

RESEARCH INTO LEARNING PROCESS IN A VOCATIONAL SECONDARY SCHOOL IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Natalja van Gejeka
Riga Construction College, Latvia

Abstract

The paper provides an insight into the results of a lesson designed and carried out at Riga Construction College in the study subject “Building Constructions”. The aim of this study is to better understand the impact of learning environment reorganisation into juvenile groups while teaching technical study subjects. In particular, the research conducted at this vocational secondary school focused upon introducing a particular form of integrative collaboration amongst the learners. Criteria were developed to respond to the question: How is the organisation of the learning process based on the Learners’ Integrative Collaboration Model changing? A formative teaching experiment, which analyses learners’ integrative collaboration through structured observation at the beginning and end of the acquisition of the study subject “Building Constructions” points at positive changes associated with the model’s criteria: working in a team, mutual learning, business communication and creativity action.

Key words: vocational school learners, working in a team, mutual learning, business communication, creativity action, learners’ integrative collaboration

Vocational education in the context of sustainability

Modern construction needs professionally qualified specialists able to use knowledge, skills and experience, along with attitudes acquired in a professional school that serve in real life. Therefore, the task of a vocational secondary school is to train specialists who are able to quickly adapt to dynamic processes that take place in the field of design, production, work management and control; specialists who are professionally mobile and are able to continue their education abroad and, thereby, compete in the international labour market. However, there is a gap between the demand for highly-qualified skillful specialists and the realities of qualification and capacity. The Riga Technical vocational bachelor’s degree programme “Building” report of 2006 expresses employers’ dissatisfaction concerning the practical training level of entry level construction specialists regarding their deficient ability to work in interdisciplinary teams and organise collective work.

Currently, in Latvia, radical changes are taking place that affect almost all spheres of life and have a significant impact on everyone’s lives. Latvia’s development plan

prioritises education and knowledge using creativity, tolerance, cooperation and participation as a strategic pillar of Latvia's sustainable development (NAP – Latvian national development plan: 2007–2013 [Latvian National Development Plan: 2007–2013], 2006). The transition to a market economy with all of its contradictions, to some extent, determines vocational training objectives and content and advances new rules and priorities, which, in turn, affects the development of the education system as a whole. It has some qualitative change: training programmes have become more sophisticated and more closely related with specific specialties.

At the same time, changes have concerned both the teaching and learning processes in the classroom as well as the teacher's tasks. It should be noted that the pedagogical activity of today's teachers has a subjective character. Their task is to organise the educational process so that it can promote a greater learner's autonomy, help develop their creative individuality and personality (Eriksons, 1998; Gudjons, 2007; Žogla, 2007; Mits, 2008). Evaluating the content of educational literature in compliance with national education standards, a number of educators (Andersone, Maslo, Krūze, Rutka, & Žogla, 2008) note a discrepancy between theory and practice in a pedagogical process; they also focus on interactive teaching methods and learners activity into focus, which, in their view, can cause specific difficulties when put into practice.

The author of this research believes that a dogmatic educational environment type prevails and that authoritarian teaching styles are more common in various national training institutions. In such a type of environment, a developing personality is characterised by almost total passivity and dependency, which is least acceptable to people in a democratic society, but very beneficial for a non-democratic society.

Consequently, it is important to organise the teaching and learning process in such a way that it permits learners to take an active position in dealing with creative tasks, teaches them to think creatively, to draw conclusions, to resolve conflicts amicably, to seek information, to understand the different knowledge spheres of mutual relationships and to be independent researchers. It has been pointed out that only those human sustainable developments headlining practical skills that contribute to the further education after graduation promote long-term viability prospects (United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2005). Sustainable development is widely discussed in various educational sources and has been analysed by a number of well-known researchers (Dewey, 1997; Hansen, 2002; Sterling, 2003; Kelly, 2006; Salite & Pipere, 2006; Gray, Chang, & Radloff, 2007; Pynch, 2007; Reunamo, 2007; Salite, Micule, Kravale, Ilisko, & Stakle, 2007; Lukk, Veisson, & Ots, 2008; Salite, 2009). Latvian scientists and educators (Ģeriste, 2004; Kravale, 2006; Gudjons, 2007; Žogla 2007; Kāposta, 2011) note that training highly-qualified specialists requires extending fundamental knowledge, educational content differentiation and integration, the strengthening of vocational orientation and the development of prospective professionals' creative thinking and research competence.

