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PAPER PROPOSAL FORM

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Proposal

Title: *A transdisciplinary project-based learning approach setting the ground for launching the Ovidius University Center for Innovation and Technology Transfer*

Abstract (maximum of 150 words): This presentation highlights an initiative to improve teaching effectiveness by means of transdisciplinary projects involving students from different study programs, working in teams to solve real problems, originated from the community. The initiative is part of a wider effort to transform education, research and engagement with the community, endeavour to which Ovidius University of Constanta is committed. To address this strategic goal, the university has decided to establish a Center for Innovation and Technology Transfer and applied for financial support from European structural funds to implement it. Aside from building the infrastructure and creating a platform for communication between the university and the community, another key task, the training of the academic staff in project-based learning, is underway. In this session, we will report on the design and implementation of the teacher-training course on active learning technologies.

Key words (up to five): project-based learning; evidence-based teaching; soft skills; transdisciplinary training

Has this paper previously been published/presented elsewhere? No.

Text of paper (maximum of 3000 words, excluding references):

Introduction/Background. Despite the rapid evolution of education technologies across European universities, in line with expectations from students and society, Romanian higher education institutions (HEI) have remained reluctant to change, particularly in adopting more active[1,2] and inductive[3] learning techniques. For instance, although problem-based teaching methods were explored by some medical schools as early as the 1960s,[4] becoming over time the norm in numerous universities worldwide not just for medical training but for teaching in any discipline,[5,6] Romanian HEIs seem still hesitant in applying such teaching models. Even though there is a growing tendency to assign problems that are more relevant to the present students, these problems are seldom open-ended and do not necessarily encourage the interaction of a team of students. Similarly, although some form of project-based learning[7,8] has had a long tradition in the technical programs of Romanian universities, as was the case worldwide,[9] the approach used has not followed all the present requirements[10] and has not been extended to other fields of study. In this context, recognizing the need to promote a more student-centred approach, Ovidius University of Constanța has set as one of its strategic goals to encourage the use of active learning techniques.

Ovidius University is a mid-size comprehensive public university established in 1961 in the port-city of Constanța, on the Black Sea coast of Romania. The mission the university pledged to serve is triple, emphasizing education at European quality standards, research for sustainable development and "Blue Growth", and engagement with the community for solving regional problems in the Black Sea and beyond. To better accomplish its mission, Ovidius University has designed a Center for Innovation and Technology Transfer (CITT), with the role to combine the training of students with research and innovation as well as with addressing the problems of the communities.

The CITT will host the Digital Innovation Hub, an entity that was selected by the European Union for financial support from the Smart Factories in Central and Eastern European (EU13) program to support the local business in the effort to digitalize their operations. Given the comprehensive nature of Ovidius University, other directions of smart specializations are also covered, as the laboratories of the centre will allow students and academics, together, to approach a very diverse set of topics. Examples range from virtual and augmented reality to cybersecurity, from digital fabrication and prototyping to autonomous vehicles and drones, from audio/video digital design to ecotoxicology and biotechnologies. With a new building and modern equipment, the centre is intended to attract talented students and outstanding academics from the region and beyond.

Designing the CITT has represented a unique challenge for the managerial team of Ovidius University, which imposed various rounds of consultations. In this process, the Ovidius University team applied design thinking approaches, with support from an international team of IBM experts, engaged in the corporate responsibility program of their company. Moreover, in conceiving the centre an entrepreneurial approach was used, with guidance from the Ain Center for Entrepreneurship, the University of Rochester.

While the proposal for establishing the CITT is under evaluation by European Union experts, Ovidius University acknowledges that aside from building the infrastructure two other pillars are needed to support the success of the centre. One such pillar is the effective communication between the university and the community, which has to be both ways. To better connect the students and academics of Ovidius University with the community, including here both the private sector and the public agencies and authorities, an online platform is being designed, inspired by a similar project developed by a partner higher education institutions, Trakya University of Edirne, Turkey. The platform is designed to foster the communication between the two parties, such that the beneficiaries can upload their needs, on the demand side, and find out about the offer of the university, on the supply side. The other pillar is the training in project-based learning of the academic staff who will supervise the transdisciplinary teams of students using the infrastructure of the centre. In the following, we will elaborate on the design and implementation of the teacher-training course on active learning technologies.

