



## EVALUATION OF PROJECT-BASED LEARNING

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**Abstract:** In our rapidly changing world, the role of education is not only to pass on knowledge, because the acquired knowledge will be quickly expired, the different professions are also changing in a short time. It would be also important to pass on a kind of ability which the students will be able to independently acquire knowledge after completing their studies with or they would be able to navigate safely through the world, or to work in a team.

The project-based education is one opportunity to reach this, with many people have been dealing since the mid- 20th century with, but it has not become popular in education. One explanation to this is that the project work is managed in team, hence it is difficult to evaluate well.

In my article, in addition to the general description of the evaluation of the project task, I give valid examples of how this evaluation can be applied in education. Considering the importance of project-based education being present in all age group, some of my examples can be used in public education and the other in higher education.

**Keywords:** evaluation, problem-based education, project task, problem solving, IT education

### 1. Introduction

Lifelong learning has increasing importance in the 21st century, as the acquired professional knowledge is about to expire within ten years (Csíkos, 2010). The old school model of passively learning facts is no longer sufficient to prepare students to survive in today's world (Edutopia, 2007). Project-Based Learning (in short, PBL) makes learners as an active participant in the process of learning and helps them to learn skills which are mandatory in the 21st century. In short, we can say that "Project-Based Learning integrates knowing and acting".

Project-Based Learning is an instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world (Schuetz, 2018). The topic, planning and organizing the session, dealing with the topic, creating and presenting the results of the work are based on the students' true independence. The role of teachers is to help this autonomy (facilitator, supervisor). The working method of project education is primarily cooperative teamwork, but it is important to give way to individualized work as well.

There are many benefits of Project-Based Learning. It helps bring the school's theoretical curriculum closer to real life, thereby motivating students. Project-Based Learning allows students to learn by doing and applying ideas. Students engage in real world activities that are like the activities that adult professionals engage in. Students gain a deeper understanding of the material when they actively construct their understanding by working with and using ideas (Indrawan, Jalinus, & Syahril, 2019).

Using PBL has a positive effect not only on student performance but also in relation to learning (CareAcademy, 2018). By using it, students are more responsible, aware of the work, more independent in their work.

It helps to develop competencies that remain in the background during traditional education, but we will need it very much in life. Examples are teamwork, cooperation skills, and explanatory skills (Krajcik & Blumenfeld, 2006). In addition, it helps students develop self-regulatory learning. It improves the ability to adapt to change, the ability to solve problems in unknown situations, and the reasoned justification of decisions made. It has a developing effect on the ability to think critically and creatively, as well as on the ability to accept and evaluate other people's ideas and views, i.e., the ability to empathize (Edutopia, 2007). As a result of the PBL method, students take more universal and holistic approaches, improve

team collaboration, and work together to learn about their own strengths and weaknesses, resulting in improved self-regulatory learning.

Researches (Bhagi, 2017; Williams & Linn, 2002) have demonstrated that students, who learn in Project-Based Learning, get higher scores than students in traditional education. Further research (Csíkos, 2010; Rivet & Krajcik, 2004) has also found that attitudes towards learning have been positive and that there has been a positive change in other non-cognitive personality traits.

In addition to the many benefits of project education, there are also many difficulties (Bogler, 2016; Taylor, Trinh, & Spirnak, 2000). Solving a project takes much more time than if the teacher simply shared that knowledge. It requires more time and energy from both the teacher and the student.

Solving a project often does not only improve the knowledge of one subject, so the problem arises as to which class to deal with. A solution could be to introduce project days where subjects could be taught in an integrated way. More and more schools are taking initiatives to do this; however, these are usually a few separate days a year. And for a real task, independent work at home would also be important, which cannot be solved in a project day. The solution to this could be to introduce project lessons instead of project days. (K. Pusztai, 2017)

Another difficulty with applying Project-Based Learning is that the working method is most often teamwork. This raises several issues (McCharty, 2019). For example, it would be important for all students in the group to be equally active in solving the task. However, usually after a while, the roles develop in the groups, and many times a student gets to the periphery without being given a task.