The peculiarity of secondary vocational education is expressed in two types of professionals – in mainstream education and in vocational and technical training. In traditional training programmes, especially in technical disciplines, insufficient attention is being paid to learners' creativity and its potential for growth. The teaching and learning process focuses more on the reproduction of the study material rather than on the creation of something new. In the context of sustainable development, there is a need for a new education quality assurance according to the selected competencies. Sustainable

development strategies aim to achieve a balance between human, natural and social interaction. During the educational process, teachers have to organise the teaching and learning process in order to promote learners' development through the construction of knowledge and decision making.

Learners need to integrate diverse knowledge and skills, because a directly integrated body of knowledge determines the quality of education these days. To promote the reorganisation of the teaching and learning process in vocational schools, socio-cultural aspects were implemented. As highlighted in the introduction, the growing requirements of society as well as changes in the field of science bring the problem of integrating teaching and upbringing into focus in vocational schools. The education system focuses on the development of intellectual personality as a picture presenting an integrated view of world phenomena and the process of deep interrelations. The lack of integration of knowledge among study subjects, the inability to apply previously acquired knowledge at the beginning of the professional school and the lack of practical experience in construction causes serious difficulties related to the creation an integrated world picture and a secure self-determination in within societal structure. Therefore, the problem of integration in school today is very important and topical. Integration is an important modern learning process precondition where full implementation would be a transition to a qualitatively new level of education. It should be noted that the integrative links between technical study subjects and social disciplines in vocational secondary schools are weak and quite controversial. Even among researchers, there is no conformity of opinions concerning the essence of these links.

Thus, in a vocational school, the teaching process with its dominant dogmatic educational environment neither contributes to materialising creative individuality nor develops the ability to quickly adapt to dynamic processes in the fields of design and work organisation. Consequently, the teaching and learning process that enhances the development of creative potential, the ability to work in an inter-disciplinary team and organise collective work should be organised. This kind of learning in vocational schools is possible by creating a special course of technical study subjects based on the Learners' Integrative Collaboration Model developed by the author. The criteria were developed to respond to the question: *How is the organisation of the learning process based on the Learners' Integrative Collaboration Model changing?*

The structure of the Learners' Integrative Collaboration Model

The Learners' Integrative Cooperation Model was developed and the form of interaction between learners and a teachers was determined. Learners' integrative collaboration presents a process of developing linking in a team context where learners act as a united unit, constructively reconciling their actions, where each participant is responsible for his/her own part of the work. This requires a common objective and fulfilling tasks assigned by the teacher in which each individual expresses his/her creativity and individuality as part of a fully integrated team. Creative activities convert learners' collaboration into integrative cooperation.

According to the developed model, the aim of organising learners' integrative cooperation is to promote the acquisition of learning skills and to further professional self-education, including the development of creative potential. The didactic principles of organising the educational process are also reflected in the model: learners' cognitive

activation; learning process intensification; learning material flexibility; knowledge evaluation to ensure the continuous and efficient management of the learning process; the democratic principle; the principle of succession; the principle of differentiation; the reflection principle.

The main pedagogical conditions of the study reorganisation process for professional schools include content enrichment, compromise and cooperation as strategies for conflict resolution; non-verbal communication tools and a change of approach towards learners' evaluation.

Learners' integrative collaboration include problem-solving, project work, discussion, professional business games, visualisation and personification. Further, some features of learners' integrative collaboration are defined in the model.

