New Trends and Issues Proceedings on Humanities and Social Sciences

Issue 5 (2017) 95-103

ISSN:2421-8030
www.prosoc.eu

Selected paper of 5th International Conference on Education- IC-ED-2016, 26-28 May 2016, South East European University, Skopje Campus.

Interdisciplinary approach to project based learning: Experience through student workshops

Mojca Foski [a], University of Ljubljana Faculty of Civil and Geodetic Engineering, Slovenia
Gasper Mrak [b], University of Ljubljana Faculty of Civil and Geodetic Engineering, Slovenia
Alma Zavodnik Lamovsek [c]*, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia

Suggested Citation:
Foski, M., Mrak, G. & Zavodnik-Lamovsek, A. (2017). Interdisciplinary approach to project based learning: Experience through student workshops. *New Trends and Issues Proceedings on Humanities and Social Sciences*. [Online]. 05, pp 95-103. Available from: www.prosoc.eu

Selection and peer review under responsibility of Prof. Dr. Milan Matijević, *University of Zagreb,* Croatia

Abstract

In this article we wish to describe the experience of using interdisciplinary studying approach to project based learning (PBL) within the framework of the master study program in Spatial Planning which is run at University of Ljubljana, Faculty of Civil and Geodetic Engineering. The article is intended mostly for the purposes and objectives of interdisciplinary study in PBL, how we can use it and perform it in study processes, what are the expected results and obstacles which come across in the process. Student workshops are the most appropriate forms of such learning approach, which means cooperation among educational institutions and local communities. The purpose of this article is to discuss the key elements of interdisciplinary approach to PBL from the theoretical perspective and then show its significance and practical application in the higher education study process. The aim of the analysis of student workshops, which were held as part of various courses in the field of spatial planning over the past 15 years, is to show advantages and disadvantages of interdisciplinary approach to PBL for teachers, students as well as for the collaborating local communities. To gain insight into the actual opinion on student workshops of the local communities we created an anonymous on-line questionnaire. The results show a high satisfaction rate of the local communities with the student workshops and with the results regarding the local spatial development challenges in the area of the municipality involved. In the conclusion, the importance of interdisciplinary approach to PBL is expressed as teaching and learning method to link theoretical and practical knowledge. Moreover, the local communities are also aware that the student workshops are mostly a form of learning process – they are very supportive of it, and have high hopes for future in-depth cooperation with educational institutions.

Keywords: interdisciplinary approach to project based learning (IPBL); student workshops, University of Ljubljana; Faculty of Civil and Geodetic Engineering; local communities; survey;

*ADDRESS FOR CORRESPONDENCE: **Alma Zavodnik Lamovsek**, University of Ljubljana Faculty of Civil and Geodetic Engineering, Slovenia.
E-Mail Address: alma.zavodnik@fgg.uni-lj.si / Tel: +386 1 241 85 00

1. Introduction

Master study program Spatial Planning at the Faculty of Civil and Geodetic Engineering, University of Ljubljana (UL FGG) is a young study program. The performance of this program started in school year of 2011/2012 when the Bologna principles were introduced to Slovene high school educational system. Even though young from this perspective, it has more than 35 years long tradition in interdisciplinary study program of urban and spatial planning (which was later on transformed into a study program which the article is about). Besides this long tradition study program, different subjects from the field of urban and spatial planning were performed within university study programs of geodesy, civil engineering, architecture and geography, all within University of Ljubljana.

The traditional as well as the new study program designed are highly interdisciplinary. The curriculum covers urban and spatial planning contents as well as related issues such as law, economy, environmental protection, spatial sociology, cadastral land rearrangement, real estate management etc. (Table. 1). Application of subjects which are directly connected to methodology of spatial planning, urban and rural planning etc. is also based on project work. The article deals with the experience of the interdisciplinary studying approach to project based learning (IPBL) which is performed in the frame of second cycle studying program Spatial Planning at the Faculty of Civil and Geodetic Engineering, University of Ljubljana. The main purpose of the article is to enlighten the aim and the goals of the interdisciplinary studying approach to project based learning, to explain the ways of its usage and performance in the study process and to display the expected results as well as the obstacles which appear within the process. The years of practice proved that the student workshops are the best form of project based learning, because they, besides the study process, connect the educational institutions and local communities where most of workshops are performed. The main aim and benefit of this form of learning is that all stakeholders gain positive experience from cooperation. Educational institutions get the opportunity to perform learning process in realistic environment. Students work on concrete questions and tasks while the teachers and the experts from practice lead them through theory and practice of interdisciplinary based project learning. Local community benefits through new ideas and solutions for the concrete problems and through public involvement in the problem consideration.