Purpose. The goal of the endeavour described here was to design and implement a project-based course unit devoted to train the trainers. The main expected outcome of the module is that teams of academics will be able to design a course unit by using a project-based learning (PBL) approach in which teams of students from different study programs complete a transdisciplinary project involving real world problems, originated from their community. Second, the experience gained by the academics taking the unit will provide some first-hand practice useful to implement the PBL unit they design. They will be familiar with *i*) assigning an overall project topic, *ii*) creating the environment for the students to assemble transdisciplinary teams, *iii*) assisting the teams to choose and clarify the goal of the project, *iv*) self-assessing the learning requirements, *v*) performing the critical bibliography search and the self-study, *vi*) working together to find various solutions and to choose the optimal one, *vii*) implementing that solution and *viii*) presenting the final results and reflecting on learning. Third, the trainees will be able to evaluate the technical skills as well as the soft skills acquired by the students, both as a team and as individuals.

Methods. As the existing experience in PBL is relatively scarce, we had to rely more heavily on a peer learning approach. Inspired by the online resources made available by the Buck Institute for Education[11] and other sources[12,13] we started the design of the training unit with the end result in mind. The strategic goal was to expose the academic staff to PBL methods and, more specifically, to prepare the lecturers who will jointly teach, using PBL methods, transdisciplinary teams of students, making use of the infrastructure of the Centre for Innovation and Technology Transfer. Starting from the overarching goal, we formulated specific objectives in the form of learning outcomes, as stated in the previous section.

In planning the unit, along with the objectives we also had to consider some constraints, particularly those regarding the time availability of the academics taking the training. A reasonable compromise seemed to be one with weekly meeting of about four hours, in a sequence of four weeks, totalling about 16 hours of direct interaction. Added to these meetings was the time required for self-study and preparation of various deliverables, estimated to at most 6 hours.

According to the activity plan, the first meeting starts with a description of the unit and a discussion of its relevance for the trainees. Initial questions regarding the role of the teacher in the present context, the student expectations of their teachers, the way we learn more effectively can set the ground for the general introduction of active methods in teaching. Simple and familiar examples of inquiry-based, problem-based and project-based methods used in various fields of study, can provide a minimal background for understanding the basics of active learning approaches as well as why they are the engine for deep learning.

Next, the general topic of the project was presented and carefully discussed, to check for consistency, whether it meets the criteria for good PBL driving questions[13] or not. Is the topic authentic and provocative? Is it open-ended? Can it incite the inquiry and facilitate the achievement of the learning outcomes? Does it stimulate teamwork and transdisciplinarity? Does it allow for accurate assessment?

Once the topic was presented and well understood, the next step was to assist the trainees in assembling transdisciplinary teams. As the target audience consisted of academics from very diverse fields of study, from different departments, who may not know one another, the forming of teams is a crucial step for the success of the entire effort. As icebreakers we used self-presentations and quick answers to simple questions, followed by short exercises regarding interests and classes taught. Next, the trainees proposed several project topics each, listened carefully to all other proposals made by their peers, and approached the ones with compatible proposals to explore possibilities of collaboration.

According to the initial plan, the first day should have ended with the teams clarifying the topic of their common project and its main goals, followed by an analysis of the needs for more information. The teams should have performed a self-assessment of their knowledge and decide on the notions that need to be learned. As assembling teams required a longer time than initially planned, these activities were postponed for the second meeting.

During the second meeting, the first part was dedicated to a review of what was accomplished in the course of the previous one. The deliverables regarding the project topic were reviewed by all teams and briefly shared with the entire class, to observe common patterns as well as possible obstacles. The special emphasis was on choosing carefully appropriate learning outcomes.

After performing the critical bibliography search and the group-study, the key activity during the second meeting was the planning. The goals set forth previously, now became operational, with clear actions, a timeline with landmarks, deliverables and indicators of success. The plan also specified the roles and responsibilities of each team member.

The third meeting was devoted to teamwork on preparing various deliverables (for instance regarding the evaluation criteria for the learning outcomes and the project deliverables, the team and the individual

student assessment principles or standards, the self-evaluation benchmarks etc.) and the final presentation. The last meeting was allocated for assessment, which was complex and multicriterial, including self-assessment, peer evaluation and instructor's appraisal.