The situation of teachers in teamwork is also difficult. Each class has 20-30 people, while the upper limit of a well-functioning group is much lower, so a teacher will be the tutor of several groups at the same time, which is a much more difficult task than holding a frontal lesson.

Perhaps one of the biggest difficulties in Project-Based Learning is the issue of evaluation. What, when and how to evaluate, and how to evaluate individuals in a teamwork. While there are many articles on PBL and its benefits, there are much fewer on evaluating Project-Based Learning. I think many teachers would like to use PBL, only because of the difficulty of assessment, they prefer a different method. That is why I think it is very important to see examples of evaluating a project task.

In my article, I first deal in general with the evaluation of PBL. Although I have set the main goal of evaluation within Project-Based Learning, I still deal with evaluation patterns that can be applied in general, to any other method. I then examine how project teaching and evaluation take place in some parts of the world, and then I present my own research, i.e., some public education and higher education projects, their evaluations and their educational experiences. The main aim of my paper is to provoke thought, and I suggest the presented examples for further development.

## 2. Evaluation of the project task

In pedagogy, assessment is always a comparison. The question is, who, whom does it compare to.

The teacher refers to the external (curriculum) requirements, the other students, the student's previous performance, his own open or sometimes hidden expectations, and often to international expectations (IEA, PISA).

The student is mainly concerned with the open and by "caught" hidden expectations of the teacher and his peers. You do not usually know the external requirements, you can appreciate your own development especially at high jumps, but you also need external help for this.

Parents' benchmarks are scattered across a wide range of areas: what other child does, what grades does other child, what kind of further education want to do he / she have with his / her child, or perhaps where his other child did hold in this age.

Project-Based Learning, also called challenge-based learning, begins with the assumption that there is not necessarily just one right answer to solving a problem. Finding creative solutions is important but very difficult to evaluate. If projects are interdisciplinary, it becomes even more challenging for teachers to criticize topics that may be unknown to them.

If we consider the evaluation as a feedback about the progress or achievement of the student, it can take many different forms and may be formal or informal, if necessary.

### **2.1. What to evaluate?**

A very important question in the evaluation is what to evaluate (Hernandez, 2016). The end product is important, but if you focus only on this, the meaningful learning that happens throughout the process can be lost. The advantage of PBL is that students learn much more than content. They learn how to work with others, solve problems, present ideas to the audience, and learn from their mistakes. So in the evaluation, we are not only curious about what they have learned, but how they came to learn it so that they can use these processes in the future.

Some areas of assessment include content acquisition, collaboration or participation, as well as presentation or style. Additional considerations may include adherence to deadlines or other elements related to the topic or project.

### **2.2. How and when to evaluate?**

In traditional education, assessment is seen as the end of the learning process, ie often only once at the end of the learning process. However, the assessment has much more potential (Orbán, 2011). Applying it appropriately, students can be encouraged to succeed. That is why it is very important that the evaluation should appear from the beginning and be present throughout the learning process. We can do this by clearly setting out the expectations of the result in the objective.

Feedback and corrections should be frequent so that students can continuously improve their work and produce a successful end product. Waiting for feedback for too long may result in work that is too far from the desired goal and their corrections would require over-energy.

### **2.3. Results of project work**

We think rarely that the fate of the final products is a valuation element as well (M. Nádasy, 2010). The end goal can be a pageant, a poster, a mock-up that goes to the wall of the corridor, which gets out to the director's office, the library, the mall, the domestic or foreign sister school. But it can be a reward, what a student who has worked the most on it can take home. However, the result can be a comic book or a document that can be published in a newspaper, but it can also be a play we perform for parents, classmates or a more public audience. An increasingly fashionable end product is a video or presentation that can be made available to the Internet after the performance, allowing students to receive a broad range of feedback.

### **2.4. Dimensions of evaluation**

Evaluations have four dimensions (Orbán, 2011): self, peer, teacher and audience evaluation.

