University *of Ljubljana*

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Project-Based Learning in Times of COVID-19 - Both a Challenge and an Opportunity

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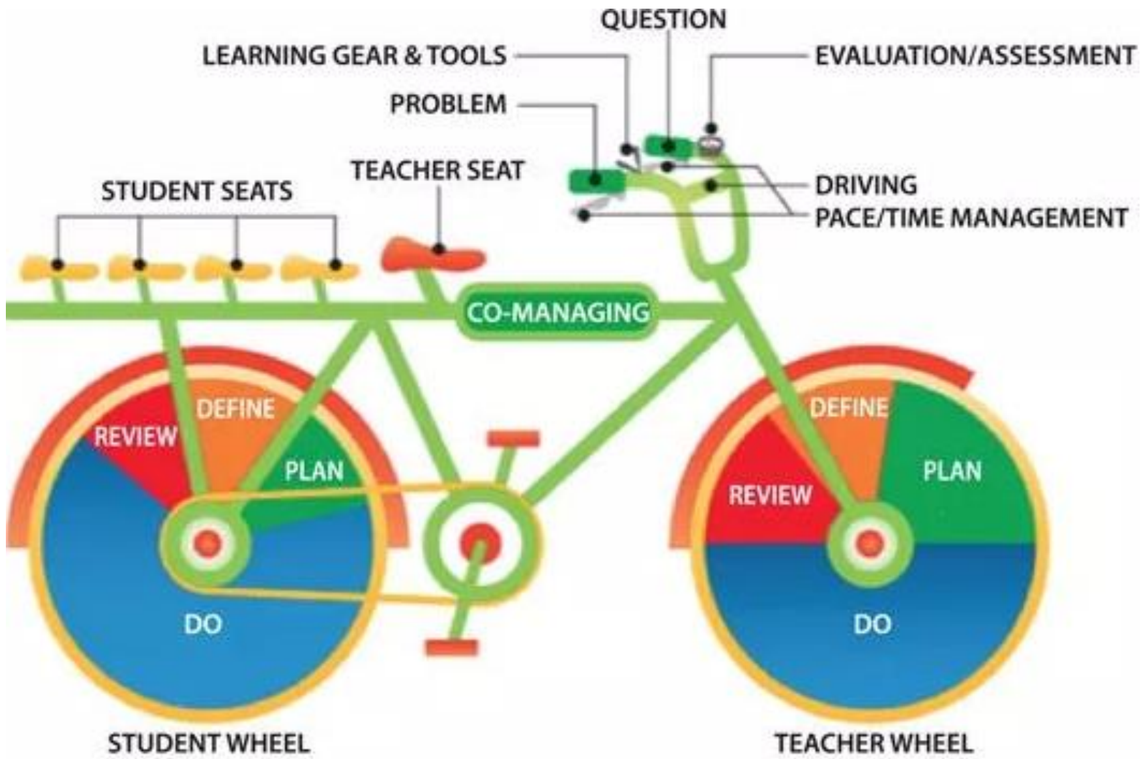
The 21st Century Learner is…

Characteristics of a 21st Century Learner (Taken from Tan (2016), Retreived from https://smiletutor.sg/facilitating-21st-century-learners/)

Project-Based Learning (PBL)



The Project-Based Learning bicycle model illustrates:

- clearly set objectives (driving direction)
- learning through a sequence of meaningful activities (key steps of PBL)
- collaboration between teacher and students (on a common bike)

Trilling, B. & Fadel, C. (2012). *21st century skills: Learning for life in our times*. John Wiley & Sons.

Project-Based Learning - characteristics

Relationship to students' life experiences;

Interdisciplinary approach;

Planned and directed activities;

Consideration of students' interests, learning styles, and abilities;

Developing the ability to communicate and collaborate;

Focus on the learning process;

Openness of the learning process;

The evaluation of the end result as well as implementation of PBL.

Ferk Savec, V. (2010). *Projektno učno delo pri učenju naravoslovnih vsebin*. Maribor: Univerza v Mariboru Fakulteta za naravoslovje in matematiko.

Project-Based Learning - key steps

PBL steps by Fray:

Key steps

- initiative
- project sketching
- implementation plan
- implementation
- final step

Intermediate steps

- guidance
- coordination

Fray, K. (1982). *Die Projektmethode*. Weinheim: Beltz.

The context of the use of PBL

Study Programme: first cycle university study programme at University of Ljubljana, Faculty of Education, the two-subject teacher (Chemistry), 4th year

Name of the Subject: Experimental and Project-Based Learning (9 ECTS)

Number of enrolled students in academic year 2020/21: 19

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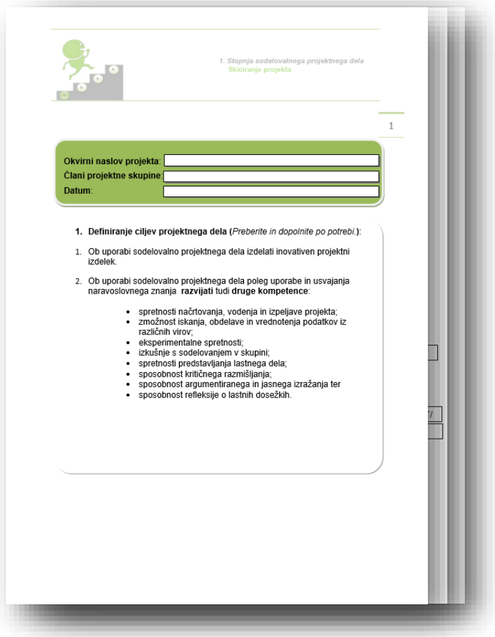
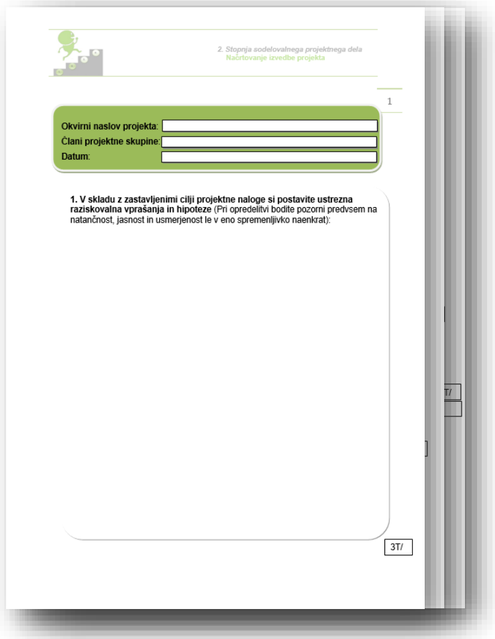
Project portfolio

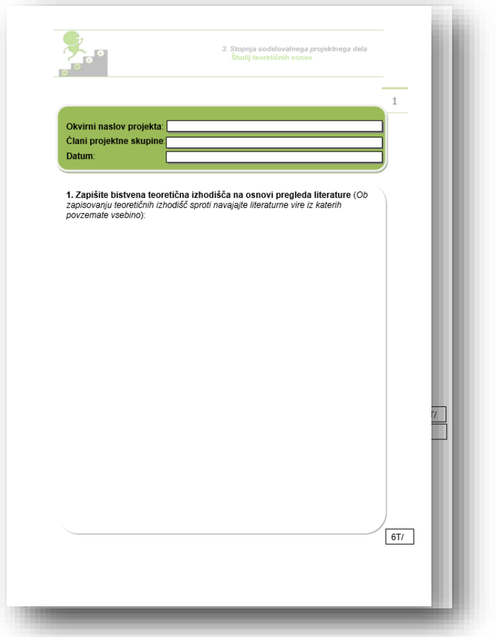
Templates (forms) of the project portfolio to support the implementation of individual PBL step.



