperation with the local municipality. ESD fosters cooperation at all levels – in the classroom, cooperation of a school with families and the society. When students organize an event at school this is a common practice to involve pupils' parents and members from the society and other organizations. It fosters positive interrelatedness among all the actors involved. Among the events mentioned by the school leaders are: a week of animal protection, the day of cats, the day of planting trees, the day of health, meeting with the representatives of different professions, the day without any wasted paper, and the day of greeting.

Work to be done, as mentioned by the school leaders, is a development of close connectedness with a community by implementing inclusive policy at school. The community needs to be educated how to be inclusive to all people, otherwise the students with special needs when they complete school meet a harsh reality in the community that practices an exclusivist attitude. Implementation of an inclusive policy towards children with special needs, and creating a welcoming place for children from the community to join diverse activities that are taking place in schools, and is an achievement of many schools: "*Our school has rich cultural traditions; therefore the school becomes an inviting place for the local community members. Other schools who participated in similar projects (for example, UNESCO schools' associated projects) invited our school to participate in various cultural events.*"

ESD with its innovative approach to problem solving cannot be isolated from the society and other educational establishments. Therefore, ESD fosters joint project initiatives, teacher mobility, and workshops. Schools' practice is enriched by cooperation with a local municipality and a community. Issues to be considered, as mentioned by the school leaders, are overcoming formal cooperation with a local community and making it more meaningful and orientated towards the aim of ESD. This may be explained by the lack of common goal. Society is becoming commercial and driven by the consumers' policy.

How does ESD Promote Innovation in the Teaching-learning Conceptual Framework?

With the regards to innovations in pedagogical practice, the school introduces new methods in teaching. Teachers choose teaching methods that motivate learners to use knowledge in practice. Innovative education in schools involves introducing new learning approaches, and methods of teaching carried out with a sustainability aim in mind. Innovations in education mean constructivism in teaching, self-directed learning, interrelatedness in curriculum, and meaningful learning experience. Some schools are open to innovative practice in a response to all changes that are taking place in the society. Innovative practice in many schools is implemented by designed new learning materials that respond to the diverse needs of all students, by developing new infrastructure that makes the environment open of the inclusion of children with special needs and opens opportunities for informal education.

Innovative practices introduced in schools encourage each and every teacher to search for new approaches and forms of teaching. Schools constantly re-evaluate and reshape educational content and methods. Teachers learn new technologies, search for new ways of modernization of schools, learn the experience of other schools, and new methodologies how to teach talented children. There are open and creative teachers, who understand the value of changes and progress, understand the interrelatedness of

all things via exchange of personal experiences; they analyze changes in education and understand their position as change agents. This opens the ground for innovations in pedagogy and development of a cooperative culture at school.

This electronic survey allows us to discover a number of cases of good practice though an overall picture of sustainable development has been fuzzy and marginal, demonstrating a lack of shared understanding of a sustainable development. There was a considerable ambiguity in how school administrators interpreted a sustainable development. The increasing emphases of standard and standardization at schools have been mentioned as obstacles of implementing sustainability agenda in schools.

Signs of Wise Leadership as Discovered in Two Cases of Good Practice

The second part of the study reveals signs of wise leadership as discovered in the example of two schools of good practice in Latvia.

School Nr 1 is a relatively new school with young and enthusiastic staff members that has gained its high reputation in the community with the high academic achievement scores, innovative practice, strong emphases on value education and a culture of sustainability. This school's administration pursues a strategy of a participative decision making processes and has developed a commitment to an ecologically transformative culture at school. The school has developed caring and supportive community of learners. Particularly strong in this school is an ecological dimension of sustainability reached through the integration of it in the school's curriculum via science disciplines and informal learning. Most of the environmental projects, such as recycling, nature projects, and community based environmental educational projects, are carried out by the committed teachers and in the extracurricular activities out of deep passion. Political dimension of sustainability in this school has been practiced by developing a dialogical and democratic decision making processes among the administration and staff members. Each teacher has a voice in deciding upon the best ways of transforming the culture of school towards a more sustainable.

The leader of this school believes that ESD can improve educational purposes and outcomes by integrating values of sustainable development in all aspects of teaching. In this school, sustainability is not a matter of one discipline but it is integrated in many subject areas. Particular attention is paid to integrating an ecological dimension and learning environmental topics. All pupils are active participants of the learning process and they all are involved in decision making process over their learning. Teachers integrate locally relevant information, as well and make pupils aware of their responsibilities on a global scale.

