Funded by the European Union

TEACHERS & RESEARCHERS NETWORKING FOR INQUIRY-BASED LEARNING

PROJECT RESULT:

TEACHERS' & RESEARCHERS' NETWORKING PROCEDURES

(TYPE: GUIDE)

LERA
Lithuanian Educational Research Association

Authors:
Rūta Girdzijauskienė
Natalija Ignatova
Eglė Pranckūnienė
Neringa Strazdienė
Sandrita Škerienė
Gražina Šmitienė

Researchers contributors:
Jurgita Bražinskienė
Dita Nīmante

August 2022

CONTENT

Introduction

The idea of networks and networking is becoming particularly relevant in the modern age of globalization and the development of information technology when many functions and processes are implemented through networks. Networking is the search for contacts, making useful acquaintances, and exchanging information and experiences with people with similar goals and interests. The network is a type of cooperation or partnership that connects individuals, groups, and organizations with similar goals and allows them to exchange resources, and information to improve the effectiveness of their activities (Carson, Gilmor, Rocks, 2004).

In the current field of education, networking between various educational actors is becoming increasingly important. Networks are being created among schools, universities, non-governmental organizations, and educational professionals, including teachers, school leaders, policymakers, and researchers. According to Crandall and Stoll (2005), networking is an effective form of professional learning in which schools, in collaboration with each other, and (in this case) with researchers, focus on the learning and progress of students.

The Project *Teachers & Researchers Networking for Inquiry-based Learning* (Project) brought together educational researchers and school teams to enrich the experiences of students with inquiry-based learning by creating a sustainable network of schools and researchers. The Erasmus+ small-scale partnership international project was initiated by the Lithuanian Educational Research Association (LERA), whose mission is to create and implement advanced, research-based educational practices in schools, to expand cooperation between educational researchers and practitioners. The Social Leadership Association (SLA), Vilniaus Vytauto Didžiojo Gimnazija, Aizkraukles nuovada vidusskola, Vilkaviškio r. Pilviškių "Santakos" gimnazija, Eišiškių Stanislovo Rapolionio gimnazija were also part of the project consortium.

The project involved 7 Lithuanian and Latvian educational researchers and teams from four schools (19 teachers and 175 students) seeking to implement inquiry-based learning (IBL) projects that open new horizons of cognition for students. Inquiry-based learning projects were implemented by students with the guidance of teachers and researchers. During the seven months of the project's implementation, researchers, teachers, and students merged into a learning community that involved participants from different social and cultural contexts in Lithuania and Latvia.

Inquiry-based learning (IBL) projects combine two forms of active learning: project-based and inquiry-based learning. In both cases, the focus is not on the information provided by the teacher, but on the problems posed and solved by the students, when the students themselves formulate a topical question that needs to be answered or an authentic and challenging problem that needs to be solved. To this end, students independently search for resources and information, make decisions on the implementation and results of the IBL project, reflect on their learning, provide, and receive feedback to improve their learning and its results, and develop critical thinking, problem-solving, as well as social skills. Through the implementation of IBL projects, the curriculum becomes meaningfully linked to real life and the natural context of learning, revealing the bonds between different subjects and curriculum areas.

IBL projects are designed according to the phases (stages) of the inquiry, e.g., the 5E model, and include *orientation*, *conceptualization*, *investigation*, *formulation of conclusions,* and *discussion* (Pedaste et al., 2015).

At all stages, students are actively engaged and constantly reflect on their activities; meanwhile, the teacher assumes the role of a consultant or mentor. The researchers performed several roles in the Project:

- the presentation of the concept of IBL and different research models and methods to teachers.
- the consultation of school teams in the planning and implementation of IBL projects.
- the evaluation and feedback on IBL projects.
- the conceptualization and dissemination of project results.

Researchers played an important role in the project by consolidating a network of learning schools and facilitating networking among teachers and researchers. In the network of teachers and researchers, new opportunities for professional learning were created, and at the same time, schools as learning communities were also getting stronger.

1. Stages of building a network of teachers and researchers

According to Stoll et al. (2006), networks are being created in four stages: "*I. Starting out – acquiring information and beginning to use ideas; II. Developing – experimenting with strategies and building on initial commitment; III. Deepening – well on the way, having achieved a degree of mastery and feeling the benefits; IV. Sustaining – introducing new developments and re-evaluating quality*" (Stoll et al., booklet No. 8, p. 2).

Similar stages became apparent when creating a network of teachers and researchers:

- *Preparing by learning together* involves familiarization, refinement of network goals and vision, building relationships based on trust, and creating joint learning opportunities for teachers and researchers.
- *Testing a new practice means* having gained new knowledge through experimentation and the application of new ideas into practice.
- *Deepening of the new experience.* Application of selected inquiry methodologies in schools; implementation of IBL projects by students; consultations and sharing of experience among teachers and researchers.
- *Evaluation of new practices*: new practices are introduced in schools, mastery is acquired, the benefits and meaning of the network are felt, the quality of IBL projects is assessed, and the results of the network's activities are disseminated through various platforms.

1.1. Preparing by learning together—the first stage of networking

At the 1st stage of networking, teachers and researchers debated and agreed that the implementation of IBL projects is helping to turn educational practices in schools from a traditional, academic way of teaching to inclusive, deep, active, and self-directed learning for students.

New knowledge and experiences accumulated in the network were disseminated to 4 schools by 19 teachers with the support of 7 researchers and promoters of professional learning in the network. The networking of teachers and researchers was based on the following "theory of action" (Figure 1):

- *strategy*: creation, sharing, and dissemination of professional knowledge between researchers and teachers (blue oval)
- *goal:* the implementation of IBL projects by combining the potential of schools and researchers and striving for changes in school curricula (green oval)
- the *desired result*: students' active involvement in IBL projects to foster their self-directed learning, as well as the professional mastery of teachers (orange and blue ovals).

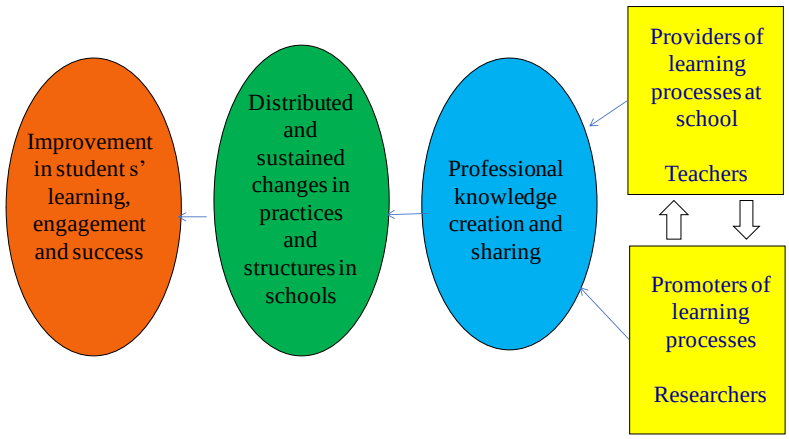


Figure 1. Teachers and researchers network theory of action (acc. Earl et al, 2006).

The established network of professionals is united by a common goal, a clear direction, and the joint creation of new practices and relationships based on mutual trust (Bolam and Crandall, 2006).

In the first stage, the purposes of the network were defined:

- to bring together schools and researchers interested in IBL and contemporary educational strategies to investigate innovative and effective educational processes;
- to develop, in cooperation between schools and researchers, a variety of IBL ideas, and ways of achieving them.
- to enable schools and researchers to exchange information and experience relevant to the implementation of IBL projects.
- to create an information base for the implementation of IBL projects and ensure its dissemination opportunities.

It was also clarified, how the purposes of the network would be achieved; how relations based on trust will be established, and how the necessary conditions for the functioning of the network will be ensured, such as time for networking activities, communication space, channels, and platforms, financial resources, and certification of acquired competencies (see Annex I, The Plan of the Project).