Results. A group of 82 academics from all colleges and departments registered for the training, interested in exploring active learning methods, however, only 37 completed the course. The trainees manifested initial interest in methods to stimulate students to work in teams to solve problems, to be more assertive and creative, to take control and responsibility in their learning, to improve their self management. Moreover, they showed curiosity for developing some competences in planning and implementing a course unit, in course management in communication and teamwork.[14]

The results of the course were measured with a survey which questioned the effectiveness of the endeavour and the overall degree of satisfaction with the course. During the actual classes, the opinions and knowledge of the trainees were probed with Kahoot and Mentimeter surveys and tests.

The first observations drawn from the implementation revealed the awareness that a change in teaching methods is, indeed, necessary. However, the change is hindered by various obstacles. The academics recognize that trying out new teaching methods require academics to exit their comfort zone. Specifically, problem-based teaching with a transdisciplinary approach requires an enormous amount of preparation before the classes start and prior to each class. Although in subsequent classes the time and effort needed for planning decreases, the first experience may be discouraging.

The most challenging task for the academics is drafting an authentic and provocative project topic. Identifying project topics that can inspire students and challenge them so that they acquire the professional competences required by the curriculum is a demanding activity. Distinguishing transdisciplinary topics, that allow students from different programs to discuss, study and work together for carrying out the project poses additional problems.

Additionally, the responses of the trainees refer to the effort required when the accent is shifted from lecturing to coaching. Academics may need new skills for the class management and the proper guiding of students during their project activities. The time to acquire such skills varies from one individual to another, that is why planning and prior preparation are crucial for the success of the entire process.

Given the initial effort required, young academics are more likely to embrace the change than those who contemplate their retirement. University management has to be aware of such obstacles and design packages of incentives to stimulate the adoption of novel teaching methods.

The trainees pointed out that the students may also be reluctant to new teaching methods, at least in the early stages. By shifting the effort from the lecturer to the student, who will have to actively participate in learning, the pressure on and the amount of work of the students increase, particularly during the academic year. Students who tend to study mostly during the final weeks of the semester will find themselves forced to distribute their effort more evenly through the year. Although for some the change may be disruptive, for most learning by projects that are relevant for their future career should be stimulating in the long term. Therefore, the transition should be gradual, and the classes taught using PBL have to be introduced progressively, allowing the students enough time to adjust.

As a follow up to the course, we decided to have monthly meetings to deepen knowledge and discuss class experience. Moreover, at the end of the academic year we plan to have a colloquium, during which the participants will report on and answer questions on the progress made in implementing active learning methods.

Conclusions. We reported on a four-week training course designed to prepare our lecturers to design and implement a project-based course unit particularly for making use of the infrastructure, which will be

available in the Ovidius University Center for Innovation and Technology Transfer. We use PBL methods to train our academics to build transdisciplinary teams, to work in such teams to identify authentic and provocative project topics, to clarify goals when the problems is open ended, to self-assess learning requirements, and perform critical bibliography searches, to present the results to their peers and evaluate one-another.

The necessity of changing teaching methods in accordance with the expectations of our demanding students and the needs of the modern society is generally accepted. Although some with reluctance, academics recognize that universities have to remain in close connection with their communities and respond to the dynamics of the society. They acknowledge that if society changes, universities should transform too.

The feedback received during the implementation of our project indicates that the young academics are more open to change and more ready to rethink and reposition their didactic endeavour accordingly. This includes new teaching methods and new assessment approaches.

The use of online platforms such as Google Classroom, Kahoot, Mentimeter and other such instruments allow for fast and accurate feed-back. The data which are being collected permit an evidence-based teaching approach, offering the university management useful information for further decision making.

The information being collected, particularly regarding the obstacles in the implementation of PBL, is useful in designing new university policies. The need for a gradual change, for pilot studies, for training have to be addressed in order for the process to be successful. Moreover, proper incentives need to be identified to motivate academics in embracing the change. And, finally, support systems have to be designed such that those who engage in the transformation process receive feed-back from peers and are encouraged to not give up but continue their enterprise. Accepting partial failure as a possibility and acting with tenacity to improve the teaching methods will probably be the most important message of our endeavour.

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