PROBLEM-BASED LEARNING APPROACH IN THE SALESLABS PROJECT: EXPERIENCE OF REZEKNE ACADEMY OF TECHNOLOGIES

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Abstract

In order to facilitate the contact of the contemporary business environment with the study process contents, the study process strategy, methods, tasks and achievable study results are important. The results of the study process are ensured by collaboration with the business environment, real business problem-solving solutions and using a problem-based learning approach that consists of six steps: experience, problem, hypothesis, examination, conclusions and self-assessment.

The aim of the article is to analyze the results of problem-based learning approach in learning the contents of the study course at the Rēzekne Academy of Technologies design and technology study programs.

The research uses theoretical and empirical methods: theoretical - research of literature and Internet sources, empirical - focus group discussions, analysis of expert interview data. Research base 14 students and 3 lecturers. Research period – 2018/2019. The research is of practical importance, as problem-based learning studies are an interdisciplinary research area, which according to the action research is done by case-by-case analysis. As a result, design product solutions of 3 businesses are developed - uniform and promotional materials. Meanwhile students acquire personally significant knowledge, develop design thinking, form their own and team self-assessment, as well as responsible attitude towards the assigned task.

Keywords: business environment, design products, design education, problem-based learning, SalesLabs Project.

1 INTRODUCTION

The readiness for life activity that people need in the 21st century can be promoted in higher education using new progressive teaching methods directed at the formation of a student as an individual and a professional, including interdisciplinary projects in the education content and solving real life problems as the basis of education. The involvement of academic staff, students and entrepreneurs in innovative projects, improving the scientific research capacity of the academic staff, ensuring technological development and transfer for the development of entrepreneurship at Rēzekne Academy of Technologies (RTA) promote new approaches to education, the improvement of academic results and research activity.

Interdisciplinary, inter-sectoral approach – to ensure contact with as big a variety of fields and sectors of activity as possible, it opens new opportunities for education and novation and allows reacting to current social economic and cultural trends and requirements ([1], [2])

The requirement for new life skills in modern society is related to the necessity to solve multifaceted and complex problems, to ensure all kinds of effective communication, to work in a team, develop skills for work with a large amount of information, work in situations where there is no right or wrong answer because the situations are unique and occur for the first time, to ensure the competition of innovative products and services in the world created by global technologies [3].

Aalborg University (Denmark) is known for its interest in alternative approaches to education, providing students with an active role, involvement in learning, also defining a new role for the educator in the learning process, to be the initiator and coordinator of cooperation in the process of knowledge transfer. The synergy effect – peer-to-peer learning – manifests in this joint education process also known as the Aalborg PBL model [4]. The use of the primary principles of PBL in education is also current elsewhere; for example, it is successfully used in the education process at the Northern Lithuania College (Lithuania), and the experience is also being transferred at Rēzekne Academy of Technologies (RTA) (Latvia).
In 2017-2019, RTA together with the Northern Lithuania College are implementing project No LLI-184 "SalesLabs for Employability Competencies Development (SalesLabs)", which is being implemented with the support of Interreg V-A Latvia–Lithuania programme 2014-2020 at Rēzekne Academy of Technologies [5]. The project aim is the introduction of an experimentally new teaching method to go in line with change and improve student integration in the job market. This is learning in the work environment, more specifically referred to as problem-based learning. The teaching method emphasises practical classes, during which groups of students search for solutions to real problem situations of local businesses, implementing their ideas in new products or services on the market.

2 METHODOLOGY

The aim of the article is to analyse the research activity of education based on the principles of problem-based learning (PBL) in RTA design education programmes. The education results are ensured by cooperation with the business environment and the solutions to problematic issues of real businesses.

The theoretical and empirical qualitative data processing and analysis methods are used in the study: theoretical – the study of literature and Internet resources; empirical – focus group discussions and structured expert interview data analysis.

Research base: 14 Design education programme students and 3 docents (experts). Time periods – the Spring and Autumn semester of 2018 and the Spring semester of 2019. The qualitative data are obtained through a focus group discussion in 3 groups of students, evaluating the research activity of problem-based interdisciplinary learning. Three experts participate in the study, expert interviews are conducted using a survey which includes 8 questions, and the data obtained are summarised and analysed as a result. The choice of experts is determined by appropriate academic and professional competence and experience working with the PBL approach. The experts evaluate: the advantages and disadvantages of the new approach and give recommendations for more efficient progress of the education process based on the PBL principles and for the evaluation of the results. The experts participate independently of one another; they are not informed about the other responses. The content of the discussions and interviews is structured in accordance with the content of the SalesLabs project and the requirements for obtaining the results.