- The learning function is related to knowledge of the physical-mechanical properties of building structures and their calculation according to the borderline position method.
- The socio-cultural function is related to the values and norms of the profession. Learners, being involved in the team project development, simulating constructors' office work, getting to know construction labour rules and regulations. When acting as a team of designers, each learner acquires learning interaction and cultural co-operation skills.
- The communicative function is related to communication in which each learner is engaged, thus enriching his/her communicative experience.
- The self-realisation function is related to the integrative collaboration as learners play the roles in diverse situations and roles. This gives participants the opportunity to test their ability to find their own strengths and weaknesses, acquire new knowledge, develop skills and enrich the experience.
- The diagnostic function is related to the observation of learners' activities in integrated collaboration to determine the characteristics of the learner in various fields while the learners are able to identify their strengths and weaknesses.
- The correction function is related to the possibility of adjusting the learners' behaviour and activity during integrative collaboration.
- The motivating function is related to expression free from stress and towards positive emotions.

Methodology of the study

The author suggests using a team project method (the Learning Environment Reorganisation Model) in the lessons of the study subject "Building Constructions" at Riga Construction College, which is based on integrative learners' collaboration. Three years (2008–2010) were devoted to pilot-studies (Martinsone & Pipere, 2011; Žogla, Kalniņa, & Antiņa, 2012) which helped to detect some weak points in learners' integrative collaboration in class and introduce corrections into the suggested method of teaching. This paper presents the main pedagogical experiment with convincing proof for an increased creativity level as a result of corrections introduced into the teaching method.

Three groups of learners studying basic level building management were studied; two experimental groups (20 and 21 learners respectively) and a control group (22

learners). The duration of the experiment entailed one semester. After a short introductory lecture, learners in the two experimental sections joined together in teams of three to four members. A quantitative data analysis method was applied (structured observation – 160 minutes) at the beginning of the experiment and four learning hours (160 minutes) at the end of the experiment were employed to analyse changes in the learning environment of the control and experimental classes. After a short introductory lecture, learners in the two experimental sections joined together in teams of three to four members. To see the impact of the model on the dynamics of changes in the development of learners’ professional skills, the criteria of learners’ integrative collaboration were developed: working in a team, mutual learning, business communication and creative action (Table 1). Working in a team, learners act as a single system, sharing duties and constructively matching their individual actions with others. Mutual learning is a possibility to use all the team members’ knowledge with effective exchange of experiences in order to create systemic knowledge. Business communication is the distribution of roles in teams. Each learner takes responsibility for his/her own work. Creative action includes fast, flexible thinking, bright imagination, curiosity, a sense of humour, interest, conscious self-education, creativity.

Table 1. The criteria of learners’ integrative collaboration

Criteria			
Working in a team optimum links building process during a team activity in which learners act as a single system, sharing duties and constructively matching their individual actions with others	Mutual learning a possibility of using all the team members’ knowledge with effective exchange of experiences in order to create systemic knowledge	Business communication distribution of roles in teams, each learner taking responsibility for their own work	Creative action fast, flexible thinking, bright imagination, curiosity, a sense of humor, interest, conscious self-education, creativity

The focus of observation was the learners’ integrative cooperation. The researcher’s role was that of an active participant of the observation process. Throughout the experiment, my colleague-expert, who does not work with the learners in their third year, and I were the observers in the classroom. Communication with the learners provided an explanation, and the two teachers secretly observed the learners’ interaction in the classroom, evaluating their integrative collaboration.

The effectiveness of the Learners’ Integrative Collaboration Model was measured in accordance to the developed criteria. In order to get a better overview of the dynamics of the changes, the levels and indicators of learners’ integrative collaboration were determined (Table 2). Note that, in this case, the teacher’s role in the classroom significantly differs from the role of the teacher in the traditional approach. According to the model, the teacher’s participation decreases gradually, and each learner’s learning autonomy increases as his/her collaborative experiences organise the learning process towards mastery (Žogla, 2001).