1.2. Testing a new practice—the second stage of networking

As already mentioned above, the first stage of networking focused on preparation for learning together, sharing, and the creation of new common knowledge (see Annex I). At the second stage of networking, teachers and researchers were learning together at webinars and joint meetings. The researchers presented various models of inquiry to teachers, and the researchers themselves were learning from each other (see Table 1). This laid the foundations for the planning of IBL projects in schools. Teachers did choose the inquiry models and discussed IBL project topics with the students. In parallel, they were developing plans for IBL projects and consulting with the researchers to get feedback and insights (see Table 1). Two surveys were conducted to gather information about teachers‘ expectations and initial plans for IBL projects:

• The first survey was carried out to learn about teachers‘ experiences in IBL, their expectations, and topics to be explored with students. This information helped researchers offer inquiry-based learning models, planning tools, and research methods relevant to the IBL projects discussed during the webinar for Lithuanian and Latvian researchers.

• The second survey was carried out to learn about the initial plans for IBL projects. 19 teachers completed the form about the first planning steps of IBL projects before the international webinars for Lithuanian & Latvian teachers (see Table 1):

- ✓ the themes of the 16 IBL projects encompass topics related to the Green Deal: e.g., circular economy, the use of renewable resources, increasing plant watering efficiency, sustainability, human health, environmental safety, a world free of poverty and hunger, and healthy nutrition.
- ✓ initial distribution of IBL projects by research methods (models): 8 projects based on the 5E model; 2 projects based on the value-based problem-solving model; 2 projects based on the art-based inquiry model; 4 projects will be placed as Inquiry Learning Spaces (ILS) on the Go-Lab platform.
- ✓ the IBL projects integrate different subjects, e. g. biology, chemistry, English, Lithuanian, information technology, mathematics, physics, biology, chemistry, etc. Participating groups of students include: primary school students; students from grades 8, 9, 10, and I, II, and III grades of gymnasium; some of the projects encompass non-formal learning activities.

Based on this information, the researchers were appointed to consult a concrete school or a team for a specific IBL project. The Lithuanian and Latvian researchers organized workshops for teachers

concerning the adapted ABC Learning Design tool to be applied for the creation of IBL projects' plans (see Annex II). In total, plans for 18 IBL projects were developed (4-5 projects by each school).

Table 1. Joint learning of teachers and researchers at the 2nd stage of networking development, "Testing a New Practice", February–March 2022

The event	Participants	The content of the event
Meeting of project's participants.	All partners*	International network initiation between Lithuanian and Latvian researchers and teachers
Webinar „IBL tools, methods and Inquiry models"	Lithuanian and Latvian researchers	To inform and interest teachers about inquiry-based learning (IBL) and project-based approaches, the researchers shared their experiences and discussed inquiry in STEM school environments. The researchers proposed the 5E model, the model of value-based problem solving, art-based inquiry, and Go-Lab as a virtual platform for Inquiry teaching and learning. These inquiry design models and methods have broadened the scope of STEM education to include STEAM and even STREAM education.
Training: Go-Lab platform	Lithuanian and Latvian researchers	The researcher from the University of Deusto (Spain) presented the Go-Lab platform and its facilities to find Inquiry Learning Spaces (ILS) and to create ILS (IBL projects) with the GRAASP tool.
Training: „ABC Learning Designmethodology"	Lithuanian and Latvian researchers	For the IBL projects' planning, it was decided to propose the ABC Learning Designmethodology. The researchers from the University College of Namur-Liège-Luxembourg (Belgium) shared their experience using the ABC Learning Design methodology.
Two webinars: „Inquiry based learning projects"	Lithuanian and Latvian teachers and researchers	The researchers presented to teachers: (a) the Project's idea, goals, and main activities; (b) the plan of the school's activities for the period 2022 January–July; (c) STEAM education and social inquiry design models and methods; ABC Learning Designmethodology for IBL projects' planning; Go-Lab platform.

1.3. Deepening new experience—the 3rd stage of networking

In the first two stages, after defining the purpose, ways, and principles of the network, the biggest attention was paid to the joint learning of teachers and researchers to acquire the new knowledge and experience necessary for the further stages. The deepening of new experiences and implementing IBL projects began with the mastery of selected models of planning and inquiry.

Along this path, the researchers encouraged teachers to consider and anticipate what topics or fields will be covered by IBL projects; what problems or issues students will face; where and how students will find the necessary information; what kind of inquiry tools will be needed; and how students will evaluate and present the results of the study. These and other issues have become relevant in the preparation and implementation of IBL projects during the 5 phases of inquiry (see Table 2).

Table 2. Guiding questions for implementing different stages of the IBL project

Phase of IBL	Guiding questions for teachers
Orientation	What is the topic of the IBLP? What is the class and number of students involved? What is the duration of IBLP? How is IBLP related to the themes of the subject curriculum? Which other subjects will be integrated? When and where will the IBLP be implemented (during classes, partly during classes, not during classes)?
Conceptualization: questioning, generating hypothesis	What kind of problem will be solved? What orienting or provocative questions will be discussed? Will students work on the one problem? or will groups of students choose different aspects of the problem?

Investigation, exploration	What kind of information is being sought to answer the questions? What sources are used to gather information? How is data collected and fixed? Where is it stored? How much information needs to be collected? What will it be used for? How much time is spent on collecting information?
Data selection, analyses, interpretation of results and conclusions	What exactly are students encouraged to do—learn, submit, and make discoveries? To whom will the information be provided, in what forms, and when? What should be the result of the project?
Presentation, dissemination, discussion of results in the community, reflection of students	Knowledge of the inquiry must be relevant (this is what we invite you to raise the problem for) and require dissemination. Where and to whom will the results of the project be presented? In what form? Who will take part in the presentation? What are the roles involved?

The implementation of IBL projects was based not only on the phases of the inquiry cycle but also on the different learning needs of students, the variety of forms of assessment, and the versatility of learning and research activities. While planning IBL projects, teachers were using the "ABC Learning Design" (Young, Perović, 2020; https://abc-ld.org/) tool. Researchers explored this tool with the support of professors from Namur–Liege–Luxemburg University and adapted it for the planning of the IBL projects in Lithuanian and Latvian schools (see the activities in Table 3).

Table 3. March-April 2022 Networking Activities

The event	**Participants**	**The content of the event**
Four workshops: IBL projects' planning	Lithuanian and Latvian teachers and researchers	The Lithuanian and Latvian researchers trained teachers on how to create the IBL projects' plans: (a) the planning of project activities according to the theme, goals, and based on appropriate inquiry learning phases; (b) applying the *ABC Learning Design* tool for IBL projects' planning (**see Annex II**).
Two international webinars presenting IBL projects' plans		The Lithuanian and Latvian teachers presented prepared detailed plans according to the *ABC Learning Design* for IBL projects' implementation (4-5 plans per school).

Teachers who were using the *ABC Learning Design* tool admitted that it "*helped to plan IBL project activities in time, to anticipate forms of cooperation, tools, and results*", "*helped to develop intellectual processes, as it provided an opportunity to plan each stage in detail, making it possible to predict possible errors*", "*made it easier to prioritize activities, made it easier to set goals, helped to predict what knowledge and tools learners would need, and enabled them to choose activities and feedback that matched the goals. Ideas arose on how to improve practical activities to achieve the goals. Planning encouraged discussion, collaboration, and ways of acquiring new knowledge*".

According to the researchers, detailed and accurate planning contributed significantly to the success of the IBL projects by allowing teachers to model and visualize the progress of the entire project and, together with colleagues and students, implement IBL project ideas more consistently.

1.4. Evaluation of new practices—4th stage of networking

This stage encompasses the implementation of the 18 IBL projects during regular classes or extracurricular activities. Teachers and their students fully implemented the planned IBL projects. Each school team had regular meetings with researchers to discuss issues that arose. During these meetings, teachers were encouraged to look deeper into the 6 types of learning activities in the *ABC Learning Design* tool:

Acquisition (understanding, mastering of knowledge).