The progress of the SalesLabs project, in accordance with the conditions of the activity research, provides for the opportunity for the academic staff in different fields in cooperation with students and entrepreneurs to try a new approach, education process organisation and methods in acquiring the content of the education course. The project coordinators, involving RTA administration, organise the improvement of the education process in 10 education courses, expecting to develop competencies that students need in the 21st century.

RTA 3rd and 4th year students of the professional Bachelor programme “Interior Design”, as well as 2nd year students of the college level professional higher education programme “Fashion Design and Technology” and the authors of the article in the activity research, using the problem-based learning principles, have been performing interdisciplinary experimental activity in the education process for 3 semesters. The experience with specific cases is viewed in the education courses “Fashion Design” and “Interior Design and Artistic Decoration”, which resulted in solutions to 5 company defined questions, in fashion, interior and advertisement product design. The results of the education courses conveyed by the authors of the article are analysed in this article.

The authors of the article summarise the theoretical guidelines on the problem-based learning (PBL) approach to education, its elements, and analyse the research activity of students in the project, with the stages of the design process as the basis.

3 THEORETICAL STATEMENT

Focusing on the dynamics of the development of modern society, the rapid progress of modern technologies, the opportunities and challenges offered by globalisation, constructivism is posited as the most appropriate learning strategy, the beginnings of which are found in the 1st half of the 20th century. Constructivism involves reorientation from teaching to learning. It is based on the idea of learning as an active process, during which the student actively constructs knowledge, based on their own experience. Knowledge is not offered in a “ready” state; favourable pedagogical conditions are created, which ensure the acceptance of each student’s intellectual abilities and respecting their opinion. They (the subject) become a full-fledged participant of the learning process. The educator in this context is a consultant,
the organiser and coordinator of problem-based learning. They model the conditions that stimulate the development of the student’s critical thinking (using contact of contrary opinions, discovering contradictions in the discussion process, etc.) [6].

The student-centered pedagogical approach, in which students learn about a subject through the experience of solving an open-ended problem found in trigger material is called problem-based learning. There must be a contextual problem which can stimulate the students to learn the topic with high order thinking skill (HOTS) [7].

By getting involved in creative activity, the student develops their ability to express knowledge in different ways, transferring it to real life. Learning activities based on real life situations are stimulating and exciting. The opportunity to feel responsible for your own learning begins the moment the student’s learning is based on their own questions and discoveries (Fig.1).

![Figure 1: Structure of Organisation PBL](image)

Students also need to participate in the evaluation process. Evaluation in constructivism provides for and activates student initiative and personal input in research results, projects, model design and presentation. Constructivism develops the social and communicative skills of students, creating the learning environment focused on cooperation and exchange of ideas. Students need to learn to formulate their ideas clearly and to successfully cooperate in a group when performing tasks.

Methods for different study fields and class organisation techniques help to develop student transferable skills and are an important part of employability competence. In order to create practice, here are some very important parameters to consider: (Fig.2).
Attitudes to studying - collaborating in group:

- I can achieve my aim if other members of the group achieve it as well. Success of the group depends on success of all members of it.
- We are all interested in success of the group and we strive to be successful.
- We take care of each other.
- Evaluation is based on criteria [5].

The analysis of the theoretical guidelines of the problem-based learning approach shows its relation to constructivist beliefs on multifaceted views and solutions to problems. Constructivism is based on active individual involvement in the creation and construction of knowledge. The learning process directed at mental development includes four leading interrelated elements:

- Acquiring and understanding knowledge, which is the basis for the creation of new thought-forms;
- Discovering new knowledge through independent activity;
- Expanding the limits of the knowledge acquired by applying it in new circumstances;
- Inventions – possible problem solutions with many alternative solutions.

The most important in constructivism is the student’s mental activity, developing critical thinking. This requires a radical update of teaching methods and tools, the ability of the educator to use a variety of learning technologies [9].

The activity research conditions are appropriate for the organisation of the education process. Activity research is practical research for solving the education problem followed by quality improvement [10], involving scientists, education administrators, and docents in the process. The research problem is the situation considered as a theoretical or practical issue or task that needs to be explored [11]. For Design education, the preparation of designers is important considering the current issues in education – lifelong learning, implementation of the requirements provided for in the standard for the profession, the interdisciplinary approach, activation of the innovation processes.