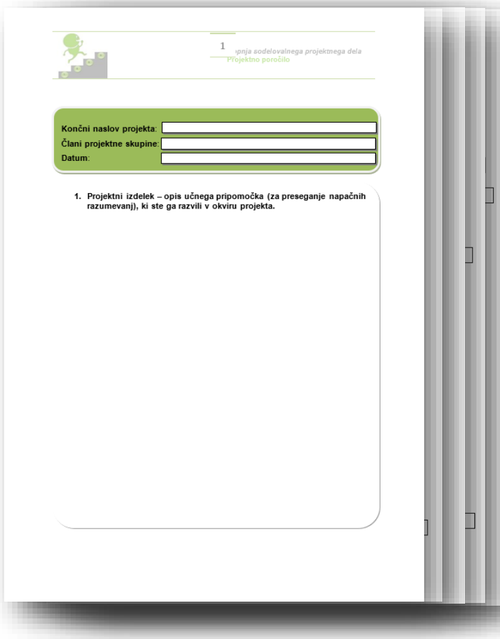
Project sketching



Implementation plan



Implementation

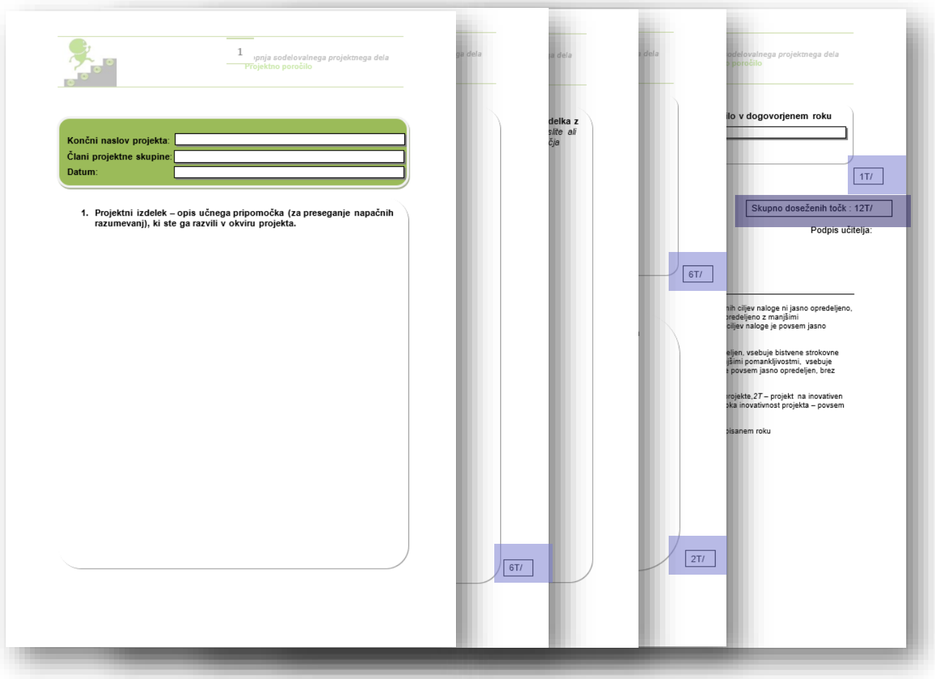


Final step

Ferk Savec, V. (2010). *Projektno učno delo pri učenju naravoslovnih vsebin*. Maribor: Univerza v Mariboru Fakulteta za naravoslovje in matematiko

Project portfolio

Example: Final step



The evaluation of the project portfolio

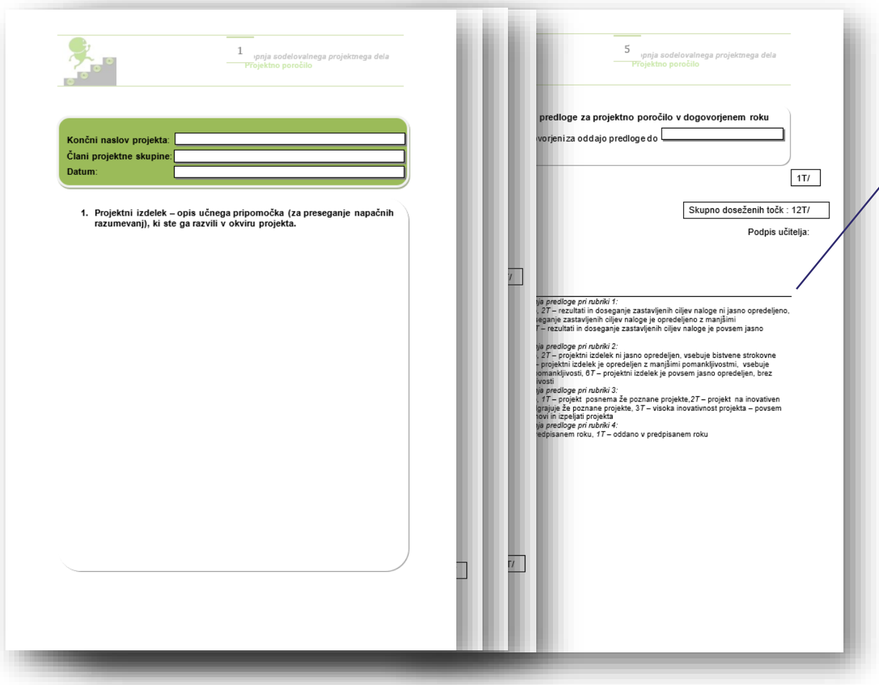
number of points of individual sets of the project portfolio form

the sum of all points at the end of the project portfolio form

Ferk Savec, V. (2010). *Projektno učno delo pri učenju naravoslovnih vsebin.* Maribor: Univerza v Mariboru Fakulteta za naravoslovje in matematiko

Project portfolio

Example: Final step



The criteria with description for evaluating the project portfolio

Predlagan kriterij vrednotenja predloge pri rubriki 1:
0T – ni opredeljeno, *2T* – rezultati in doseganje zastavljenih ciljev naloge ni jasno opredeljeno, *4T* – rezultati in doseganje zastavljenih ciljev naloge je opredeljeno z manjšimi pomankljivostmi, *6T* – rezultati in doseganje zastavljenih ciljev naloge je povsem jasno opredeljeno