#### **2.4.1. Self-evaluation**

Self-evaluation is an especially important piece of the summative evaluation because it taps into higher-level thinking and awareness of the material, process, and final product. It makes students think about their successes, mistakes, and goals for the next time. I think it is important that the evaluation always ends with the filling of written form, which serves the purpose of preventing the student from avoiding his / her own evaluation and opinion according to the given criteria. Because our goal is to evaluate and thinking on the students honestly, the completed form will remain with the student so that no one else can look at it.

#### **2.4.2. Peer evaluation**

Peer review is always a very important consideration for students, they want rather meet their friends than adults. Correct assessment of students contributes to a better collaboration process and increases student responsibility.

During PBL, peer evaluation is present at several levels: on the one hand, in-group private assessment, which is a constant accompaniment to the process, and, on the other, in the final assessment, a public

assessment. At the end of the process, however, there is a great need for an “internal” evaluation session where the participants in the project discuss in themselves the content and work organization lessons of the (new type of) work. It is then possible to draw attention to aspects and techniques of self-study. In many cases, this opportunity also allows us to open up to the next complex topic in light of the lessons from the project solved.

Aspects that can be used in the internal evaluation include (M. Nádasy, 2010):

- What did the team-mates like the most and what did they like the least?
- What goals have we achieved compared to our common plans?
- What experiences did the team-mates have with the different organizational ways?
- What problems and conflicts hindered the work, how could they be overcome?
- What organizational problems have been encountered, how can they be prevented at other times?
- What kind of school and extracurricular circumstances made it difficult to work?
- What kind of school environment changes is absolutely necessary for the next project?
- What external signals did be received on the fly or at the end of the project?
- What is the fate of the project results in the short and long term?
- Do you want to do project work on other occasions?

All these questions are worth asking and answering in the atmosphere of success and joy of working successfully.

### 2.4.3. Audience evaluation

Michael Hernandez's research (Hernandez, 2016) illustrates the importance of evaluating an external audience. Hernandez took a group of students to Cuba to make documentaries about the culture and history of the island nation. The main goal was to learn how to make documentaries. One of the students, who excel from the peer, publicly posted to YouTube after the project ended and received critical comments from someone living in Cuba. In his research, Hernandez described that the student was much more influenced by the comments of unknown (but knowledgeable) people than by the evaluation of his teachers or classmates.

## 2.5. Public vs. Private Evaluation

Ideally, PBL is a credible experience, whether in the classroom or outside the school. Therefore, it should be possible for the feedback from the public to assess the success rate of the project. Public critiques (such as comments on blog posts) and class discussions provide a broader perspective and can carry even more meaning for the student than teacher feedback.

Private evaluations, such as self-reflection and teacher feedback, can treat confidential information about teammates, allowing students to be honest with their peers and themselves.

It is therefore very important that both types of evaluation play a role in the process.

## 2.6. Evaluation Techniques

The goal of evaluations should be to emphasize growth and encourage improvement. It is therefore very important that our criticism is constructive. Several techniques (CareAcademy, 2018) help us in our oral or written constructive criticism.

The essence of the technique is known as "Critique Sandwich" is to encapsulate our negative comments about a problem or flaw between positive notes.

The point of the "I like that..." technique is to try to give you feedback that starts with: I like that ..., I wonder if ..., The best next step might be...

The essence of the "Rose / Thorn / Bud" technique is that our critique should include something good (rose), something bad (thorn), or a suggestion, a potentially good thing (bud), which may be a good idea but needs work. (Romero, 2015)

### 2.7. Summative evaluation of Project Work

It is very difficult to evaluate individuals during teamwork. In addition, it would be important for all students in the group to be equally involved in solving the problem. However, after a while, roles in groups also form, and in many times, some student gets to the periphery, so he /she doesn't get a task.

To solve this, a possible idea is to evaluate each teamwork at the end too, and the group together will receive a total score to be shared between them. And the scores can be converted to a ticket at the end. (It is a good idea to first convert more teamwork to one ticket so that the partial scores add up.)