Activity research combines science, research and activity, searching for ways to improve the learning process, improving competences required for active participation in the society of knowledge. Carrying out the research promotes new skills, analytical abilities, allows trying a variety of methods and gives its participants the opportunity for self-realisation. Activity research involves diagnosing a situation, designing a plan for improving the situation, implementing it and evaluating the results obtained [12].
4 RESULTS

In the SalesLabs project, company defined problem situations are solved with the application of efficient PBL models and learning principles in the acquisition of the education course. Problem-solving algorithms, according to the specific nature of the study course, manifest in the Design programme courses as research activity, studying new materials in the field of graphic, interior, or fashion design and creating new real solutions (uniforms, accessories – bags, product packaging, interior projects or style guides) in cooperation with a specific company. Sample design products are manufactured using the latest material processing technologies in RTA laboratories.

This is learning in the work environment where groups of students, searching for a solution to a specific company defined problem, acquire the content of the education course, which corresponds to a particular course topic. 3 groups of students during 3 semesters, dividing the tasks to be performed, suggest ideas, prepare proposals for solutions to the problem issues related to product design defined by the companies “Kuup Cafe”, SIA “Eltera”, SIA “IGGI”, Z/S “Kotini”, Z/S “Juri”, SIA “Midis”. The educator is a moderator between the company and the students who offers literature sources, provides consultations, discusses possible alternative solutions, and helps with their implementation. The educator does not point to the right or wrong way of solving a problem; still 30% of work evaluation is exactly the result obtained by the group of students, which at the end is also evaluated by the company according to specific criteria.

The organisation of the education process includes the following PBL stages: experience, problem, hypothesis, testing, conclusions, and self-evaluation. The acquisition of the content of the education courses “Fashion Design” and “Interior Design and Artistic Decoration” is structured considering the following stages of PBL elements:

1. The general content, objectives, and target results of design and artistic decoration education are defined, primary notions and conditions of design, primary principles of fashion/spatial environment design and decoration are reviewed;

2. The problem is analysed using the structure of the design process; during the “problem analysis” the students get familiarised with the problem defined, find out any unclear notions and terminology. A problem analysis plan is prepared, which involves formulating the first questions for the problem analysis with the help of the docent, searching for information sources, planning the process implementation stages, as well as defining the responsibilities of each group participant;

3. The design process is planned as a chain of activities, which includes the knowledge required, formulating the problem analysis questions and finding answers, integrating the study of theoretical sources with the analysis of practical situations, preparing and presenting the design of a specific product (problem analysis report);

4. The problem analysis is performed in a small group, up to 5 persons, using the communication and cooperation learning methods in creating the design product;

5. The student learning/problem-solving activities are purposefully supported by the docent, providing timely feedback and consultations on a particular topic/issue, on the validity of the theoretical conclusions summarised by the authors of the design ideas, the design progress planned, and the results expected;

6. The group and individual learning progress is systematically (self-) evaluated and reconsidered.

The practical problems offered to the students for solution in the education course are related to creating a new interior design, designing a visual company brand or packaging for a specific product, designing a product (clothing/an accessory). On the educator’s part, these are only viewed to express assumptions, which allow the students to make conclusions through testing. As a result of the research activity, the students should acquire knowledge of personal importance, develop creative thinking, form their own and team self-evaluation, as well as a positive attitude to the task given.

The respondents evaluate the education course acquired through the PBL approach on a 1—5-point scale according to the following criteria (Fig 3):
In the focus group discussion, the authors evaluate the results achieved to obtain more detailed information on the results of the application of PBL in the acquisition of the education course content (Fig. 4, 5).

**Figure 3** Assessment of study courses

**Figure 4** The Results of the focus group discussion 1

In your opinion, which of the PBL principles did you use more and which less to do project tasks?
The subjective experience of the participants regarding the education process and cooperation is also found out (positive/negative). The respondents describe their personal gain in the SalesLabs project, primary difficulties encountered during the design process, communication with the entrepreneur, frequency and importance of meetings. The most significant results are the following:

- New knowledge about work with customers has been acquired and experience in cooperation with real entrepreneurs as well as listening to and solving real company problem situations has been expanded, thus getting better acquainted with a particular work environment in a particular sector, establishing new contacts, and gaining more confidence in oneself as a future professional;

- Additional experience has been gained in organising the work process independently, solving tasks given, as well as experience working in a team, employing group work, and seeing the accomplishments of the other students involved in the project solving real company problem situations;

- Knowledge has been acquired in design; skills and abilities in learning to use specialised software have been improved; additional experience has been gained in fashion and interior design and in graphic design; and the strengths and weaknesses of the work contributed have been critically evaluated, gaining satisfaction with the final result obtained and noticeable professional growth in the design specialty chosen;

- New skills and abilities have been acquired when presenting the company design solutions in front of a large audience, practicing the English language and gaining positive feedback from entrepreneurs involved in the project.