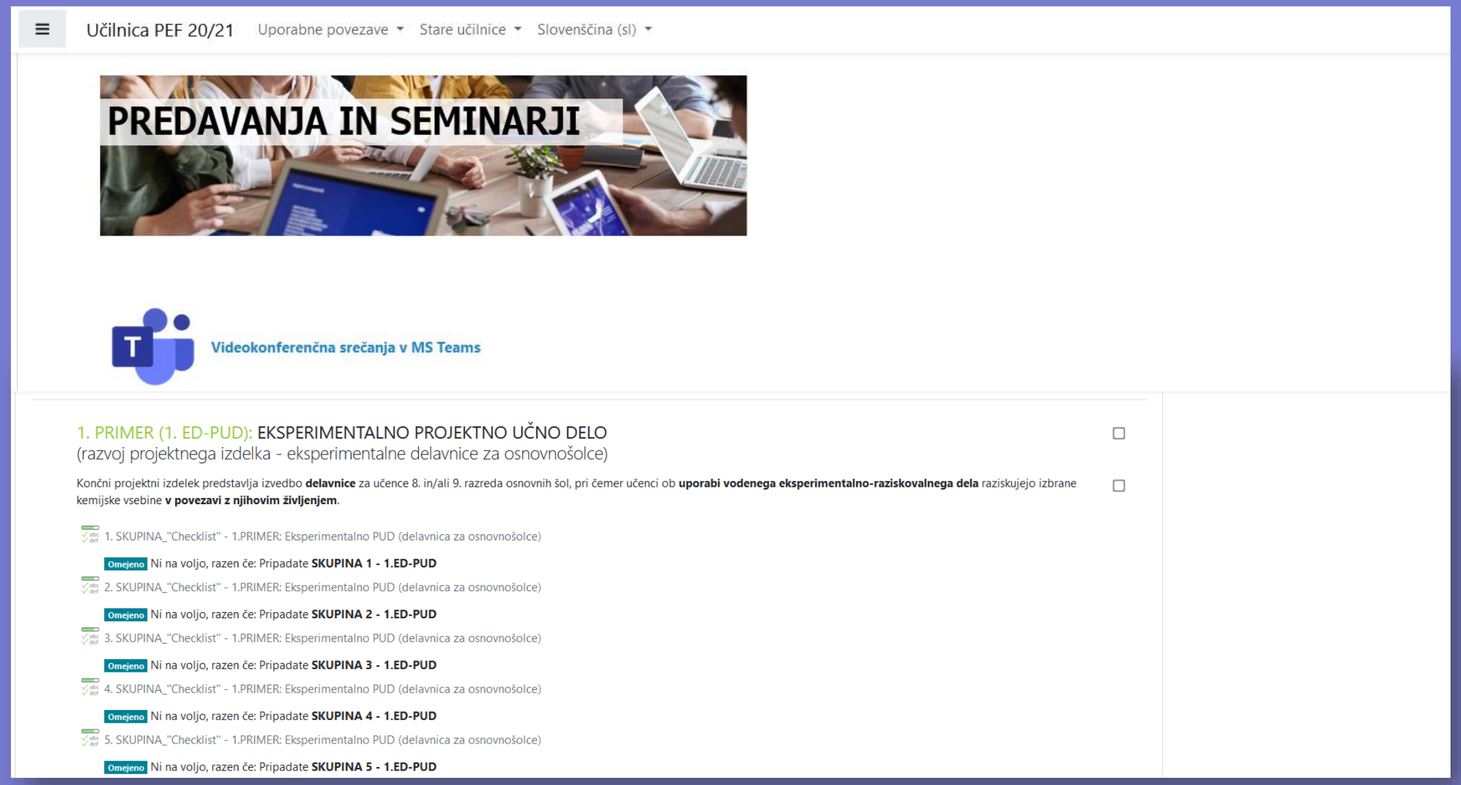
Predlagan kriterij vrednotenja predloge pri rubriki 2:
0T – ni opredeljeno, *2T* – projektni izdelek ni jasno opredeljen, vsebuje bistvene strokovne pomankljivosti, *4T* – projektni izdelek je opredeljen z manjšimi pomankljivostmi, vsebuje manjše strokovne pomankljivosti, *6T* – projektni izdelek je povsem jasno opredeljen, brez strokovnih pomajkljivosti

Predlagan kriterij vrednotenja predloge pri rubriki 3:
0T – ni opredeljeno, *1T* – projekt posnema že poznane projekte,*2T* – projekt na inovativen način poglablja/nadgrajuje že poznane projekte, *3T* – visoka inovativnost projekta – povsem sveže ideje pri zasnovi in izpeljati projekta

Predlagan kriterij vrednotenja predloge pri rubriki 4:
0T – ni oddano v predpisanem roku, *1T* – oddano v predpisanem roku

Ferk Savec, V. (2010). *Projektno učno delo pri učenju naravoslovnih vsebin.* Maribor: Univerza v Mariboru Fakulteta za naravoslovje in matematiko

Implementation of PBL using online classroom Moodle and collaborative environment MS Teams