If we apply this method frequently, students will stand up for themselves and become more involved in the work.

Furthermore, let we the peripheral students at least once be in leadership roles.

## 3. Project work and evaluation abroad

At first (Marton, 2013) we are encountered Project-Based Learning in the United States in the context of 1900s vocational training. A notable pioneer was John Dewey in the Chicago tentative school, who broke away from educational situations that focused on traditional knowledge transfer and involved the student in a passive role. The theoretical and practical foundations of the method are described by Dewey's student W.H. Kilpatrick in "The project method," published in 1918 in Teachers Collage Records. The author's book on the detailed theory of the project-based method was published in 1925 under the title Foundations of method: informal talks on teaching.

In the twentieth century, Project-Based Learning became widespread in England, Canada, Germany, and Austria. In Russia, during the 1930-31 schoolyear, they switched to Project-Based Learning throughout the country. (One year later, it is withdrawn because its democracy is incompatible with central government.) (M. Nádasy, 2010) However, in the rest of Europe, Project-Based Learning plays no significant role in public education practice.

In the following, I will elaborate on project pedagogy in Germany and Austria. I will then present some American institutions that have extensive research in Project-Based Learning and publish their experiences and results on their websites for the purpose that teachers can use them, comment on them, and further develop them.

### 3.1. Western Europe

Hungarian Project-Based Learning mainly follows the tradition of project pedagogy in German-speaking countries (Verók & Beatrix, 2011). One reason for this is that we have the largest proportion of German-language literature, followed by English and French.

In the following, based on the experience of the Jugend-Schule-Wirtschaft project, I describe Project-Based Learning in Western Europe

In Western Europe, the project-based approach has a long tradition. The method has considerable literature. There are summarized works, analyzes, measurement results of the project teaching experiences.

Reform pedagogical traditions have had a significant impact on the educational reforms that emerged since the 1970s. The method emerged as a critique of the former education system.

Various forms of informal education are created and become part of school practice: project-oriented education, project, workshop, freelance work, case study.

The project-based method has been integrated into public education and has become part of the curriculum. There are project books and textbooks offering project assignments that are relevant to Project-Based Learning.

The topic selection of projects is highly differentiated and strongly linked to current social practice.

The implementation of projects in terms of form and content is influenced by a modern approach and thinking, a new methodological culture that meets the needs of postmodernism.

A forward-thinking (positive, more optimistic) mindset and problem-based approach are typical.

In criticism of education, the moral factor gives a strong voice, which is coupled with child-centeredness and it sets out the school's responsibility for shaping the future.

## 3.2. United States of America

### 3.2.1. University of Delaware

The University of Delaware, US, is not only applying problem-based teaching in many areas. On his website (Delaware, 2020), he publishes a collection of problems, called "Clearinghouse", whose tasks are well suited to Project-Based Learning. The university also organizes workshops for teachers to help them apply it in their class. However, on their website, you will not only be able to view sample assignments, but you will also find tutorials on the courses. In addition, they publish forms to test the success of their learning and find videos containing problems and solutions to group problems.

### 3.2.2. High Tech Middle North County

High Tech Middle North County (High, 2000) is a California high school that enrolls 6th-7th and 8th-grade student groups (335 students in total) in innovative projects that not only improve their knowledge but also their problem-solving skills. Every year there is an "Exhibition Night" where each student presents his work. In addition, every semester students must report on their knowledge. Each student has a designated faculty advisor who offers academic, emotional, and social support during their three-year high school studies.

On the school's website, you will find several detailed projects, which include the evaluation of the project assignment as well.

### 3.2.3. Buck Institute for Education

The High Buck Institute for Education (Buck Institute, 2020) is a non-profit organization dedicated to helping teachers use project-based education. It creates, collects, and shares high-quality PBL educational practices on its website.