The school has a good profile in facilitating collaboration of the school with families, local community and providing a platform for a dialogue between all the actors involved.

School practices project-based learning by actively involving pupils in discovery learning about the environmental pollution and environmental protection. The school involves pupils in a number of initiatives related to cleaning the surrounding and in science projects which are directly related to local environmental issues.

As reported by the deputy head of the school, ESD helps to improve and enrich the school's curriculum development by building interconnectedness between subject areas. As the deputy head has mentioned: "*ESD guides our students to have the knowledge, skills and values to care for and solve their future sustainable development issues.*" By

integrating environmental and social dimension of sustainability, *we teach our pupils such values as respect towards other cultures, religions and viewpoints and practice those values, and make it as a whole school policy.*" The school builds pupils' intercultural skills by involving them in a number of international projects.

With the regard to innovative practice, school Nr 1 has developed a culture of research where teachers accept their role as researchers who are involved in updating their qualification by learning the latest approaches and methods of teaching and introducing ICT technologies in teaching. Spiritual dimension is also seen as a significant part of this school's policy; therefore parents more often make a choice to choose this particular school for their children.

School Nr 2 does not demonstrate high results in test scores, but the school is successful in creating an accepting environment for children from the disadvantaged families, children with special needs who are not much included in other schools. Among them are the children from the low income and single parent families. Still, this school practices a political dimension of sustainability and is successful in organizing sociocultural and ecological changes towards a culture of learning sustainability. This school works towards designing a caring and creative all – inclusive culture at school. As it was reported by the administration of the school, teachers face a tension between the accountability of the school for the educational outcomes and a transformation of the school's culture towards sustainability. The school puts a particular emphasis in pursuing physical, emotional and spiritual health of their students. School teaches their students basic skills and work habits how to make wise choices for a sustainable future, both personal and global. Sustainability in this school is practiced in everyday activities, such as switching off lights when unnecessary, recycling paper, volunteering in the environmental projects, and others.

The administration of the school believes that ESD can update and improve educational purposes and outcomes by implementing inclusivity as a whole school approach where each and every child is valued and respected. Despite the discussions on the best models of inclusion of children with special needs in general education, schools and the society display a resistance to inclusive policy due to many subjective and objective factors. The school is searching for the best solutions to meet the needs of every child within the context of the whole school policy and to create an inclusive environment where all children have an access and where each child is a full and valued member of a school's community. As the school leader has mentioned: *we do not demonstrate high academic achievement but we offer a welcoming learning environment for every child, we respect his/her cultural background and social status. We work with children who come to school from the low income and disadvantaged families, therefore we need to teach basic skills and build cooperation at all levels – with the municipality, with families, special pedagogues and other specialists"*

"We believe that apart of academic knowledge we need to provide a strong value education. Value system will help our learners to build positive relations towards themselves, others, and the environments. To reach this aim, we use project work, constructivist approaches towards teaching, and practice hands on learning."

Both schools constantly renew their practices, and teachers perceive change as a part of their reality. There are some particular points that were singled out in both cases of good practice: the way both schools introduce innovations by respecting the past experience in schools, and the ways they introduce pedagogical approaches suitable for ESD.

Connecting Past, Present and Future for Introducing Innovative Practice

As mentioned by the leaders of both schools, one of the signs of sustainability in school management is honoring and preserving the best of the past traditions in teaching and curriculum development, and then moving beyond the best of the past by introducing innovative practice in teaching. Abrahamson (2004) suggests a 'creative recombination' which combines the best of past experiences, renews it and creates something new (p. 10). Teachers tend to practice what is understandable and proved in practice, but the leaders of the school encourage their teachers to replace habitual ways of doing things with new learnings in a supportive way by furthering teachers' professional development. While introducing innovative practice, the interviewed school leaders perceive problems as opportunities for learning. They work in flexible teams. As one of the leaders has mentioned, "*by introducing new practice we develop teachers' dispositions for taking risks and change rather than sticking to standardized instruction. We create the environment for continuous rather episodic teachers' further development and inquiry*." Both schools adapt new technologies by integrating them in schools' practice. Sustainable leadership preserve the best from the past traditions, at the same time revisits memories and wisdom and values slow, thoughtful changes. Such schools avoid standardization that weakens adaptability an resilience.