- Provide the necessary information resources for students' inquiry, and indicate the virtual learning environment where students will find/search for information (i.e., articles, books, virtual search portals, etc.);
- Anticipate questions that will point students in the right direction. It is more effective to present not the general task, e.g., "*Find information about ...*", but specific issues, e.g., *What function does oxygen perform in the blood? How does oxygen enter the blood? What happens when the level of oxygen in the blood decreases*? It is recommended that students raise a problematic question themselves. It is appropriate to ask students: *How many and what questions could we raise and seek answers to by exploring this topic?*;
- Allow students to prepare a presentation of the collected information (a presentation, poster, mind map, infographic, compendium, etc.) to classmates and the research group. Systematized, structured, and visually presented information can become an excellent teaching and learning tool for students in other classes or groups.

Collaboration:

- Work in small groups. It is recommended that each group have a specifically named task, the deadline for the implementation of activities, and the expected result to be achieved (presentation, schedule, notification, etc.). To help students share tasks in the group and ensure the involvement of all members of the group;
- To encourage students to investigate not only at school during lessons but also independently using digital platforms (later exploring the results in a group) to study in the natural environment;
- To provide the possibility for the students to self-evaluate their achievements through the inquiry stages and to evaluate the work performed by each other (expert method, critical review method, etc.).

Discussion:

- To provide the possibility for each student or their group to discuss issues related to the topic of the project or its execution with students of other groups, other competent persons (for example, teachers of other subjects), and a project manager (through group discussion methods, debates, reasoning methods, etc.);
- To make it possible (and, if necessary, to assist) groups of students in finding a unified research solution (method, principle, variables, topic).

Inquiring

- To encourage the consideration of several research methods to make an argumentative choice of the most suitable possible;
- Encourage the consideration of various ways of presenting the results (e.g., research reports, scientific articles, scientific reports, posters, artistic forms such as podcasts, infographics, collages, storytelling, etc.), urging to make an argumentative choice of the most suitable.

Practice:

- Provide an opportunity for students to get acquainted with several research methods, tools, and alternative research environments (science centers, laboratories, digital laboratories, etc.) to provide an opportunity for reasoned choices;
- To teach to plan practical activities, to allocate them in stages, and to provide deadlines for their implementation.

Production:

- To encourage the use of various methods for presenting results (for example, research reports, scientific articles, scientific reports, posters, artistic forms (video presentations (H5P, etc.), podcasts, infographics, collages, storytelling, and so on);
- To provide the possibility to prepare creative works based on the conducted research, which would contain insights for further inquiry, the possibilities of applying the inquiry results, and the search for solutions relevant to the pupil, group of students, or society (e.g., prototyping, model development, the creation of performances, etc.). To encourage students to reflect on the importance of the inquiry carried out for society, ensuring its harmonious and sustainable development.

Reflection on learning outcomes and self-assessment is a significant stage of IBL, during which students actualize and make sense of newly acquired knowledge and abilities. The unique learning experiences of students were reflected in the variety of forms of their presentation, e.g., scientific article, scientific report, booth report, artistic form (video presentation (H5P, etc.), *podcast*, infographic, collage, story telling, etc.). Teachers and students documented the implementation process of IBL projects, prepared reports, and presentations to present the achieved results. All implemented IBL projects have been presented by teachers and students during the online final conferences, involving Lithuanian and Latvian teachers, students, researchers, and the wider public.

The networking of teachers and researchers was focused on the renewal of educational practice at schools implementing IBL. The efficiency of networking could be evaluated by screening the outputs and results of the Project in comparison with the initial plan (see Table 4).

Table 4. Planned and achieved results of the Project

Results planned during January-June, 2022	**Results achieved during January-July, 2022**
✓13 on-line Network events for 16 participants; ✓ 16 teams (teacher + researher); ✓ 16 pilots projects; ✓ 50 students; ✓ 3 articles in social media; ✓ procedures for networking (1 electronic document).	✓ 18 on-line Network events for 26 participants and 2 on-line international Network events presenting projects‘ results; ✓ 16 teams (19 teachers and 7 researchers involved into the networking); ✓ 18 implemented and shared on the Erasmus+ Project Results Platform IBL projects; ✓3 Inguiry learning spaces for IBLs disseminated in GoLab platform; ✓ 175 students participated; ✓ 1 article on the coordinator’s website; 3 articles on the partners’ websites, and 1 article on the national Lithuanian periodical e-journal „Švietimo naujienos“; 3 videos; ✓ procedures for networking (1 electronic document).

The benefits and findings from the networking process could be illustrated by the reflections and feedback of teachers, students, and researchers relating it to the initial *purposes of the network* defined at the first stage.

Purpose 1: To bring together schools and researchers interested in IBL and contemporary educational strategies to explore ways of innovation and educational process effectiveness.

Teachers recognized that IBL projects were innovative, effectively implemented, useful and meaningful for the students and schools. Teachers, reflecting on the experience of their students’ claim

that IBL develops students' academic knowledge and abilities, as well as key competencies, provides deeper subject knowledge, and develops skills of working with devices and tools:

"In addition to subject knowledge, in project activities, students learn to plan their own activities and those of the group, to divide responsibilities, to choose methods of activity, tools, and materials, to cooperate, and to apply the available knowledge and skills in practice" (VVDG[1]).

"... each inquiry project is useful for students and teachers, as it diversifies the learning process, promotes communication and cooperation, and develops research skills." (VVDG).

Teachers admit that IBL projects increase students' learning motivation and engagement:

"There were technical glitches with the project because the measuring device was faulty, but the students quickly found a solution. Some tried to fix the device, while others found the apps, installed them on the phone, and continued the measurements." (VVDG)

"But most importantly, students have experienced success in their learning, which greatly motivates them!" (VVDG)

"It helps to establish a closer connection and stimulates students' creativity ... students have become bolder and more confident in me, they feel safer, and I think it will also resonate in the subject's learning outcomes." (VPSG[2])

Students learn best through practice ... students are the best teachers, especially if they like what they are doing (if they are interested in it". (ANV[3])

"I was surprised by the fact that less massive inquiry work was more beneficial for students with lower learning skills. They valued their benefits even more." (ANV)

Teachers argue that IBL reveals or expands the contexts of the application and significance of knowledge in different fields of science in everyday life:

"Teaching is more often associated with the daily lives of students" (VVDG).

"One of the most pressing problems selected by students, is global and related to responsible consumption and production. Some are concerned about social issues, while others are focused on preserving the planet's resources and promoting sustainability." (VPSG)

IBL provides opportunities for interdisciplinary integration during formal and non-formal education.

"Non-formal education is good because it is integrated, it is less regulated, and it has a specific result (a product created by students) ..." (VVDG).

"It's great that there's a non-formal education program where it was possible to do a study without haste; there was no need to look at the formal plan; it was possible to work flexibly." (VPSG)

IBL helps to 'discover' new forms and methods of teaching:

"It was extremely useful to test new methods that have not been applied, such as discussion, and working in small groups." (VPSG)

"Asking students what they should do to maximize their benefits... to make the student's learning process more visible." (ANV)

Purpose 2: To develop, in cooperation between schools and researchers, a variety of IBL ideas and ways of achieving them.

Researcher Gražina argues that:

---

[1] *VVDG – Vilniaus Vytauto Didžiojo Gimnazija*

[2] *VPSG - Vilkaviškio r. Pilviškių „Santakos" gimnazija*

[3] *ANV - Aizkraukle novada vidusskola*

"Inquiry-based learning of students by independently discovering new facts, knowledge and consolidating learning abilities is inseparable from the student's cognitive competence and the goals of developing critical and creative thinking in a modern school. But the reality of teaching and learning in schools is another one.
Some schools (teachers) are successful in the development of students' cognitive competencies, while it is quite fragmented in other schools. It was the experience already gained by the teachers, its reflection, and the creation of new experiences that were the main impetus for participating in this project. No less important was that most of the teachers represented the field of science (physics, biology, chemistry), and they were interested in the possibilities of interdisciplinary integration in IBL and STEAM methods. The presentations of the IBL project's carried out by teachers and students testified that the principles of integration of STEAM subjects and the stages of the 5E model were applied in the planning and implementation of projects."