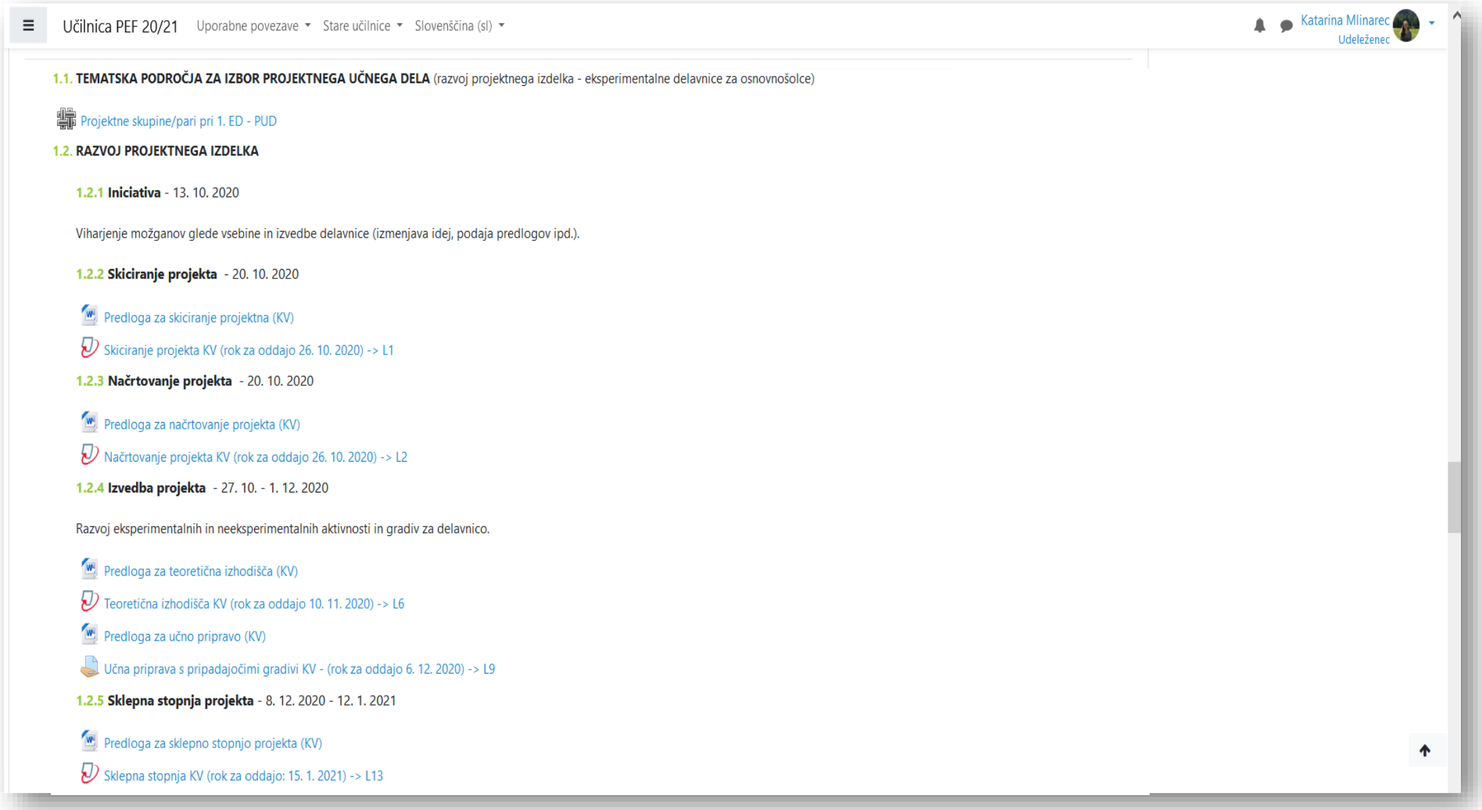
Online Classroom (Moodle)

- General information about the subject
- Schedule of subject implementation
- Materials for PBL
- Assignment (Turnitin) and evaluation

Collaborative Environment (MS Teams)

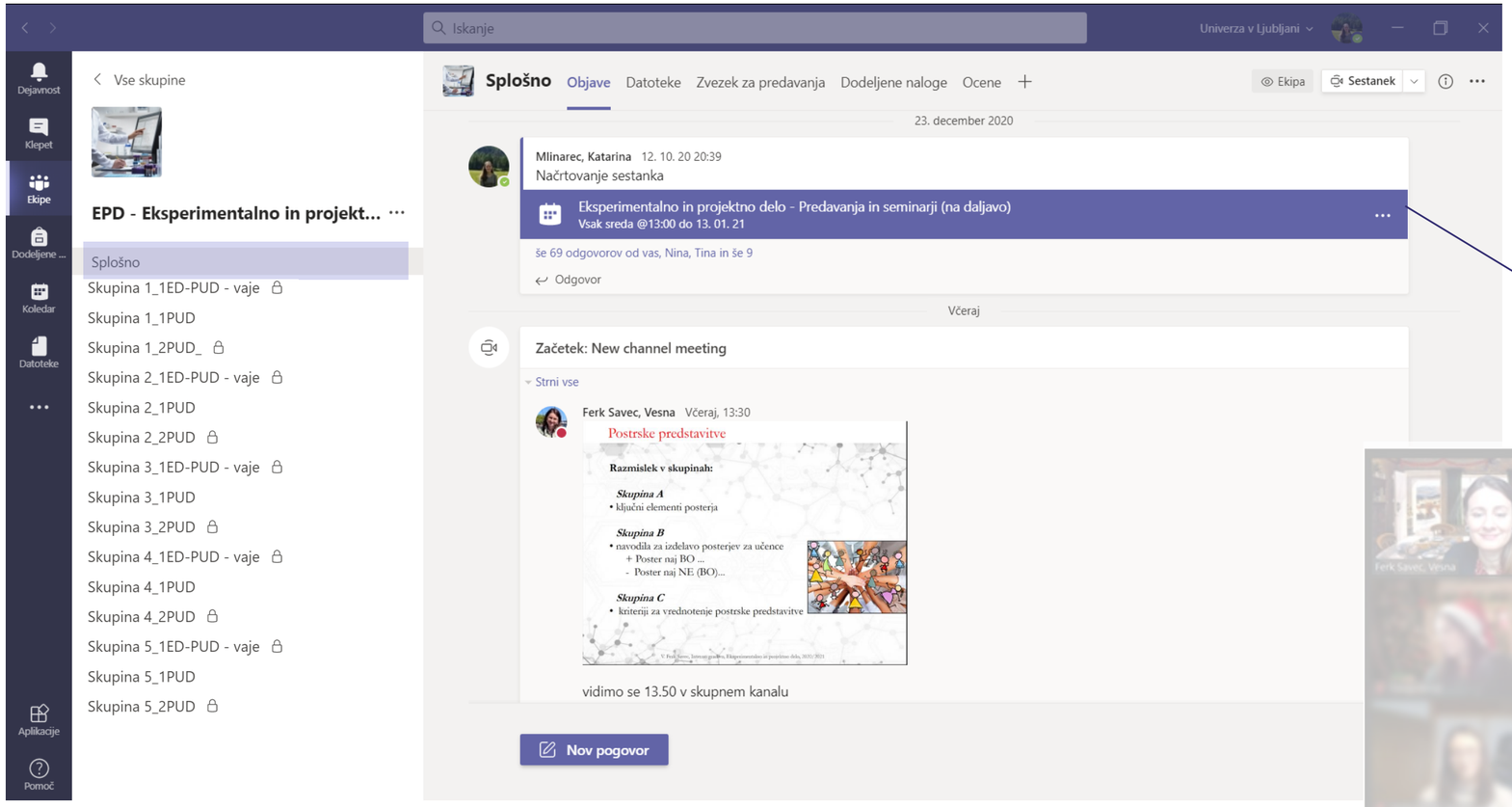
- Conducting videoconference meetings with all students
- Conducting videoconference meetings of project groups
- Collaborative work of project groups in specific channels

Examples from the online classroom



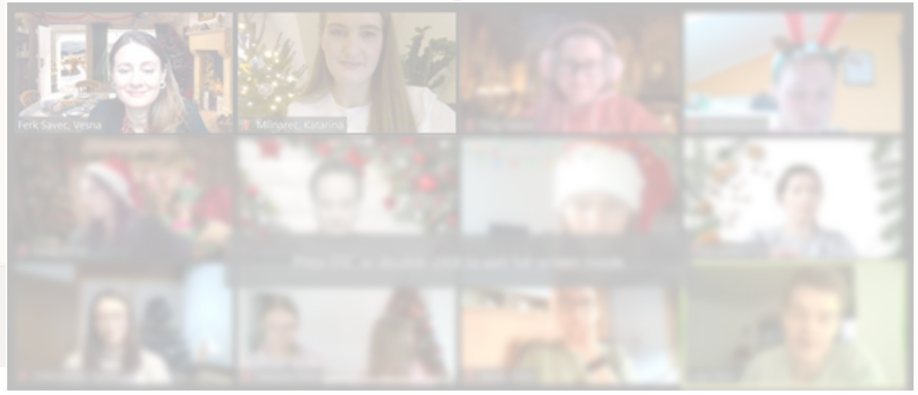
- Implementation of PBL by steps
- Instructions, templates for project portfolio
- Submission of portfolio (Turnitin)