Table 1. Second cycle studying program Spatial Planning curriculum

	II year	**ECTS**
1	Spatial statistics	4
2	Regional planning	4
3	Regional and urban economics	3
4	Infrastructure systems with seminar	10
5	Real estate management	3
6	Elective course II	6
7	Project assignment with seminar	10
8	Master Thesis	20
	TOTAL	**60**

The article will present the IPBL method as a successful learning method which has more benefits than weaknesses for students as well as for teachers. The definition of IPBL is defined at the beginning of the article, which than continues with presentation of the benefits and the weaknesses from the point of view of teachers and students and the explanation of the importance of IPBL for the local communities.

The later was also cross checked through the survey

2. Methodology

A long tradition of Spatial Planning study at the UL FGG has already been mentioned in the introduction. The IPBL also has long tradition which is proved by the analysis of the student workshops which have been carried out within the last 15 years in the frame of different subjects in the field of spatial planning (Table 2.). All the workshops which were carried out between 2000 and 2016 were analyzed according to the end user of the workshop, the location, the problem considered and the involved stakeholders. Stakeholders are divided among faculties which through the work of their students actively cooperated in the workshops and other institutions, mostly from the local environment. The share of students coming from the UL FGG and from the other faculties was taken into consideration in the analysis as well.

The strengths and weaknesses of the IPBL were analyzed in the second step on the basis of literature and practical experience form the workshops that were carried out, from the point of view of the students as well as of the teachers. Empirical part of the analysis has been done on the basis of many years of experience (of the authors of the article) in high school education. The main question was if and how the IPBL method reaches the provided learning goals. The semi structured interviews were carried out with students, in which the main questions were the workshops' performance, learning method, achievement of new knowledge and communication skills. One of the most important issues was whether the IPBL method leads to the expected expert competences.

The third step was the anonymous web survey on satisfaction of local communities with student workshops and their results. It was carried out in May, 2014. The questionnaire was short and the interviewees needed 5-8 minutes to fill out (see also Zavodnik Lamovsek, Mrak, Foski, 2015). The main goal of the anonymous web survey was to find out whether the student workshops were useful for the cooperation with high school educational institutions for local communities and to analyze the strengths and weaknesses of such cooperation. The survey was not limited to local communities for which the workshops were carried out, all 212 local communities were addressed to cooperate. We are aware that many local communities themselves use this method for dealing with problems in the fields of spatial planning and land management.

The survey consisted of five content sections, but only the analysis of answers from the second and the third sections are presented in the article.

Section 1 – General data on interviewee (position in the local community), data on (previously carried out) student workshops and data on information on student workshops.

Section 2 – Questions on workshops' implementation and stakeholders' involvement.

Section 3 – Evaluation of workshops and their benefit for the local community.

Section 4 – Follow up recommendations and personal remarks of the interviewee.

Section 5 – Questions for local communities which have no experiences with student workshops.

56 local communities answered the survey, which represent 26% of all local communities in Slovenia. The pattern was assessed enough representative to continue with the analysis of the survey result

3. Interdisciplinary approach to project based learning

Interdisciplinary approach to learning is usually defined as a learning method where teachers of different professions cooperate in curriculum compilation and in study process performance (Jones, 2009). The learning method is used when a certain problem needs to be considered and researched from different aspects. The solutions are then merged into an integral and coherent result (Internet, 3). This method is used also when we want to direct the students to learn about different professions and their specific work. Educated in this way the students are directed to get knowledge and skills of interdisciplinary work.