Researcher Rūta confirms that teachers were able to choose the methods of inquiry implementation, employing a variety of research methods, and were free in their roles while implementing inquiry in class and in the roles they assigned to students.

"We offered schools 5E and art-based research methods. They were applied by the teachers, but the expediency and effectiveness could have been better."

Researcher Gražina discovered the different levels of teachers' readiness to ensure students' autonomy in the inquiry and provide support for students' self-directed learning:

After the implementation of the IBL projects, it became clear that more time is needed for planning and discussing with school teams about IBL, its organization, and consistent transition from structured research (when the teacher helps to formulate the research question(s), and a detailed plan) to guided research (when the teacher presents only the problem to be solved, and the question(s) of open inquiry when the teacher presents only the problem, the idea, and the team of students and the teacher travel towards a research result.

Students, reflecting on their experience implementing IBL projects, also enjoyed the variety of learning spaces and possibilities for personalization and deeper learning. They claim that participation in the IBL projects diversifies learning environments, provides opportunities to choose and delve into topics of personal interest, and helps discover new meanings of everyday phenomena, as well as guidelines for future research and study.

"We chose this project because it's unusual. It was prompted by the desire to try something new and non-routine." (VVDG)
"Therefore, after the construction of the device, firstly, the students looked for solutions to improve the results of the experiment, and after doing this, we turned to specialists, who confirmed that without special laboratories we could not continue the experiment. However, the students did not despair, because the engineer rated the device they constructed very well and confirmed that their engineering solution is atypical and worthy of development after entering the university." (VVDG)
"We spend a lot of time at school, so it is very important that the environment in which we are located does not harm our health. During breaks at school, it is quite noisy, so it is interesting to learn how to measure it. Is it possible to reduce the noise level in the gymnasium, and how do you do it?" (VVDG)
"

"The most important thing I have learned is not to underestimate the impact of partners. These guys really surprised me with the quality of their work" (ANV)

Purpose 3: To enable schools and researchers to exchange information and experience relevant to the implementation of IBL projects.

The feedback of the Project's partners shows that the distribution of tasks, as well as efficient cooperation and communication, were ensured during the Project's implementation. The communication with partners was organized using the Zoom and Teams platforms. Supporting materials and project documents were shared on the Google disk and made available for the project's participants according to their tasks and responsibilities (see Annex I). The project's management and progress monitoring were carried out in two directions:

1. Activities' implementation. The plan of activities was shared with all the partners to help them communicate, synchronize, and monitor the ongoing activities according to the project plan.
2. Ongoing strategic monitoring of the Project. Each week, the project manager, two leading researchers from LERA, and partner representatives from the SLA had meetings to discuss last week's activities and next week's plans. During these regular meetings a realistic project implementation plan was prepared and additional activities were planned and implemented.

*Purpose 4***:** To create an information base for the implementation of IBL projects and ensure their dissemination opportunities.

The learning community of teachers, school principals, and researchers that developed the methodology of IBL practice and networking procedures was created during the Project with the aim of sharing new practices and lessons learned from IBL implementation. Teachers and students presented their IBL projects during the final conferences for the Project participants and the wider public. The information base to presenting IBL projects consists of: supporting materials; project documents for the schools shared on the Google disk (accessible for Project's participants); 3 IBL projects shared on Go-Lab platform; 18 IBL projects shared on the Erasmus+ Project Results Platform (accessible for the broder community and all stakeholders).

In summarizing their networking experience during the Project, the researchers raised issues related to the implementation of IBL in schools, as well as suggestions for making collaboration between schools and researchers more meaningful and efficient:

> *"My goal was to improve educational practice by using the array of knowledge available to researchers and the experience of teachers and schools in implementing educational innovations. When working with teachers and schools, I notice that enthusiastic, change-making teachers often "pick up" good ideas and put a lot of time and heart into implementing them, but those activities lack depth, completeness, and conceptuality. Researchers, in turn, have conceptual knowledge and a holistic understanding of innovation, but they lack knowledge at a practical level. Collaborations between researchers and schools or teachers could be an effective way to change educational practices in a meaningful and effective way, as well as to generate new knowledge about teaching and learning."*

> *"The success is evidenced by the variety and quality of projects implemented by schools and teachers, the opportunity for all project participants to get acquainted with the work done, and to generate ideas for future projects. The area to be improved is the interaction between schools and researchers, the optimization of the purpose of meetings. In our case, the school was not particularly inclined to cooperate; it was more focused on the independent implementation of projects. Therefore, the contribution of the researchers is appreciated as follows: 'We were able to help or contribute more'."*

> *"Selection of schools and considering their experience and expectations. We saw that the schools that participated in the project are very different in terms of their IBL experience, the expectations with which they come to the project, and their willingness to cooperate and*

share. This should be considered when planning cooperation between researchers and schools in the future. It is also important to provide more time for reflections on the quality of the implementation of the project itself, i.e., what could be done better, more meaningfully, in a more diverse way. Most schools are not new to the implementation of IBL. It is very important to look for the criteria of quality and meaningfulness, as well as opportunities for greater involvement of teachers and students. And, of course, the variety of ways of dissemination and publicity. What has accumulated is very interesting. It is necessary to publicize it, disseminate it, and to organize a network of schools implementing this type of innovation."

"We should devote more time to discussions about teaching and learning, the search for inquiry questions and the interest or involvement of students in the inquiry, the value of the research error and the reflection of the research results, the understanding of the problems of the broader research conducted, and the inter- and trans-integration of the subjects studied. And only afterwards to plan and organize the teaching and learning activities of the school year."

The main researchers' insights are integrated into the *Recommendations for Networking Between Researchers and Teachers* below.

2. Evaluation Tool for Inquiry-based Learning Projects

The concept of inquiry-based learning is associated with problem-based learning, project-based learning, the concept of STEAM education, etc. A distinctive feature of inquiry-based learning is the proactive learning, reflection, and presentation of students' activities. The fundamental difference between these learning organization strategies is scientific reasoning (depth of interpretation of facts): formulating problematic question(s), and hypotheses, analyzing and interpreting the obtained results, and discussing the results of the presented research. In inquiry-based learning, student learning is not limited to finding and presenting facts related to the problem under study (Pedaste et al., 2015; Alameddine and Ahwal, 2016). The following aspects are extremely important in this learning: research questions raised by students; formulation of hypotheses (assumptions); research activity planning; experimentation; data collection and recording; analysis and interpretation; and reasoning (Ismail, 2006; Bayram-Jacobs, Wieske, Henze, 2019; Sjoberg, 2019).

IBL projects that were evaluated were grounded in research-specific criteria. In the scientific literature, the following criteria are set for the evaluation of scientific research: *the relevance of the study, the problem, previous investigation of the topic, object, aim, tasks, hypothesis; research methodology; analysis and interpretation of empirical research results; conclusions and/or recommendations; research presentation* (Leavitt, 2000; Bitinas, 2006; Rupšienė, 2007; Kardelis, 2017; Bonaccorsi, 2018).

The following were the assessment criteria on which the IBL projects were based, and projects were organized in accordance with them:

- IBL projects were carried out by students, who were the target age group;
- IBL projects were aiming to develop students' research and cognitive competencies by increasing and expanding their research experience;
- Students were encouraged to look at the research process from the perspectives of various fields of science, including the science of education;
- Teachers were using complementary inquiry methods that encouraged students to become self-directed and creative explorers in a variety of learning environments.