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Table 2. Indicators of learners' integrative collaboration

Criteria	Indicators' level and characteristics			
	phenomenon is expressed	phenomenon is rather expressed	phenomenon is poorly expressed	phenomenon is not expressed
	3 points	2 points	1 point	0 points
Working in a team	communicates well, coordinates work with the team members well according to the duty allocation	communicates well, but unable to participate in the work for a long time, maintains respect of division of responsibilities	communicates occasionally, intermittent respect of division of responsibilities	works only individually, often ignores the joint action
Mutual learning	able to design independently as a team member, consulting others	able to design only in consultation with others	able to design only in consultation with the teacher	cannot recommend anything to others, works under the supervision of a teacher
Business communication	able to explain and justify opinion while consulting with others	fragmented business links are formed	communicates with difficulty, taking responsibility for his/her own work	business links are not formed
Creative action	works creatively, always with own original ideas for solving the problem	works creatively, but intermittently	designs independently, but unable to create new original ideas, self-educates consciously	no creativity, unable to design independently, can only reproduce

Results

The research results into learners' integrative collaboration in the 1st and the 2nd experimental group as well as in the control group are provided in Tables 3, 4 and 5. As seen in Table 3 and Table 4, at the beginning of the experiment, no differences between the 1st experimental group and the control group (*chi-square tests*, $p > 0,05$) are seen (van Gejeka, 2013). At the beginning of the experiment, the 2nd experimental group and the control group are essentially indistinguishable (*chi-square tests*, $p > 0,05$) (van Gejeka, 2013). Therefore, there are no significant differences between the groups at the beginning of the experiment. In contrast, at the end of the experiment, the 1st experimental group and the control group are significantly different (*chi-square tests*, $p < 0,05$)

as well as the 2nd experimental group and the control group. Both experimental groups essentially differ from the control group in integrative collaboration indicator characteristics (*chi-square test*, $p < 0,05$) (van Gejeka, 2013).

Table 3. Results of learners' collaboration abilities (the 1st experimental group and the control group) (van Gejeka, 2013)

Criteria		1st experimental group				Control group				Chi-square p
before the experiment	working in a team	6 30%	6 30%	5 25%	3 15%	7 32%	7 32%	6 27%	2 9%	0.950
	mutual learning	7 35%	10 50%	3 15%	0 0%	6 27%	14 64%	2 9%	0 0%	0.654
	business communication	13 65%	5 25%	2 10%	0 0%	14 64%	4 18%	4 18%	0 0%	0.697
	creative action	13 65%	4 20%	3 15%	0 0%	14 64%	6 27%	2 9%	0 0%	0.762
after the experiment	working in a team	1 5%	6 30%	4 20%	9 45%	5 23%	8 36%	7 32%	2 9%	0.043
	mutual learning	0 0%	3 15%	10 50%	7 35%	5 23%	13 59%	3 14%	1 4%	<0.001
	business communication	1 5%	1 5%	10 50%	8 40%	13 59%	5 23%	4 18%	0 0%	<0.001
	creative action	0 0%	4 20%	10 50%	6 30%	14 63%	6 27%	2 9%	0 0%	<0.001

In the course of the experiment, *working in a team* changes significantly in the 1st and 2nd experimental groups. At the end of the experiment, the learners who work hard within the team remained only 5% in the 1st experimental group (at the beginning of the experiment the 1st experimental and the control groups are not essentially distinguishable – 30% and 32% of the learners who hard work within the team). Consequently, we can argue that during the experiment, the learners were encouraged to cooperate.

There is a significant growth in the number of learners that create a fragmented *business communication*: at the beginning of the experiment – 10%, at the end of the experiment – 50% in the 1st experimental group. Business communication increased in the 1st experimental group (with 35%) and the 2nd experimental group (with 48%).

The number of learners who *worked creatively* increased by 30% in the 1st experimental group and by 33% in the 2nd experimental group. The number of learners who worked creatively only fragmentally increased very significantly: from 14% to 42% in the 1st experimental group and from 10% to 50% in the 2nd experimental group. The control group where the Learners' Integrative Collaboration Model was not proposed designed constructions traditionally. An analysis of learners' integrative collaboration indicators before and after the experiment in the control group show that only very minimal changes occurred.