It provides workshops, helping teachers to design or adapt a project for their own classroom as well as and evaluate students in project work. After a successful workshop, it provides on-site Sustained Support Visits, as research and experience show that follow-up is necessary for successful professional development, transformation of practice, and sustainability of PBL.

## 4. Evaluation of specific project tasks in public education

The following I present some project tasks and their evaluation. The first of these project tasks is one of the projects developed by High Tech Middle North County (High, 2000), the rest are self-developed projects.

### 4.1. School Buffet Design

#### 4.1.1. Description of the project

The narrow interpretation of the task includes the design of the buffet, ie the design of its items and the determination of the prices of each item. It is worth making certain clauses with regard to the products being sold. For example, the products should be healthy, ie do not contain more than 5% salt and sugar.

Then the solution to the problem is to make a price list.

We can extend the task by designing a buffet logo or flyer.

#### **4.1.2. Evaluation of the project**

The first step in the project evaluation is the concrete formulation of the task and its results.

The second step in the project evaluation is the continuous intra-group review by the teacher and the students.

As a third step in the evaluation, you should play the task as follows. Let's make a few groups out of the class who together design a buffet. After that, each team gets some imaginary money you can spend on any buffet. The winner is the one who generates the most revenue.

The fourth step of the evaluation should be a self-assessment using a form or an internal evaluation of the group based on the above-mentioned aspects.

#### **4.1.3. Experimentation of the project**

The task was tested with a 6th-grade pupil in an elementary school. Since the group had 7 members, it became only one group. The project took 2 lessons to complete and 1 presentation lesson was provided.

The children were happy with the task, selected the project manager and very quickly divided the workflows. They formed three groups, one designed the buffet logo, one group the products and one the flyer. They were very clever in solving them and at the end compiled the completed processes.

The teacher gave a little help in the beginning and then let them work independently, but he kept an eye on their work and helped them as needed. The team selected a good project manager who paid attention to each of its subgroups and monitored their work. Students needed little help from the teacher.

The evaluation of the project was different from the one I suggested. Due to the small number of the group, they could not appreciate the work of their peers, but the opinion of the teacher is: "They created a buffet that I would be happy to buy. The logo became demanding and the selection became realistic."

The students' opinion on the project assignment is clearly positive. They had a great time doing the task, and at the end, they said they would be happy to do this kind of task again.

Teacher opinion on the assignment: "I think this is a workable project in elementary school."

### **4.2. Organizing a Class Excursion**

#### **4.2.1. Description of the project**

Each team should make a presentation in which they introduce the vision of the class trip. It is worth to give some pointers that students should pay attention during the exercise:

Location: Why to go there?

- Travelling
- Accommodation
- Meal: in case it is too complicated to deal with it, it may be skipped.
- Programs
- Cost of the trip

#### **4.2.2. Evaluation of the project**

The first step in project evaluation is to define precisely what are the task and its results.

The second step in the project evaluation is the continuous intra-group review made by the teacher and the students. Because the task is complex, it is important to provide continuous support to the children. It means not only the constant commenting on their idea from an adult's perspective, but also for example if they look for a good accommodation, we take the role of the owner and negotiate with them.

The third step of the project assessment is to evaluate the final result with the teacher and the students. Evaluation viewpoints: content, presentation, mode of presentation. And after the evaluation, the voting comes which trip has been liked best. The winner team's reward could be to manage the class excursion in reality.

The last step of the evaluation should be a self-assessment using a form or an internal evaluation of the group based on the above-mentioned aspects.

#### 4.2.3. Experimentation of the project

We tested the exercise with three classes of 8th grade students in a primary school. A total of 25 teams dealt with the task, of which 19 solved it. The project took 4 lessons being completed and 1 lesson was dedicated to the presentation. Figure 1 shows the slides of a team's presentation.



Figure 1. An example: the slides of a team's presentation

The teacher encouraged the teams to work independently, but he constantly monitored their work and helped them as needed. The groups needed rarely some help. As the classes had already been experienced to make a presentation and hold lectures, presenting the project did not cause trouble.