Taking into account the above-mentioned provisions and the contexts of the IBL projects' implementation, the criteria for the IBL project's evaluation were defined (see Table 5).

Table 5. The criteria for IBL project's evaluation

No.	IBL project's evaluation criteria	Characteristics of the evaluation criteria
1.	Relevance of the research problem and topic addressing the big unifying ideas	A relevant, global topic or problem is chosen, which is attractive to students; it is clearly formulated; the relevance of the topic is highlighted.
2.	Students' self-directed inquiry-based learning	Students take responsibility and ownership while making decisions related to their inquiry-based learning process and its results.
3.	Transdisciplinarity of the IBL project	The project integrates different educational subjects and/or teaching areas while creating new holistic knowledge through inquiry and developing various students' transversal competencies and skills.
4.	Defined aim of IBL project	The aim of the project is formulated clearly. Clearity and transparancy
5.	Consistency of the IBL project's design structure	The IBLP design is created according to the general phases of inquiry-based learning: Orientation – Conceptualization – Investigation – Conclusion – Discussion. The specific implementation period of the planned IBL project and its activities, educational methods, measures, and planned (to be achieved) IBL project results are foreseen.
6.	Suitability of the method(s) used to carry out the implementing IBL project	To achieve the goal of the IBL project, various method(s) enabling and engaging students' learning through inquiry are chosen (for example, group study (collaborative learning method), 5E model, arts-based method, etc.).

7.	Consistency of the IBL project implementation	When the IBL project is implemented systematically, stages of implementation specific to scientific research are applied.
8.	Publicity and accesibility of the IBL project‘s outputs	Reports of the IBL projects are disseminated. The implementation of the project is socially open, and the results are easily accessible to the school or the wider community and could be (re)used in other contexts.
9.	Attitude toward the IBL project's sustainability and continuity	The focus on sustainable results and continuity in IBL is evident.
10.	IBL project is open to different groups of students	The variety of students or groups involved in the implementation of the IBL project: • students of various ages or grades (e.g., 7, 8, 9; I-III gymnasium classes, and so on); • different group of students in each IBL project or the same group of students in several IBL project, ect; • IBL project implementation engages gifted students, as well as children with special needs, socially disadvantaged students, national minority students; students of various age groups, and others.

Taking into account the IBL project‘s evaluation criteria presented in the table, below is the summary of the evaluation of the IBL projects implemented during the Erasmus+ small-scale partnership project *Teachers & Researchers Networking for Inquiry-based Learning*. The IBL project information—questions for the detailed description and planning of the projects—is provided in Annex III.

Evaluation of the implemented IBL project

Criteria 1: Relevance of the research problem and topic addressing sustainable development and the green course. 18 inquiry-based learning projects have been implemented, with multifaceted research problems and topics. The selected topics in the context of the globalization of today's society naturally respond to the big unifying ideas (see Annex IV). Teachers in the three of four schools chose different topics of IBL projects, and in one school (*Šalčininkai Eišiškių Stanislovo Rapolionio gimnazija*), a single project theme integrating four sub-themes was chosen.

Criteria 2: Students‘ self-directed inquiry-based learning. Schools select one of three support models based on the age of the students, their learning experience, and the type of research they conduct: *structured research* (when the teacher helps to formulate the research question(s), a detailed plan); *guided research* (when the teacher presents the problem, question(s) to be solved); *open inqiry* (when the teacher presents only the problem, idea). In all cases, IBL projects was based on:

- Students' initiative and the possibility to choose. The students were active in choosing and formulating the research topic, posing a problematic question, searching for information, deciding which tools and methods of inguiry to choose, and deciding where and how to present the results of the project.
- Students' responsibility for the project's implementation process and its results. During the implementation of the project, students were encouraged to organize their own learning process, to solve various problems that arise during it, to understand what kind of help they need, to reflect on their learning experience, and to evaluate the results obtained and the process itself.

Criteria 3: Transdisciplinarity of the IBL project. Almost all IBL projects implemented by schools integrate different subjects into the inquiry process (see Annex IV):

- IBL projects encompass different educational subjects’ knowledge: biology, chemistry, physics, mathematics, information technology, history, Lithuanian, English, physical education, etc. The implemented projects provide opportunities not only to integrate the content of various educational subjects but also to highlight the possibilities of applying acquired knowledge in life. It also provides prerequisites for solving the scientific problem (e.g., determination of starch, fat, and protein in seeds, tests in a natural science laboratory),

as well as daily life (healthy nutrition) or global (e.g., hunger) problems. The integration of subjects during formal education and related topics in non-formal education covered STEM-STEAM-STREAM education.

- Most IBL projects are implemented in non-formal education.
- However, it should be noted that almost all IBL projects in *Aizkraukles nuovada vidusskola*, as well as one in *Vilkaviškio r. Pilviškių "Santakos" gimnazija*, were implemented exclusively during formal education. This reveals opportunities for the flexible implementation of IBL projects in the formal educational process as well.
- Students develop various competencies (knowledge, abilities, attitudes) through IBL projects. It also expands students' experiences in other areas, such as the natural and social sciences, cultural awareness, creativity, and personality growth.

Criteria 4: Defined aim of the IBL project. The plans of IBL projects highlight multifaceted goals; students are using concepts characteristic of scientific research: *identify, measure, increase, extract*, etc. IBL projects state hypotheses that are then empirically tested. This encourages students to look at research from a scientific perspective and develop research skills.

Criteria 5: Consistency of the IBL project's design structure (according to the general IBL phases). During the implementation of the project, IBL projects' plans were created by teachers using the *ABC Learning Design* method (Young, Perović, 2020; https://abc-ld.org/) and its tool adapted for the IBL projects' design. Researchers learned to master the mentioned method and developed the template for the performance of the IBL projects plans. Geneviève Marchal and Nathanaël Laurent from the University College of Namur-Liège-Luxembourg in Belgium provided their expertise and knowledge to the educational researchers. And teachers applied the adopted version of the planning template for the IBL projects' development, management, and implementation. According to Teresa Beržanska (*Eišiškių Stanislovo Rapolionio gimnazija*), a teacher participating in the study, this methodology 'helped to plan the IBL project's activities, implementation time, predict cooperation forms, tools, and results'. As stated Sigutė Macijauskaitė (information technology teacher, *Vilniaus Vytauto Dydžiojo gimnazija*), 'it helped to develop intellectual processes, as it provided an opportunity to plan each IBL stage in detail, which made it possible to predict possible errors and the duration of the IBL project'. Daiva Kukienė (physics teacher, *Vilkaviškio r. Pilviškių "Santakos" gimnazija*) states that 'this method made it easier to set activity priorities; it became easier to set goals, predict what knowledge and tools the learners will need, and enable them to choose activities and feedback that match the goals. There were ideas on how to improve practical activities for achieving the goals. Planning discussion, collaboration, and application of new knowledge acquisition methods'.

Planning with the ABC LD tool encouraged teachers to take a closer look at the inquiry learning process, using different activities (knowledge acquisition, discussion, collaboration, exploration, practical activity, presentation), alternating and selecting them depending on the stage of inquiry. The method helped teachers plan different research stages, set significant goals for these stages, determine activities and resources, etc.

Criteria 6: Suitability of the method(s) used to carry out the IBL project. Various methods of investigative activity can be used at different stages of the activity. Inquiry-based learning is much less about memorizing facts and knowledge and more about students' active participation in understanding, discovery, and inquiry during the learning process. In the implementation of IBL projects, teachers were suggested to use one or more of the listed methods (see Annex IV). *Aizkraukles nuovada vidusskola* and *Vilniaus Vytauto Dydžiojo gimnazija* chose inquiry-based learning activities. STEAM was chosen by *Eišiškių Stanislovo Rapolionio gimnazija* and used the 5E approach, including an arts-based approach and group inquiry (a collaborative learning approach). *Vilkaviškio r. Pilviškių "Santakos" gimnazija* chose 5E and a value-based problem solving model for the implementation of IBL projects. In inquiry-based learning plans, five stages (phases) are distinguished, the consistent implementation of which promotes the development of students' learning, critical thinking, and cognitive and research competencies. *Orientation, conceptualization, research, conclusion, and discussion* are the stages (Pedaste ir kt., 2015). All five stages emphasize proactive learning activities and reflection of students or their groups.