Table 4. Learners' collaboration abilities (the 2nd experimental group and the control group) (van Gejeka, 2013)

Criteria		2nd experimental group				Control group				Chi-square p
before the experiment	working in a team	4 19%	6 28%	8 38%	3 14%	7 32%	7 32%	6 27%	2 9%	0.715
	mutual learning	4 19%	12 57%	4 19%	1 5%	6 27%	14 64%	2 9%	0 0%	0.572
	business communication	11 52%	7 33%	3 14%	0 0%	14 64%	4 18%	4 18%	0 0%	0.522
	creative action	14 64%	6 18%	2 18%	0 0%	14 64%	6 27%	2 9%	0 0%	0.439
after the experiment	working in a team	0 0%	2 10%	7 33%	12 57%	5 23%	8 36%	7 32%	2 9%	0.001
	mutual learning	0 0%	2 10%	9 43%	10 47%	5 23%	13 59%	3 14%	1 4%	<0.001
	business communication	0 0%	2 10%	9 43%	10 47%	13 59%	5 23%	4 18%	0 0%	<0.001
	creative action	0 0%	2 10%	12 57%	7 33%	14 63%	6 27%	2 9%	0 0%	<0.001

Simultaneously, evaluating the criteria of learners' integrative collaboration (working in a team, mutual learning, business communication and creative action), there were no changes in the learning environment in the control group with a conventional teaching method, where the method of integrative collaboration was not used.

Table 5. Learners' collaboration abilities (the control group) (van Gejeka, 2013)

Criteria		Before the experiment				After the experiment				Chi-square p
control group	working in a team	7 32%	7 32%	6 27%	2 9%	5 23%	8 36%	7 32%	2 9%	
	mutual learning	6 27%	14 64%	2 9%	0 0%	5 23%	13 59%	3 14%	1 4%	
	business communication	14 64%	4 18%	4 18%	0 0%	13 59%	5 23%	4 18%	0 0%	
	creative action	14 64%	6 27%	2 9%	0 0%	14 63%	6 27%	2 9%	0 0%	

Therefore, the results of research into the learning environment by using the method of integrative learners' collaboration in class gave rise to improved learners' integrative collaboration.

Discussion and conclusions

In vocational secondary schools, training of mid-level specialists capable of professional mobility, able to quickly adapt to dynamic processes in design, manufacturing and work organisation, is a very important task. Unfortunately, at present, Latvian employers are dissatisfied with the level of practical competence and ability of graduates to work in interdisciplinary teams and organise collective work. The problem of learning process organisation in vocational schools has not been sufficiently explored: the learning process in comprehensive schools has been studied, but, in Latvia's professional schools, such studies have not been carried out. Having analysed the theoretical literature in the context of the situation, we can infer that the integrative links between specific technical study subjects and social disciplines in a vocational school are insufficiently developed and are contradictorily expounded; in addition, there is disagreement among researchers concerning the understanding of the nature of the links.

The Learners' Integrative Collaboration Model for technical study subjects was developed and experimentally verified in this research. The Learners' Integrative Collaborative Model has been tested and can be used for teaching the study subject "Building Constructions" at Riga Construction College. This is shown by the comparison of learners' individual achievements in the study subject "Building Constructions" in the experimental groups and the control group.

The main characteristics of the model are compromise, learning process intensification, teaching material flexibility and evaluation of learning outcomes. The learners' integrative collaboration organisational process cycle include: the analysis of team members' cooperation in problem solving, action plan development, implementation of the project, team project presentations, project discussion and reflection (a critical assessment of the team project and self-evaluation). Learners' integrative collaboration was achieved through a common understanding of the most important topics for the special technical study subject "Building Constructions".

It can be concluded that all the criteria characterising integrative collaboration have significantly increased. Thus, it can be stated that the type of activity provided in the framework of the experiment helps learners by promoting cooperation.

Riga Construction College secondary school teachers (the author's colleagues) are considering the possibility of using learners' integrative collaboration for learning process by customising a model organisational structure for each technical study specification, objectives and tasks. Riga Construction College secondary school teachers stated that the use of the Learners' Integrated Collaboration Model facilitates discipline in the classroom and positive attitudes towards the organisation of the teaching and learning processes.

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Correspondence:

Dr Natalja van Gejeka, Riga Construction College, Gaiziņa 3, Rīga, LV-1050, Latvia.
Email: natavana@inbox.lv