The teams were created by the students themselves so they could work together easily. All together there was just one team in which not all students took part in the work. One of the interesting results of team formation was that there were several one-person teams.

Unfortunately, the winner's reward could not be that they fulfill their ideas in reality, so the teacher found out another way of rewarding. Everyone received a five (best) mark who did the job properly, and the winning team was rewarded with a KFC invitation. Each team had to vote for a job that was not their own.

Teacher and student ratings were in most cases the same, differences have been detected only in two cases. One was the evaluation of a team where the students rated better than the teacher. The other difference was more remarkable: the project the students voted as winner was evaluated significantly worse in its content as well as in the mode of presentation by the teacher.

Students' feedbacks on project education were definitely positive. 16 teams enjoyed the task very much. They liked the challenge. The difficulties, highlighted by many of the students were as follows: finding the right accommodation (there were teams who changed location because they could not find suitable



accommodation ...), and budgeting. The meal issue could have been missed, but there were several teams which managed to work it out as well.

Three groups found the project difficult as there was too much work to do. It was difficult to them to find right solutions, or some didn't really enjoy it.

In the teacher's opinion, this assignment is well suited to the use in primary school and she would like to use it in the coming years.

## 5. Evaluation of Project Tasks in Higher Education

Higher education prepares students for life, and we need to work in teams more and more in life, which is why I consider the appearance of PBL in higher education very important. There are more and more initiatives for this at foreign and Hungarian universities as well.

An interesting initiative relates to the name of Marc Gennat, a professor at the University of Niederrhein, who is replacing the exam with a project assignment. In his view, the knowledge required for the exam so far is only a theory, a basis which must be deepened by practical tasks. In his class, the exam works in project work where teams must solve practical tasks.

### 5.1. Appearance of PBL in course of Algorithms and Data Structures

University professors often struggle with the trouble that some of the material delivered during the lecture does not fit, or only very narrowly, into the content of the practice. There is an excellent opportunity to solve it the topic processing and evaluating in a project assignment.

#### 5.1.1. Description of the project

The project task should be to analyze and compare the sorting algorithm. The teams are assigned different tasks.

The concrete formulation of the task and its results: Each team should choose a “slow” ( $O(n^2)$ ) and a “quick” ( $O(n \log n)$ ) sort, which they then analyze and present. The subtasks are:

- Students have already encountered slow sorting in their studies, but there are few who have written a program for it. Therefore, when presenting a slow sort, it is essential to write *a program into arrays*.
- Since one of the important topics in the Algorithms course is linked list, the second important task of project work is to develop *an algorithm into list* for the selected slow sort.
- Describe the *algorithm* of the selected *quick sort* and the *data structure* that may be used.
- The object, such as these sorting, includes *analysis of the algorithm* by operation time or storage space. Do this.
- It would be a good idea to color the task a little with *research work*: Can they find anything interesting about the sorting.

The solution to the problem, like the wording of the problem, is multilevel:

- The presentation and analysis of the quick sort is done in the form of a short presentation, of course with the help of a ppt presentation. This demonstration is also available to the class during the exam period.
- The slow sort program into array, chain list algorithm, and analysis will not be presented, but will be posted on the course website and will be available until the end of the exam period.

#### 5.1.2. Evaluation of the project

The first step in project evaluation is the concrete formulation of the task and its results.

The second step in project evaluation is within the team. The team should keep a project log that includes who created and verified each subtask. I think it is important that the maker and the control person or

persons are different. When checking the program, the test person/subgroup should include test cases in the project log.

This project diary is also very important because the teacher is not present here as in the above-mentioned project work. Of course, students can ask for help from the teacher, but this is optional; otherwise, the teacher sees only the final product, making it difficult to evaluate the process.

The third step in the evaluation is to comment on the work of the teams with the teacher and their peers. Both the teacher and the students grade the work in several ways. (Eg based on comprehensibility, amount of new knowledge, usability, interesting.) If the teacher finds a mistake in a given subtask, he/she gives 0 scores for that.