Criteria 7: Consistency of the IBL project implementation. The projects were implemented sequentially, based on the main stages of scientific research:

- The research problem is highlighted, the goal is set, and the hypothesis is formulated; the scientific subject and other sources of literature are analyzed, and the information is systematized and summarized.
- Research planning has been completed: preparation of instructions for research work and provision of resources;
- collecting data, their analysis, comparison with hypotheses, and formulation of conclusions;
- photographing the process of research activity and collecting material for, e.g., a photo book in the case of IBL projects applying the art-based inquiry method.
- presenting conclusions and/or recommendations: the practical value and applicability of research results, and the solution of global problems are discussed. Recommendations are provided in some IBL projects (for example, by *Eišiškių Stanislovo Rapolionio gimnazija*). Some IBL projects highlight recommendations for the public, specific stakeholders, etc.

Criteria 8: Publicity and accessibility of the IBL project‘s outputs. Schools prepared research presentations and presented them during the final conference of this Project including reflections on students' research experiences. Some of the IBL projects were prepared and presented by student groups.

The results of the IBL projects were published in articles on LERA‘s and schools' websites and were presented to schools' communities, or at local conferences (for example, at *Eišiškių Stanislovo Rapolionio gimnazija*). The projects were characterized by social openness; they were disseminated, and the IBL projects results are easily accessible to schools and/or wider communities. To disseminate the results of the project, some IBL projects’ were selected by teachers with the aim of publishing them on the international Go-Lab platform for sharing teachers' good practices while creating and sharing ILS.

Criteria 9: Attitude toward the IBL project's sustainability and continuity. The implemented IBL projects were focused on sustainable and enduring results.

The IBL projects were *environmentally friendly*: initiatives reflected in the topics of the IBL projects could lead to the promotion of the more environmentally friendly solutions and lifestyles helping to preserve the environment and its natural resources, i.e., Green Practices such as efficient water use.

IBL project is a practice that changes the organization of learning and uses *ICT-based solutions* in its five stages:

1. During the *orientation phase*, which lasted up to 2 weeks, teachers used Google search, various applications for preparing presentations, research databases, videos on YouTube, and Pinterest networks; students shared knowledge and material through *Teams* or *Moodle* platforms. Teachers organized interactive discussions, polls at the interactive whiteboard, and students’ trips, for example, to the STEAM center.
2. *Conceptualization and raising questions and hypotheses* lasted about a week, during which teachers and students discussed IBL project goals and ideas and research objects. Students discussed how to achieve the result, shared roles and responsibilities, and used various forms of surveys. They planned research activities in detail and prepared to carry them out; for example, they collected experimental equipment and produced the tools needed for the chosen research method with Fritzing-CAD software and a 3D printer.
3. *During the research implementation and data collection stage*, students conducted interviews, conducted surveys, e.g., with *Mentimeter*, and collected data, e.g., with the *ThingSpeak* IoT data collection and analytics virtual platform, performed content analysis, recorded data with special laboratory devices, and filmed and photographed observed phenomena.
4. *Recording of results and data analysis*. It lasted in schools from 2 weeks to 1.5 months ago. For example, *Vilkaviškio r. Pilviškių “Santakos“ gimnazija*. The STEM team of the teacher and students conducted an experiment on the use of *Microbits* for sustainable watering of plants and created a watering device. During this stage, students worked with spreadsheets, drew diagrams, prepared visualizations, and formulated the conclusions of the research results.

5. *Presentation of results, dissemination, discussion in the community, students' reflection*. This phase revealed the diversity of the ways in which IBL projects' results were presented, and the digital documents and products created. Students prepared posters, presentations with *PowerPoint*, recorded videos in *Zoom*, *Canva* programs and presented implemented IBL projects' at various conferences and at the final project event, published information on social networks. For example, *Eišiškių Stanislovo Rapolionio gimnazija* students prepared two digital books with *StoryJumper*: in one, they presented a collection of poems created on the theme of the project, and in a photo book, they shared the moments of the IBL projects' implementation.

Criteria 10: Inclusion of participants (students) in the IBL project. IBL projects were implemented in formal and non-formal education in different contexts—primary school and different gymnasium classes—by students of different grades, from primary grades (in the case of *Aizkraukles nuovada vidusskola*) to the III grade of gymnasium. During non-formal education, IBL projects were mostly implemented by students of different classes; during formal education, in the same group of students worked on several IBL projects. The implementation of IBL projects involved talented students, national minority students, and students of various age groups.

Implementation of IBL projects is not only a way of fostering an inquiry-based learning process and 'learning differently', but also a way of realizing students' creativity, citizenship, the community spirit of the whole school, and social well-being. Implementing IBL projects has great educational value: it expands and deepens students' research competences, helps to develop general and subject competences, promotes personality growth, creates prerequisites for students to create educational content themselves, and encourages students to look at research problems not declaratively but through their own experience diffusion.

Recommendations for Networking Between Researchers and Teachers: How to Create a Network and Act Effectively

The experience and results of the Project "Teachers & Researchers Networking for Inquiry-Based Learning" allow us to formulate recommendations for teachers, schools, and researchers. When creating, maintaining, and strengthening networking among those who are interested in inquiry-based learning, we recommend:

For teachers

To plan and implement IBL projects as an integral part of the subject curriculum, taking advantage of learning in the classroom and after school time (extracurricular);

- In the school, to promote the cooperation of teachers from different subjects to expand the interdisciplinarity of IBL projects and foster cooperation between students and teachers.
- To encourage a variety of theoretical approaches and research methods so that each IBL project includes a component of novelty, innovation for the teacher and/or students, and an attribute of openness to experience and creativity. To that end, collaborating not only with colleagues from the school, but also with researchers, scientists, artists, and experts or specialists in relevant fields.
- To share the results of the IBL projects and discuss findings and challenges with colleagues at school, in the city, and in the country. To contribute to the constructive cooperation of educators, researchers, and interested institutions in IBL and the creation of a learning community interested in this field.

For school leaders

- To include the IBL projects in the list of priority activities of the school, to create conditions for them to play a significant role in the learning process at school.
- To support the initiatives of teachers in generating ideas on the organization, implementation, and promotion of IBL. If necessary, to provide administrative and financial support to the persons or groups responsible for the project activities.
- To forster teachers' cooperation at the school and city / country levels, to attract external partners for the implementation of IBL projects.
- To look for opportunities to collaborate with researchers and to initiate cooperation between the school and universities by strengthening IBL and project-based learning in educational practice.

For researchers:

- To accumulate and analyze scientific and methodological literature, international and national experiences that justify the theoretical background of IBL and project learning. On their basis, conceptualize the concept of IBL and project learning (via publications, public lectures, conference presentations, and seminars);
- To be active participants in strengthening IBL and project-based learning processes in educational practice. To this end, to initiate various projects, to get involved in project activities carried out in schools, to carry out research on this topic, and to prepare relevant publications.
- To include courses or individual topics in the study programs of prospective teachers, to create conditions for students to participate in project activities during the internship, to form their positive attitude to be proactive organizers and/or participants of IBL and project learning.