Sustainable Leadership Maintains Pedagogy and Strategies that Support ESD

Both schools educate their students for the mandatory state tests and examination requirements, but still manage creating authentic learning environment for their children to succeed. The educational process is participatory, contextual and leading towards sustainable development. Both schools practice learner – centered pedagogical approaches that put an emphases on meaningful learning, constructivist learning, as well as on value education. Constructivist learning used in both schools puts a control over learning in hands of pupils, and teachers have a role of a facilitator. Both schools organize teaching as discovery learning. As stated by the DESD (2005–2014), schools need to put emphases on values and practices related to a sustainable development in education (UNESCO, 2010). Both selected schools support this initiative. They treat schools as living systems made of people who may choose to contribute or not to contribute to a well-being of school. Or, as Van der Heiden (1991) states, "schools are networks of individuals linked together through interconnections based on conversations" (p. 273). Leaders of both schools skillfully engage in strategic conversations.

Pursuing Environmentally Sustainable Pedagogy and Approaches

Schools labelled as an eco-school put high focus on environmental dimension of sustainability, which is in line with Orr (1994), who asserts that 'the goal of education is not about the mastery of subject matter, but subject matter is simply the tool' (p.13). The deputy head of the first school has emphasized the importance of meaningfulness of what students acquire and their understanding on how the acquired knowledge affects the world and other people. Knowledge building involves not only analytical, but also intuitive and spiritual knowing that is enriched by cultural and community identities. This eco-school puts emphases on studying traditions, culture, ecological knowledge

that facilitates learner's social responsibility towards the others and the world. This grounds students in a local culture. Smith (2002) calls it "a place – based education" (p. 5) that grounds learning in local contexts and students' lived experience. The particular interest to integrate sustainability in science can be explained from the personal interest of the deputy head to bring innovative practice in school.

Conclusions

Sustainability more often is seen as desirable ideal and elusive phenomena, both in research literature and in the research part of this study. The leaders of many schools claimed that they recognize ecological and social aspect of sustainability in their practice. Sustainable development gradually becomes a part of curriculum and influences pupils' achievement. School leaders reported on how sustainability gradually became a part of meaning making processes in the school but this still requires the schools to see how all the initiatives fit together in a more holistic frame. Many schools began to view how sustainability could gradually become an umbrella of a whole school policy.

Sustainability must be enhanced in education with more concrete actions. Schools are required to have quality assurance to improve teaching and learning, based on continuous improvement and systematic thinking. The case study of two successful schools of implementing sustainability agenda reflects how integration of education for sustainable development helps to overcome the existing barriers and presents challenges. These schools reflect the examples how the sustainable leadership can facilitate in overcoming barriers of discipline restricted organizational structures, academic conservationism, traditions that tie schools to traditional modes of teaching, lack of interest and involvement of the staff members, overcrowded curriculum and pressure of time, obstacles more frequently mentioned by the leaders of the schools.

The second part of this study reflects the stories of two leaders of schools who share their experience of bringing improvement and innovations in their schools, fostering greater sustainability in their schools, building connections with a community. The evidence gained from two schools of good practice as identified in the community by the families and the school board, shows that the leaders of two schools contributed to the design of the schools' environment as a whole school approach. In both schools sustainability is contextualized as a shared whole school agenda by ensuring quality education. Both schools pay particular attention to an ecological and social dimension of sustainability, by giving attention to the social and ecological footprint they leave on local and global community. Sustainability in both schools gives an ethical framework to work within and provides a clear direction and purpose where the school is heading. By building the atmosphere of care, both schools contribute to the education of pupils into healthy and responsible citizens.

Sustainability in both schools characterizes a vision and values central of the policy of the school, with its emphasis on inclusive education, distributed approaches of leadership, as well as qualities of resilience and risk taking. Both schools undertake and initiate innovative approaches for teaching, such as inquiry and problem solving learning. Sustainable schools becomes venues of proving a rich learning environment to meet the needs of all children by providing the opportunity to work on tasks that have meaning and relevance to pupils.

The leaders of both schools demonstrated a commitment to the development of a culture of a sustainable school, they understand the systemic nature of an organization, they are practical and hands on doers, see their concerns in different scale, they enable and share leadership rather than control power relations. They hold sustainability values that allow them to work within the deeper purpose.

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