Examples from the collaborative environment



General Channel

- Access for all students
- Conducting videoconference meetings with all students



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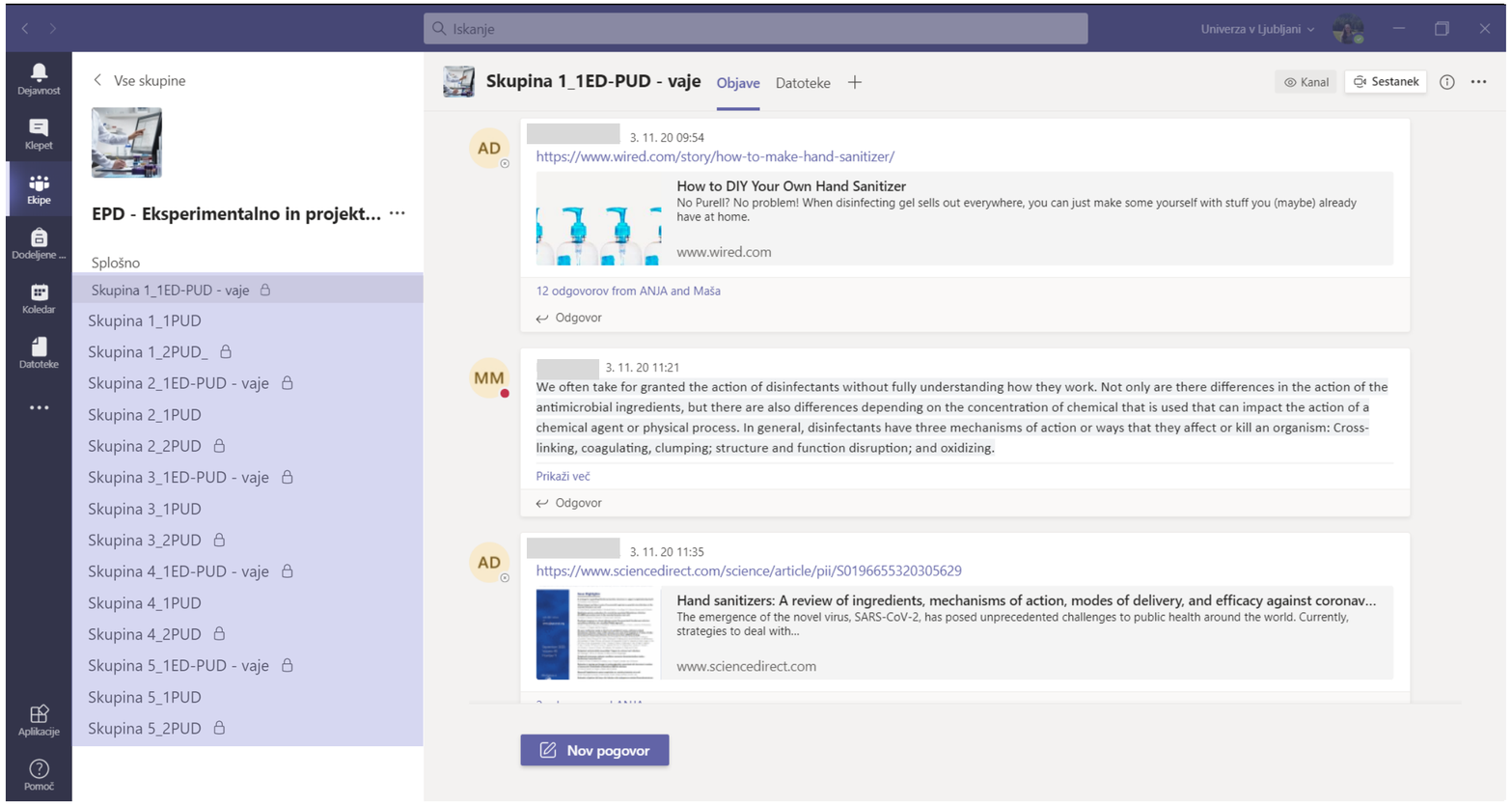
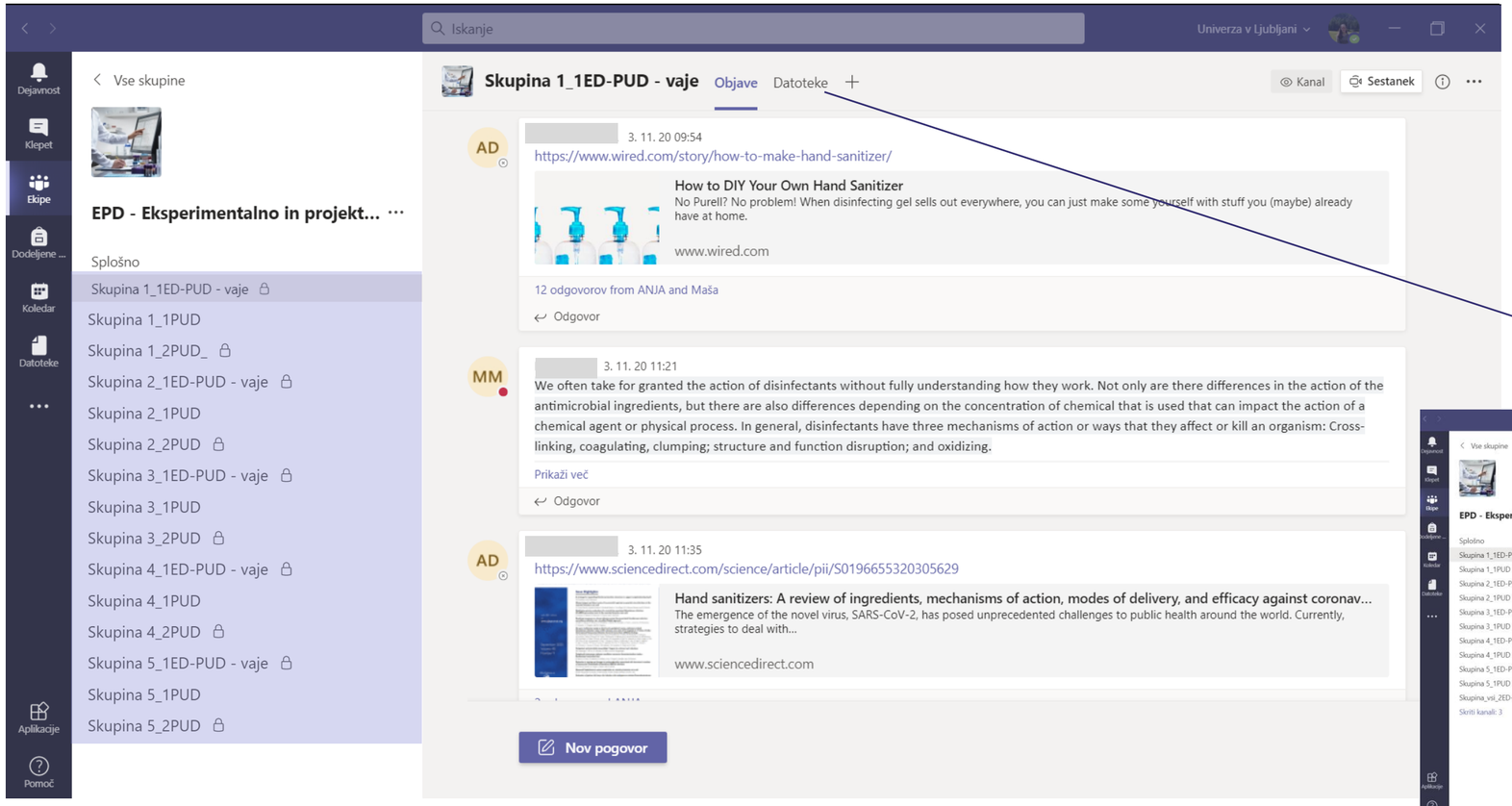