The project based learning is in theory defined as an efficient method for application of theoretical knowledge and obtaining practical skills through problem solving (i.e. Krajcik, Blumenfeld, 2006; Larmer & Boss, 2013). According to the definition of PBL we can assess that project work is based on challenges and real problems which students address by using different methods and by this get the chance for relatively independent work in given time frame. Their outcomes are real products or presentations which are presented or published at the end of the project work. The students learn the relationships among the concept, theory learning and the skills, which are gained through active project based work (Gallagher, 1997).

Spatial Planning study program at UL FGG combines both learning methods into interdisciplinary project based learning (IPBL). It is regularly performed in the form of student workshops. The method is similar to classical PBL method and is performed in five basic steps:

1. Problem definition.
2. Verification of theoretical basis in practice/connection to real environment.
3. Open discussion on defined problems with different stakeholders.
4. Learning of different techniques and tools of project work (GIS, IKT).
5. Public presentation and publication of student workshops' results.

The basic frame for workshops has been upgraded with interdisciplinary approach, not only in the sense of interdisciplinary learning but also in the sense of interdisciplinary groups of students who are coming from different faculties (Figure 2). Other stakeholders, i.e. experts from practice and different institutions involved in specific topics (Institute for the protection of Cultural Heritage, tourist organizations) and contributed to integrity of interdisciplinary approach to project learning. All stakeholders involved in the contribution to better solutions of spatial planning and land management problems were taken into consideration on concrete location and in real time.

4. Results

Spatial planning is by its nature an interdisciplinary area of expertise where project work is the typical working method. The spatial planning and land management related issues, taught at the Faculty of Civil and Geodetic Engineering, are closely related to knowledge and skills of numerous professions and fields of work such as architecture, landscape architecture, geography, geology, construction (static, traffic engineer, public infrastructure engineer) and civil engineering. Numerous professions besides above mentioned cooperate in the spatial planning process according to the nature and the meaning of the problem considered, i.e. protection and management of waters, arable land and forests, protection of cultural heritage and nature, sociology, demography, economy and others (compare with Zavodnik Lamovsek & Fikfak 2010). The analysis of workshops, carried out by the principles of IPBL, proved that they all satisfy the criterion of interdisciplinarity, for at least three professions cooperated in each of them (Table 2. and 3.), the high school education institutions as well as other stakeholders. The criterion of project learning (PBL) is completed by the method of organization and workshops realized, which always consist of interdisciplinary student groups, field work, theory verification on concrete cases in real situations, open discussion with different stakeholders, including public and final public presentation of the work results (more about in Zavodnik Lamovsek, Mrak, Foski, 2016).

Number of student workshops	Year of the workshop	End user of the workshop	Problem area	Content of the workshop	Other involved institutions and other stakeholders (interdisciplinarity)
5	2000, 2004, 2008, 2014, 2016	Local community, Local tourist organization, Ministry of education (science and sports)	Countryside	Elaboration of measures and conditions for countryside development, development plan for the tourist-recreational area	Biotechnical Faculty, UL, Faculty for the Architecture, UL Faculty for the Architecture, Zagreb University Institute for the Protection of Cultural Heritage Local entrepreneurs and tourist organization, Local community and interested
10	2001, 2003, 2005, 2007, 2008, 2009, 2010, 2012 (2 workshops), 2013	Local community	Settlements with diverse role in urban system (rural settlements, local centers, small cities/towns)	Settlement arrangement proposal, restoration of old town core, arrangement of municipal center, development potentials of urban settlements for their gravitational areas, treatment of specific themes such as arrangement of roadside space between the new highway and the settlement	Biotechnical faculty UL, Department for Landscape Architecture Faculty for architecture, UL Philosophical faculty, UL Department for Geography Interested local companies, Local community, Primary schools, Interested local residents
1	2013	Regional development agency	Statistical region	Ljubljana on the junction of V. and X. Pan European transport corridors	Philosophical faculty, UL Department for Geography, TU Vienna, Local communities
1	2015	State (Ministry of the Environment and Spatial Planning)	Slovenia	Spatial development vision for Slovenia 2050	Philosophical faculty, UL Department for Geography, Biotechnical faculty UL, Department for Landscape Architecture Faculty of Humanities (Geography master study), Primorska university interested experts

Table 2. Overview of the realized student workshops according to their end user, problem area, content of the workshop and stakeholders involved.