The teacher and student points are weighted (2/3 - 1/3 proportion), which is then distributed by agreement between the members of the group. The points will then be finalized by the teacher in the project diary or returned to the team for review.

The fourth step here also of the evaluation should be a self-assessment using a form or an internal evaluation of the group based on the above-mentioned aspects.

### 5.1.3. Experimentation of the project

We tested the task in a university course where 5 teams initially applied but by the end, only one team met the criteria. Figure 2 shows the slides of the team's presentation.

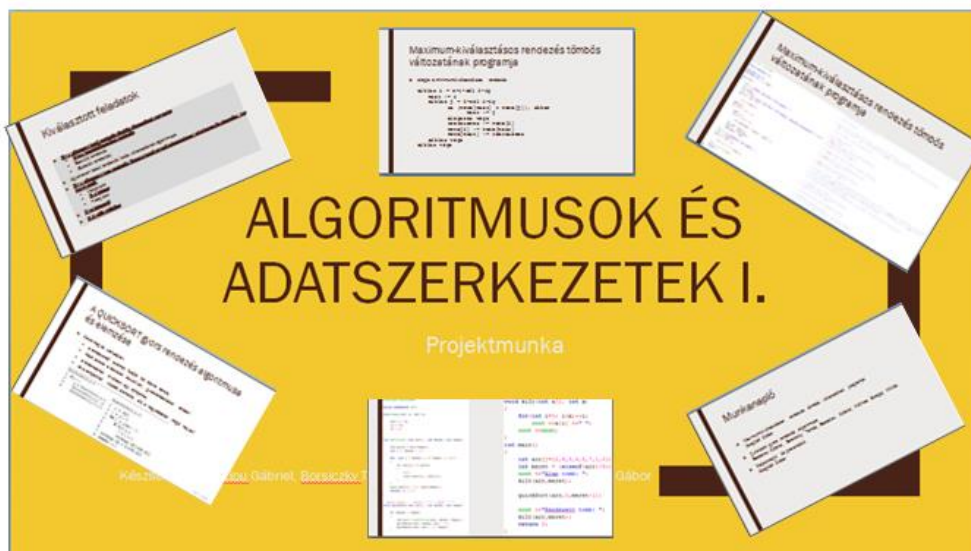


Figure 2. An example: the slides of the team's presentation

The groups were formed independently, there was no stipulation regarding their number, only the recommendation of a group of 3-4 persons. This recommendation was followed by each team, the task completed team consisted of 4 people. From their activity logs, it was found that the project was devoted to approx. 5.5 hours. (In my opinion, they spent a lot more time on the task.) They chose the maximum selection sort for slow sorting and quicksort for quick sorting. Although the original task was only to write a program for slow sorting, they did create a C++ program for both sortings. The algorithms of the two sorting were explained in a presentation. Their work was also published to other students of the course.

I sought the opinion of the students of the university course with the help of an online questionnaire. The questionnaire was completed by 8 students. I asked four obligatory questions to which the students could give 1 (very bad) -5 (very good) points and, in an optional question, they could write their personal opinion in the form of an essay. Based on these, the students are considered the project work a good idea. (The question got a score of 4.3) Group work and concerted work within the group achieved only 3.9, which show me that students work relatively little in a group, so they still have to learn this way of

working. The students considered the evaluation to be fair, with an average score of 4.4. Only one student commented that sounded like that: "It was good."

## 6. Conclusion

Participating in Project Based Learning also brings a new color to the practice of evaluation, reinforcing self-esteem and peer review in the process, but linked to engaging in the process of problem-solving. Students, in and of themselves and others, experience the experience of being fit or inadequate. These processes are also present in traditional education, but usually, take place against the backdrop of teacher evaluation, often linked to mysterious "requirements" and burdened with subjectivity.

Everything related to the project is clearer because the quality of the problem solving is public in detail and in its entirety, so it is not related to a vague evaluation aspect. In turn, self-esteem can become more realistic and gain more significance.

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