To discover and evaluate the complicated aspects of the problem under study, which increases the reliability of the information acquired and conclusions made, an expert interview was performed. At the preparation stage of the expert evaluation process in the project, the authors selected experts in accordance with their professional competence in the problem under study and formulated questions for the expert interview. The expert interview process was implemented electronically by sending the questions at the end of the semester when the experts had heard the presentations prepared by the students on the results of the solutions to company problem situations in accordance with the project plan. The extent to which the students were able to achieve the expected results of the solutions to the problem situations defined by the companies was evaluated.

The authors summarised and evaluated the results obtained, analysing the responses provided, and the evaluation given; exert recommendations and experience were taken into account at the next stage
of the implementation of the project in the next semester and included in the expected academic results. The experts defined the strengths and weaknesses of the PBL approach implemented (Table 1).

**Table 1. Evaluation of the PBL approach implemented in RTA Design programmes**

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<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<td>Complex solution of a problem, real problem situations</td>
<td>The problem defined by the company does not cover all the topics of the education course</td>
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<tr>
<td>Division of roles in a group, teamwork, students get to know each other, responsibility</td>
<td>The company represents one field, and the student is focused on it</td>
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<tr>
<td>Brainstorming in a team, innovative outlook, interdisciplinary cooperation</td>
<td>Balancing of the theoretical and practical parts of the education content</td>
</tr>
<tr>
<td>Repeated and multifaceted evaluation, evaluation by other parties involved</td>
<td>Small groups, problems dividing tasks</td>
</tr>
<tr>
<td>Challenge for a new approach in the acquisition of an education course, emphasis on the 21st century competencies</td>
<td>Initially insufficient experience for the new approach to organizing the education content acquisition process</td>
</tr>
<tr>
<td>Meeting with a company, students activate and improve their communication skills</td>
<td>Insufficient readiness for the new roles for both the educators and the students</td>
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The most significant recommendations:

- Additional preparation of the students and educators for work with the PBL principles and elements, understanding and using them;
- Setting specific problem situations and requirements by the company to ensure the correspondence of the expected solutions to the company requirements;
- Thinking through the action steps for each task to avoid unpredictable results on the part of students;
- Analysis of the practical results of the student learning and research activity to evaluate the correspondence to the theory acquired in the education course.

At the end of the semester, cooperation companies evaluated on a 1—5-point scale in accordance with specific criteria the design products created by the students and the results achieved: the sample design products, style guides, interior projects. Criterion:

1. Solution is actual for your company;
2. Offered solution is real, and it has practical application;
3. Offered solution is ready for implementation in your company;
4. Offered solution has innovative approach;
5. Evaluate solution presentation.

In the education courses conveyed by the authors, the design products created by the students received the highest evaluation from the entrepreneurs, 25 points, for all the 3 semesters.

5 CONCLUSIONS

- The learning approaches that correspond to the constructivism theory – problem-based learning; project-based learning, inquiry learning – allow students to cooperate, work on real problems, get involved in societal processes, develop multifaceted skills; the acquisition of knowledge and skills is closely interconnected.
- The PBL method is a very motivating and useful way of, firstly, organising the work of a docent, i.e. planning the course progress consecutively, step by step, and secondly, it encourages the students to take initiative, thus leaving for the docent the role of a consultant and supervisor.
The opportunities for solving the company problem situations provided for in the SalesLabs project ensure communication and new contacts in cooperation, at the teamwork design stages, in accordance with the competence of the participants, new knowledge and experience. Participation in the project seminars and presentation of the results allows the participants to evaluate their own and the others’ results, provides satisfaction with the design product created.

The opportunities for the use of modern technologies (laser cutting), which are available at RTA, allow working on innovative design solutions independently, using the technological opportunities in the creation of design products, tailoring them to the results expected.

During the implementation of the project, the students have real opportunities to gain practical experience in the operation of various companies in Latvia and Lithuania, which will also provide the important work experience after graduating RTA.

Cooperation of education, science, and entrepreneurship promotes inter-sectoral research results at RTA and innovative technological solutions in the creation of design products for companies.

REFERENCES