Specific channels

- Videoconference meetings of project groups
- Restricted access to the channel (only for members of a specific project team)

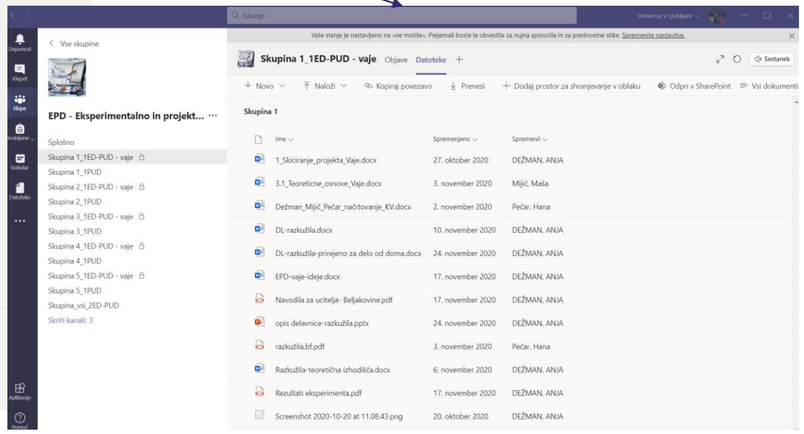
Examples from the collaborative environment



Specific channels

Collaborative work of students of specific project groups:

- co-editing documents
- collecting materials
- product development, etc.



Presenting the results of PBL

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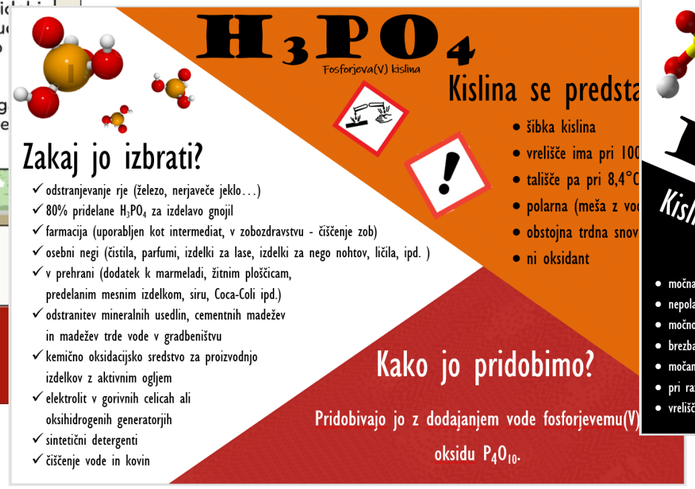

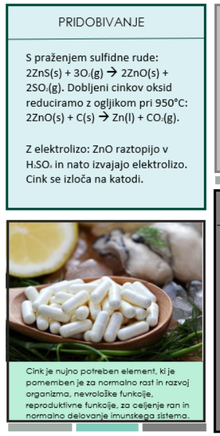

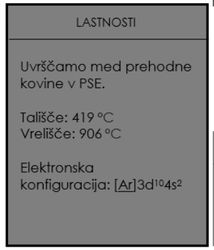

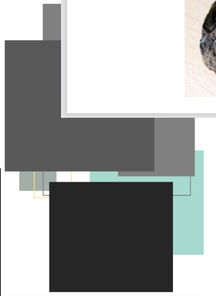

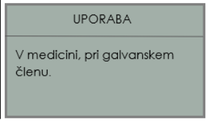

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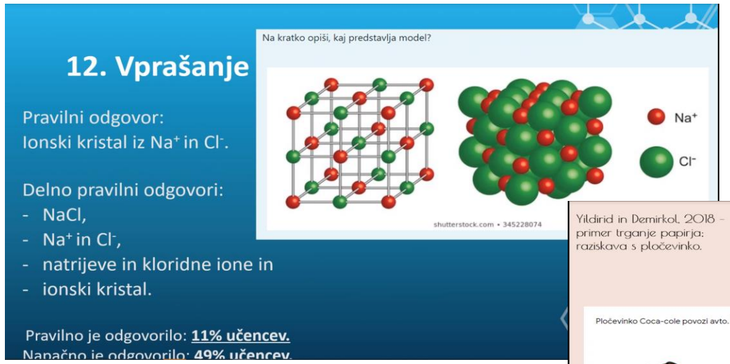