The analysis revealed that the number of students, teachers and stakeholders involved changes according to problem area and content of the workshop (Table 3.). Local communities see the greatest benefit from workshops on urban space arrangements, the largest number of workshops were the workshops on treatment of settlements with diverse role in urban system. These workshops also involved the greatest number of students and institutions/stakeholders. Second largest numbers of workshops were the workshops on revitalization of rural areas and development of tourism and agriculture in these areas. Initiatives for student workshops on regional or national levels are rare. Only two were carried out in the whole analyzed period (1 in 2013 and 1 in 2015). Regardless of the problem area and the number of students involved, the number of teachers involved in all workshops was constant (3 to 5), which on one hand provides the interdisciplinarity also from the teaching point of view and on the other hand the constant high performance of IPBL.

Number of student workshops	Problem area	Number of different involved institutions (faculties in brackets)	Number of involved students from UL FGG	Number of involved students from other faculties	Number of all students involved	Share (%) of involved students from UL FGG	Share (%) of involved students from other faculties
5	Countryside Settlements with diverse role in urban system (rural settlements, local centers, small cities/towns)	10 (4)	75	73	148	50,68	49,32
10		22 (4)	159	99	258	61,63	38,37
1	Statistical region	8 (2)	3	15	18	16,67	83,33
1	Slovenia	5 (4)	16	59	75	21,33	78,67
17		44 (6*)	253	246	499	50,70	49,30

Table 3. Overview of students' cooperation in workshops between 2000 and 2016.

The next analytical aspect was the quality of student workshops, carried out by the principles of IPBL, from the perspective of students and teachers. The theoretical introduction of interdisciplinary approach to project learning (IPBL) proved the connection between both learning techniques. The process aims to present the problems to the students from the aspect of different professions on one and to link the interdisciplinary approach with PBL on the other side. The main analysis results are summarized in the overview of strengths and weaknesses of IPBL as seen by students and teachers at UL FGG (Table 4). The outcomes were compared with the results of similar surveys of other authors (Filo, Nekolova & Orgonas, 2016; Ivanitskaja, Clark, Montgomery & Primeau, 2002; Jones, 2009; Medmrezje, 2007 a; Medmrezje & Viterbo, 2007; Puklek Levpuscek & Marentic - Pozarnik, 2005;). The comparison proved that the combination of interdisciplinary approach and the PBL is a successful formula which enables reaching defined educational goals as well as professional competences.

IPBL strengths		IPBL	
STUDENTS	**TEACHERS**	**STUDENTS**	**TEACHERS**
Development of flexible, critical and proactive thinking.	Direct guidance of students towards getting specific knowledge and skills.	Communication obstacles among certain members.	Limited control over the learned material and achievement of learning goals.
Ability of performing analogies and comparisons among different aspects of the problem/subject.	Compliance of individual differences among students.	Different professional terminologies of different study programs at the beginning cause confusion.	Preparation for the IPBL method of work is time consuming and is more complex than preparation for the classic learning method.
Understanding of different professions and their limitations.	Easier encouragement of students to focus on problem solving, critical thinking, cooperation, communication and seeking of innovative solutions.	Apparent contradiction of theoretical backgrounds of different professions.	Sophisticated organization of educational process due to changing of locations.
Ability to estimate the value of knowledge gained.	Encouraging of student creativity and self-initiative.	Numerous aspects of a problem considered may cause to big complexity.	Ensuring motivation and involvement of all involved students may be a
Development of balance between subjective and objective thinking.	Interdisciplinary approach to problem solving.	Cooperation of different professions makes difficult / enables in-depth study of individual aspects.	Evaluation of individual students due to group work is more difficult.
Achievement of different memory, cognition and learning skills.	Direct application of theory on practical projects.	Complexity of approach may cause worse transparency of learning material and learning goals.	Difficult compliance of individual differences among students working together in the same
Ability of defining the uncertainties and paradoxes and development of unconventional thinking.	Direct connection of study process with practical experiences in problem solving.	Ignorance of different working methods i.e. open exhibition, presentation of conclusions cause initial difficulties.	Higher costs of educational process in comparison to classical method.
Ability of integration of apparently different issues and contexts.	Problem solving through field work and work in real problem environment.		
Enlarged capacity of understanding the individual problem from different angles.	Possibility of direct presentation of different methods for problem solving.		
Ability of integration of individual issues and elaboration of synthetic conclusions.	Possibility of direct communication with different stakeholders and the public.		
Establishment of critical distance to own work and the work of other members of the group.	Involvement of students in the public presentation of the results.		