RESOURCES:

1. Bitinas B. (2006). Edukologinis tyrimas: sistema ir procesas. Vilnius: Kronta.
2. Bonaccorsi A. (2018). The Evaluation of Research in Social Sciences and Humanities. Publisher: Springer International Publishing
3. Kardelis K. (2017). *Mokslinių tyrimų metodologija ir metodai.* Mokslo ir enciklopedijų leidybos centras.
4. Leavitt F. (2000). Evaluating Scientific Research: Separating Fact from Fiction. Publisher: Prentice Hall.
5. Rupšienė L. (2007). Kokybinių tyrimų duomenų rinkimo metodologija. Klaipėda: Klaipėdos universiteto leidykla.
6. Tidikis R. (2003). Socialinių mokslų tyrimų metodologija. Vilnius: Lietuvos teisės universiteto leidybos centras
7. Alameddine, M. M., Ahwal, H. W. (2016). Inquiry-Based Learning in the Literature Classroom. International Conference on Teaching and Learning English as an Additional Language. Social and Behavioral Science 232 (2016), 332-337.
8. Pedaste, M., Mäeots, M., Siiman, L. A., de Jong, T., van Riesen, S. A. N., Kamp, E. T., Manoli, C. C., Zacharia, Z. C., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. Educational Research Review, 14, 47–61.
9. Ismail, N. (2006). Inquiry-based learning; A New Approach to Classroom Learning. English Language Journal, 2 (1), 13- 24.
10. Bayram-Jacobs, D., Wieske, G., & Henze, I. (2019). A Chemistry Lesson for Citizenship: Students' Use of Different Perspectives in Decision-Making about the Use and Sale of Laughing Gas. Education Sciences, 9(2), 100.
11. Carson, D., Gilmor, A., Rocks, S. (2004). SME marketing networking: a strategic approach. InterScience, Vol. 13, p. 369–382.
12. Sjøberg, Svein. (2019). Critical Perspectives on Inquiry-Based Science Education (IBSE) in Europe. https://www.researchgate.net/publication/331529566_Critical_Perspectives_on_Inquiry-Based_Science_Education_IBSE_in_Europe.
13. Stoll, L., Bolam, R., McMahon, A., Thomas, A., Wallace, M., Greenwood, A., Hawkey, K. (2006). Professional Learning Communities: source materials for school leaders and other leaders of professional develepment. National College for School Leadership, UK.
14. Stoll, L., Halbert, J.., Kaser, L. (2010). In: Day, C. (ed.) International Handbook on Teacher and School Development. London: Routledge.

ANNEXES

ANNEX I

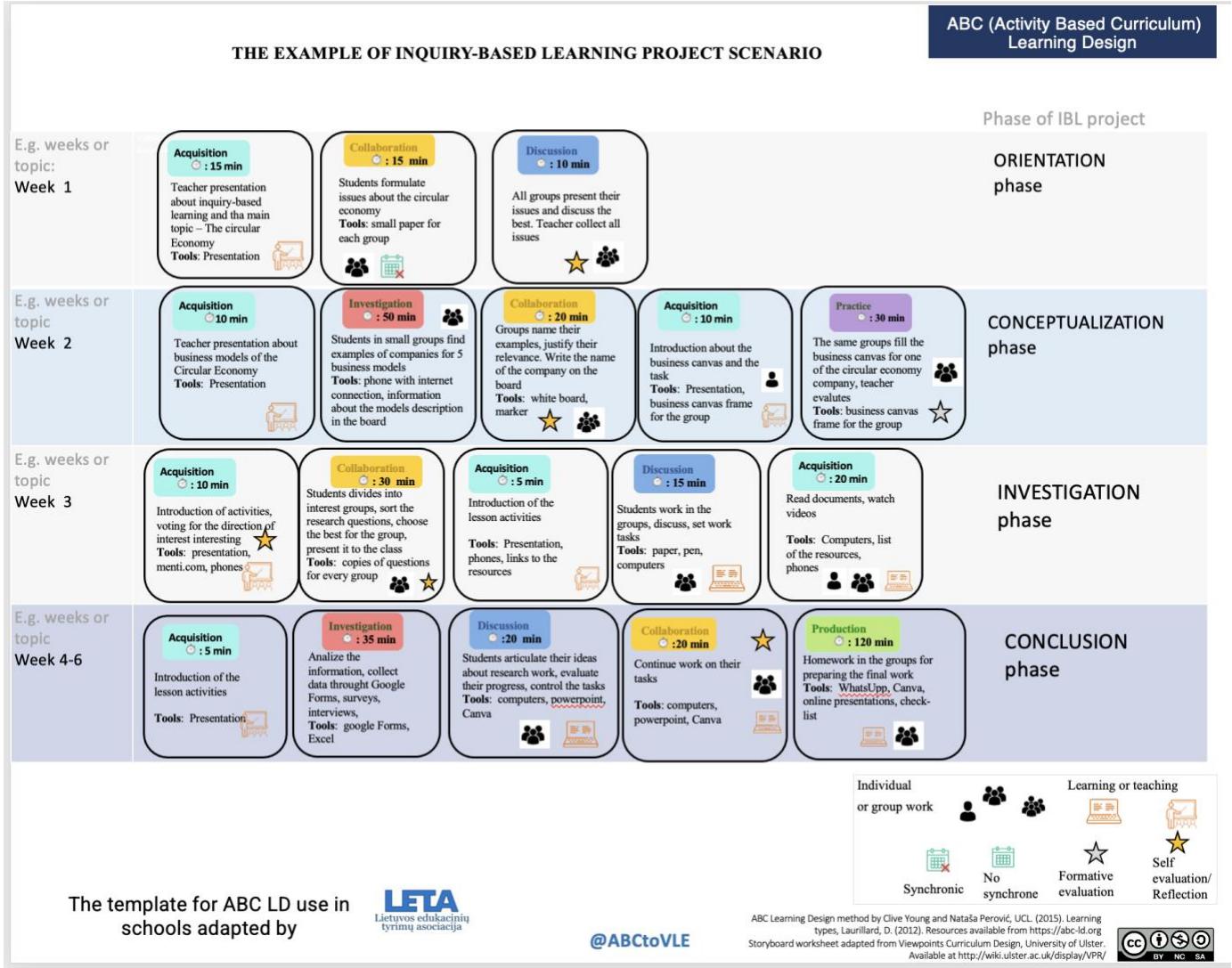
The plan for the Project (the period 2022, January–June). The Developing Stage

Activity, No.	The main functions and responsibilities of the researchers	The main functions, and responsibilities of the schools	Date
A1	**Research networking**		
A1.1.1.	Meetings between researchers discussing social inquiry design models, methods, and designs suitable for applying IBL projects in schools. To prepare questionnaires for teachers.	To select 3–4 school STEAM teachers who will implement IBL with students at the school. To appoint a contact person for the project. To select the topics for IBL.	January, 2022
A1.1.2.	To prepare a questionnaire for teachers. To prepare and present to the schools, we discussed social inquiry design models, methods, and designs suitable for IBL projects in schools and tools for their implementation. Train teachers on how to create the IBL projects' plans by applying the *ABC Learning Design* methodology.	To choose the topics of the IBL project, the period of implementation, whether formal or non-formal education will be carried out, what classes of students will participate in the project, what subjects or areas of education will be integrated, what will be the products and results of implemented IBL projects, etc. To attend webinars and workshops and provide feedback on suggestions for learning through IBL projects.	February, 2022
A1.1.3.	To develop plans and scenarios for the implementation of IBL projects in the schools (webinars in small teams of researcher and specific school's teachers).		March, 2022
A1.1.4.	To present detailed scenarios of IBL projects' implementation (webinars).		April, 2022
	To analyze the process of creating an IBL projects and its implementation plans.		Febryary-May 2022
A1.1.5.	To participate and present an assessment concerning IBL projects' implementation in schools.	To present report of IBL projects' implementation in schools.	May-June 2022
A.1.2.	**Development of procedures for networking implementation**		
	To participate in the networking process among teachers and researchers.		January-June 2022
	To prepare a procedures for networking.		July, 2022
A2	**Management (quality assurance and dissemination)**		
	To manage the projects activities. To communicate with all partners. To organize webinars, training, ect. To analyze the process of creating IBL projects and their implementation plans. To prepare reports. To disseminate the project and the results obtained. To create publications (2). To create videos (2)	To disseminate the project and the results obtained.	March-June 2022
A3	**Methodology piloting**		
	To develop networking procedures: to monitor the process of collaboration between teachers and researchers in the development and implementation of IBL projects.	To implement IBL projects, prepare reports, and disseminate the results.	January–June 2022
Communication	Webinars, workshops, and training–Zoom or Teams platforms; various issues—email; phone calls; if necessary, meetings through Zoom or Teams platforms.		January–June, 2022
Dissemination	Websites or Facebook accounts of each partner; the main resourse, LERA's website; for on-line IBL projects, Go-Lab; videos & articles about the Project.		