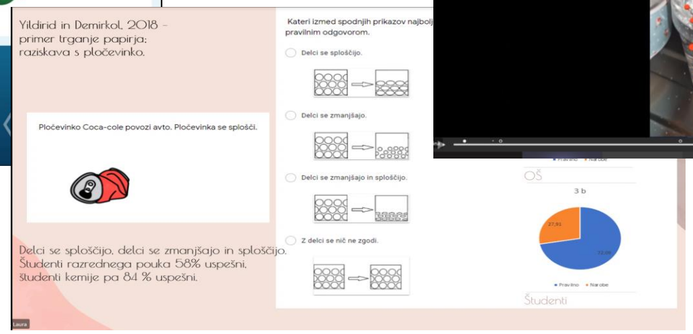

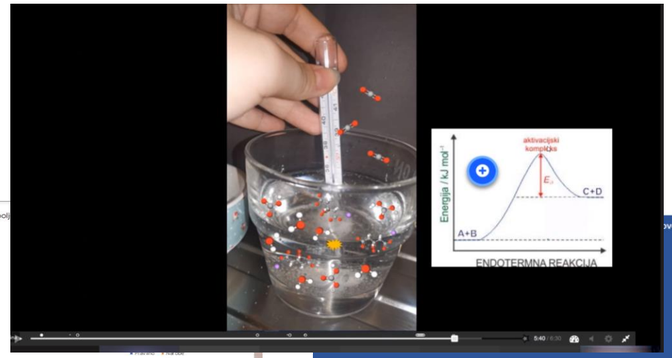

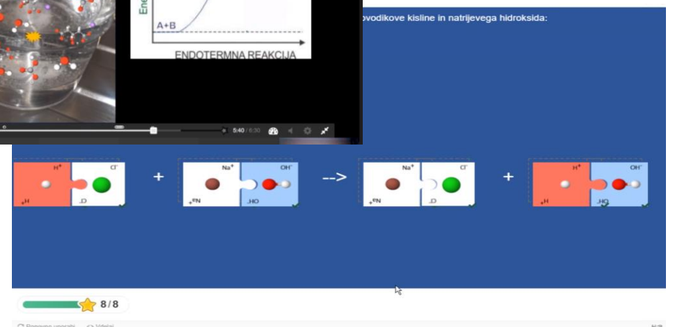

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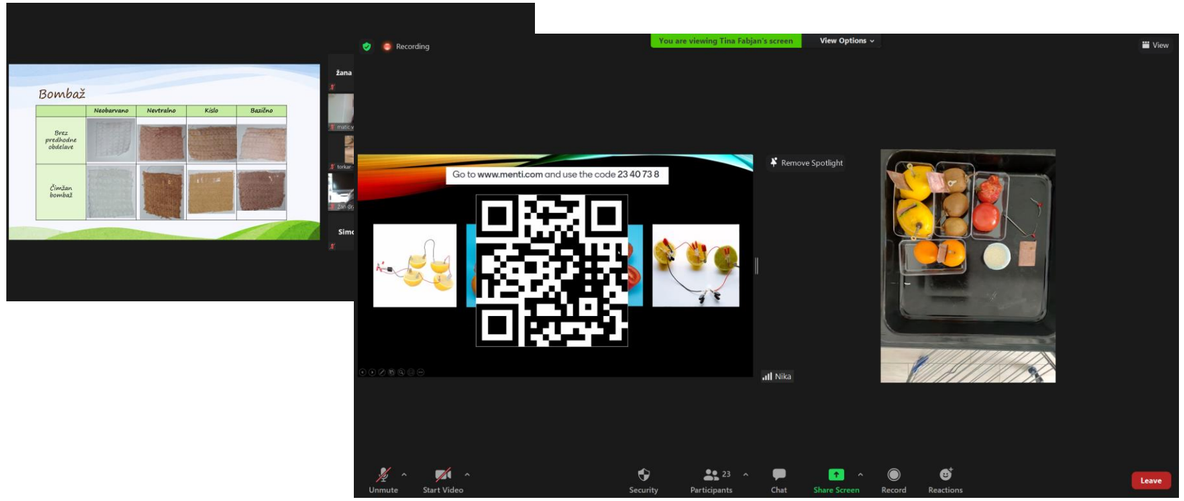
TEME DELAVNIC	IZVEDBA
KemikUm raziskuje odpravo na Enceladus	četrtek, 17. 12. 2020
KemikUm raziskuje pridobivanje barvil iz tujerodnih invazivnih rastlin	torek, 15. 12. 2020
KemikUm raziskuje razkužila	ponedeljek, 21. 12. 2020
KemikUm raziskuje alternativne vire energije	ponedeljek, 4. 1. 2020
KemikUm raziskuje pomen hladilnih tekočin v avtomobilski industriji	torek, 5. 1. 2020



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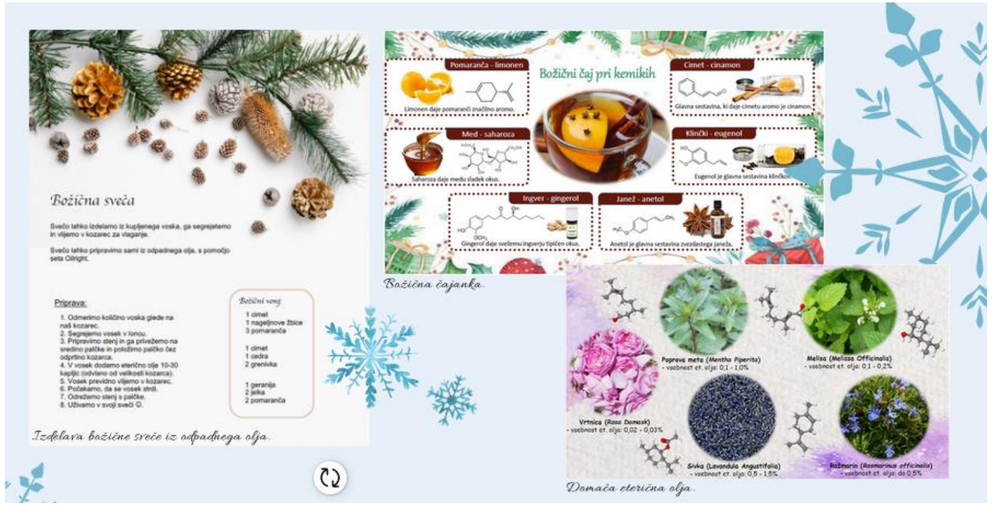
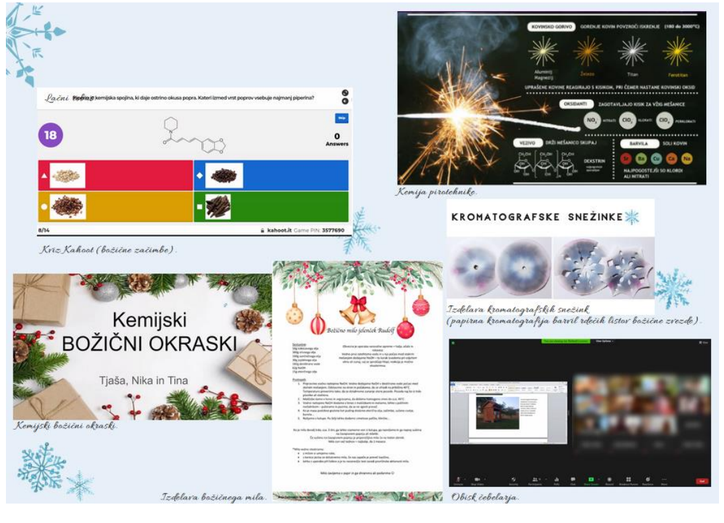
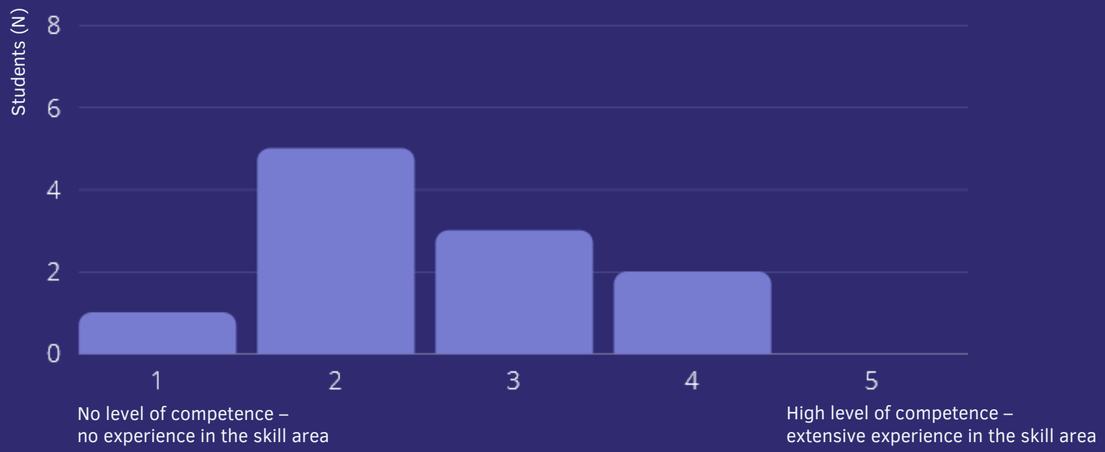




Students‘ opinion on the acquired competences

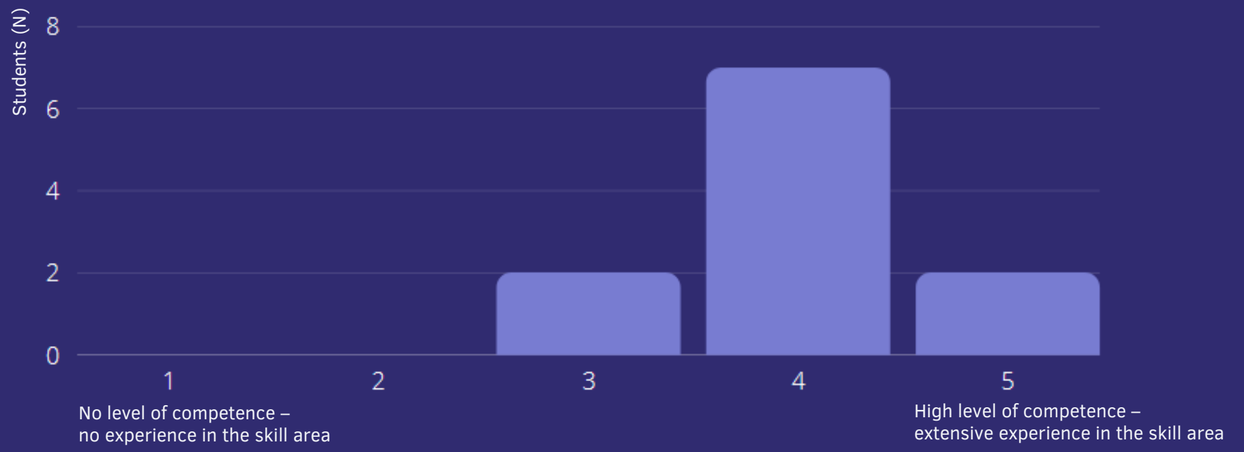
BEFORE THE IMPLEMENTATION OF THE SUBJECT

Table 1: Students‘ assessment of their ability (as a chemistry teacher) to implement project-based learning approach in chemistry lessons on a scale of 1 to 5.



AFTER THE IMPLEMENTATION OF THE SUBJECT

Table 2: Student assessment of their ability (as a chemistry teacher) to implement project-based learning approach in chemistry lessons on a scale of 1 to 5.



Students‘ opinion on the acquired competences

Students‘ thoughts on using different ICT options to support the implementation of project-based learning, e.g. (1) collaborative environment in the general channel in MS Teams - for group meetings, (2) collaborative environment in the channels of individual project groups in MS Teams, (3) online classrooms of the course, (4) videoconferencing environment Zoom, etc.

»In my opinion, the course went smoothly through MS Teams, the groups in the channel are very useful as we can use them outside the lectures. The online classroom is adequate and transparent. Zoom is OK, but I like MS Teams better.«

»Working in the collaborative environment MS Teams was great for me because we were able to solve tasks quickly while "keeping in touch" with each other so that we could quickly solve problems as they arose. I have a positive opinion of the collaborative environment. The structure and organization of the online classroom is very good.«

Students‘ opinion on the use of PBL approach

Students‘ opinion of why they would use the PBL approach in chemistry lessons.

»Because I think it's great for differentiation. It's appropriate for all students - they can determine their own role in the project and we as teachers can address the different interests of the students.«

»I would use PBL to allow students to learn in a different way, bring them closer and encourage them to participate more in subject activities. PBL also allows, a great way to assess students a little differently than usual.«

»It provides a different way to assess students' knowledge, improve students' attitude towards chemistry, it makes learning chemistry more interesting and fun, it allows students to become scientists.«

Students‘ opinion on the use of the portfolio in assessment

Students‘ opinion / experience on using the project portfolio to evaluate PBL.

»Portfolio evaluation is good, because you get the evaluation on the spot. Getting a grade is therefore gradual, it is distributed so it is less stressful.«

»I think it's a great way to evaluate what we have learnt in a different way than usual - through a written test.«

»Using a portfolio seems to me to be a good way to assess because students can show their knowledge in a different way.«

Reflection on the transfer of experience in future implementations of the subject

In all four PBL cases it is useful to keep the ICT support used for the implementation of the subject: online classroom (Moodle) - access to general information about the course, schedule of course implementation, materials for PBL, assignment (Turnitin) and assessment.

In all four PBL cases it is useful to keep the ICT support used for the implementation of the subject: collaborative environment (MS Teams) - the possibility of videoconference meetings with all students, the possibility of videoconference meetings of project groups, student collaboration in specific channels of project groups.

In developing teaching and learning tools to overcome student misconceptions in chemistry (2. PBL) it makes sense to communicate about the possibility of using individual online classrooms Moodle in the future - the experience students gain during their studies is directly transferable for use in the school setting.

Reflection on the transfer of experience in future implementations of the subject

It is important to continue the collaboration with schools (2. PBL and 1. E - PBL) - exchange of experiences between active and prospective chemistry teachers, insight into the school practice through a research approach.

Limitation of the distance learning, which also relates to the project-based learning is that it is not possible to carry out experimental work in a laboratory (1. E - PBL and 2. E - PBL). Due to this limitation, this year the experimental workshops of the 1. E - PBL were conducted online with the participation of students from primary schools. The students developed experimental workshops using substances that we can find at home, which is an interesting opportunity for reflection in the future.

References

Characteristics of a 21st Century Learner. (2016). Retreived from https://smiletutor.sg/facilitating-21st-century-learners/

Ferk Savec, V. (2010). *Projektno učno delo pri učenju naravoslovnih vsebin.* Maribor: Univerza v Mariboru Fakulteta za naravoslovje in matematiko.

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