ANNEX II

Applying the ABC Learning Design Tool

The Fragment of Planning IBL Projects in Schools



ANNEX III

Questions for teachers preparing inquiry-based learning project's description

1. Name and surname (for teachers); school
2. The subject(s) taught at school
3. The formulated theme of IBL project (inquiry-based learning project)
4. What BIG IDEA is related to the IBL project theme(s)?
5. The features of the IBL project (select one of (a) or (b) and describe it in more detail)
    a. One integrated IBL project
    b. Several unrelated IBL projects
6. If the school has chosen *(a) One integrated IBL project*, consider:
   What related IBL project themes (sub-themes) are foreseen?
   What subjects or areas of education are integrated?
   What themes (sub-themes) will you work on?
7. If the school has chosen *(b) several unrelated IBL projects*, consider:
   What are the titles of your projects?
   What subjects or areas of education will be integrated?
8. Do you plan non-formal education activities during the implementation of the IBL project?
9. Profile of the IBL project participants–students group(s):
   What is the number of students in the group?
   Will there be one or more groups for different projects?
   What is the age of the student group(s)?
   What classes of students do you plan to include in the project (e.g., 7, 8, 9, I, II, III gymnasiums)?
10. Will your IBL project involve a group of students with different opportunities? (Gifted students; students with special educational needs; socially vulnerable students; children learning non-native languages; students of all ages; another group). Comment on the formation of your student group (based on what, how, why, etc.)
11. The aim; the inquiry method involved (planned steps or stages); time; activities for students; methods; means; evaluation methods, and so on are all part of the planning and design process for IBL projects.
12. What are the planned products and results of your implemented IBL project? (If you are familiar with them at this point).

ANNEX IV

Summary of implemented Inquiry-based Learning Projects

School (country) researchers-mentors	Teacher	Subject (integrated)	Inquiry-based learning (IBL) projects		Implementation				
			The Title	The aim	Duration, weeks	Research (inquiry) method	Education formal / informal	Grade or class	students No.
Aizkraukles nuovada vidusskola (Latvia) Researcher **Dita Nīmante**	**Lauma Riekstina**	Primary scchool	1. Why sort waste?	Students will find out why is important to sort waist.	6	Inquiry-based learning	formal	1	**18**
	Kristine Balta	Financial skills	2. Reverse vending machine (deposit return system) and usage of it in our neiborhood	Make infonographic or presentation based on personal research of Reverse vending machine in Aizkraukle city	8		informal - bussiness class	4	**11**
		Math		Do reseach of Reverse vending machine in Aizkraukle city usage, benefits	8		formal	5	**22**
	Zane Sirmace - Liedskalnina	History and social sciences	3. The Circle Economy: food and waste, 3 IBL	1. What would happen if we had grown vegetables from tomorrow 2. How can grocery stores and households reduce their waste	6		formal	11A,B	**15**
			4. The Circle Economy: textil and waste 2 IBL	2. Textil materials reuse and recycle.	6		formal	11A,B	**10**
			5. The Circle Economy: waste as resources 2 BL	3. Sorting and recycle plastics in Aizkraukle	6		formal	11A,B	**9**
			6. The Circle Economy bussiness models 2 IBL	4. Involment the companies in the Circular Economy in Aizkraukle	6		formal	11A,B	**6**
Šalčininkų Eišiškių Stanislovo Rapolionio gimnazija (Lithuania) Researchers **Neringa Strazdienė, Sandrita Škerienė**	**Gražina Šibekienė, Teresa Beržanska, Žana Bogdevičienė, Birutė Lukaševičienė Vida Kajokaitė**	Biology, chemistry, Lithuanian, English, mathematics, information technology	1. Organic chemical composition of cultivated plant seeds. *Learning through inquiry in a virtual environment - GoLab*	To identify the quality of the selected cultural plants seeds' parameters (pumpkin, watermelon, cucumber, wheat, buckwheat, sunflower, rapeseed, flax, pea, bean, lupine): starch content, oil content, protein content.	4	5E & art-based	Formal and informal education ('Young Explorers' and 'Tyronauts').	8; I-II gymnasium	**13**
			2. Significance of organic matter accumulated in seeds.	To determine whether the seeds use the accumulated organic matter to obtain energy for germination.	4				
			3. Amount of organic matter accumulated in seeds and growth of seedlings.	To determine the dependence of seedling growth on the amount of organic matter accumulated in the seeds.	2				
			4. Healthy nutrition and solving hunger problems	To determine the core conditions for seed germination, set up an educational STEAM outdoor classroom, to grow a nursery of starchy, oily and proteinaceous plants, and maintain it	4				
Vilkaviškio Pilviškių „Santakos“ gimnazija (Lithuania) Researchers **Natalija Ignatova Eglė Pranckūnienė**	**Vida Marcelionytė**	Biology/ chemistry, physics	1. Using bile and enzymes to remove stains	Removing stains of various origins from fabrics using a cleaning agent with bile and enzymes	8	Value-based problem-solving	formal	III gymnasium	**11**
	Donatas Zdanavičius	Mathematics, information technology, engineering, biology	2. Sustainable watering of plants	Increase the efficiency of water use in the gymnasium (Global Goals 6.4)	12	5E	informal	I-II gymnasium	**5**
			2.1 Use of Microbits for sustainable plant watering. *Learning through inquiry in the Go-Lab platform*	Create a device with a microbit for data collection	3		informal		
	Daiva Kukienė, Lina Šulinskaitė	Chemistry, physics, biology, information technology	3. Unused clothes trip.	To develop practical skills and value-based attitude for sustainable consumption.	13		informal	I, III gymnasium	**7**
			3.1 The Journey of Unused Clothes: A Study of the Effects of Fabrics by Chemical and Mechanical Means. *Learning through exploration in a virtual environment - GoLab*	To understand how various issue care substances affect the fabric, mechanical effects; be able to work safely with various chemical and physical means; to learn to collect and to analyze scientific experiment data	9		informal		
Vilniaus Vytauto Didžiojo gimnazija (Lithuania) Researchers **Rūta Girdzijauskienė Gražina Šmitienė**	**Danguolė Skladaitienė, Ardas Skladaitis, Sigutė Macijauskaitė**	Biology, chemistry, physical culture, information technology	1. Dependence of the oxygen content in the blood on the time of wearing the medical mask.	To determine the dependence of oxygen content in the blood of teenagers on the time of wearing the mask.	8	Inquiry-based learning	formal	I gymnasium	**16**
			2. Dependence of blood oxygen level on physical exercises.	To determine the dependence of the amount of oxygen in the blood of adolescents on the amount of physical exercise.	8		formal	II gymnasium	**8**
	Gražina Valicka, Sigutė Macijauskaitė	Physics, chemistry, information technology	3. Measurement of the noise level in various gymnasium rooms.	To measure the noise level in various places of the gymnasium and compare the results with hygiene standards. Submit suggestions for noise reduction.	8		formal		**14**
		Physics, information technology	4. Construction of a hydrogen generator.	To produce hydrogen gas for metal cutting by electrolysis.	8		formal		**2**
	Rasa Balnienė, Sigutė Macijauskaitė	Chemistry, information technology	5. Where is the most CO2 in the gymnasium?	To determine where CO2 is the most in the gymnasium.	8		formal		**8**