Table 4. Strengths and weaknesses of IPBL as seen by students and teachers at UL FGG

The role and the contribution of the workshops for the future spatial development of the local community and satisfaction with workshop execution/performance were verified in the last part of the survey. The survey results proved that 52% of local communities experienced student workshops in the

last 15 years, 28% of local communities have no experiences with student workshops and 20% of local communities do not remember or have no data on student workshops.

Student workshops were highly evaluated by local communities. 96% of local communities founded student workshops as an appropriate method for treatment of spatial planning issues. Students were variegation for the local environment; they influenced the interest of local inhabitants as well as of municipality employees (83%) for the problems of the workshops. As the results of questionnaires have shown, the expectations were fulfilled in 89% of local communities, 10% of local communities were at least partially satisfied (Table 5. sum of column 3 and 4).

Questions/statements		**Answers**			
		1 I do not agree	**2 I partially agree**	**3 I agree**	**4 I completely agree**
1.	Student workshops are an appropriate method for treatment of spatial planning issues.	0 %	3 %	53 %	43 %
2.	The presence of students encouraged the local inhabitants for active cooperation in local environment (more intense public participation, public debate, raised interest for problems and activities of local community …).	3 %	24 %	52 %	21 %
3.	Decision to execute/perform the student workshop was encouragement and inspiration for the municipal administration.	4 %	23 %	38 %	35 %
4.	The results of the student workshop fulfilled expectations.	0 %	10 %	55 %	34 %

Table 5. Satisfaction of local communities with executed/performed student workshops (Zavodnik Lamovsek, Mrak & Foski, 2015)

The survey analysis also shows high level of satisfaction of local communities with student workshops and their answers to spatial development questions in the area of local community. 64% of local communities consider the results good enough for further consideration and application. Some of the results were actually used as expert basis for elaboration of municipal spatial plans or some other municipal projects.

5. Conclusion and discussion

The study of literature revealed that the origins of interdisciplinary approach to study were known in the 30s of the 20th century (Jones, 2009), while the origins of PBL belong to the middle of the last century (Thomas, 2000). Both approaches to high school teaching became more and more popular since the 80s of the 20th century. They are both indispensable parts of all advanced and innovative curriculums. Both methods are merged into master study program Spatial Planning at the UL FGG, which has been successfully performed over the last 15 years. An important fact has matured that only knowledge and understanding in the world of fast changes are not enough anymore (BIE, 2015). Advanced and innovative approaches to learning are gaining importance. IPBL helps the students and encourages them to learn real problems from practice. It shows them the challenge of active and engaged learning which leads to in-depth insight into problems considered. Different researches prove that learning by these methods helps students to retain more knowledge in comparison to classical teaching process through lectures and literature study (Levpuscek & Pozarnik, 2005).

The conclusion stresses also the aspect of IPBL as fun learning method and an interesting method for gaining the organizational and research skills for the students as well as for the teachers (BIE, 2015).

The results of survey on IPBL at UL FGG underline the facts that were described. They also confirm the presumption that IPBL has more strengths than weaknesses for all stakeholders involved. Regardless to some weaknesses we can conclude that IPBL essentially helps in achievement of learning goals and professional competences. IPBL upgrades the study in comparison to the classical curricula. Students themselves are able to combine numerous fields of knowledge. IPBL connects students in the frame of the faculty and offers possibilities for their personal development.

References

Bie (2015). *Gold standard PBL: Essential project design elements*. Buck Institute for education. Retrieved from http://bie.org/about/what_pbl (Available 01. 02. 2016)

Bie (2015). *Why project based learning (PBL)?* Retrieved from http://bie.org/about/why_pbl (Available 01. 02. 2016)

Filo, P., Nekolová, V. & Orgonás, J. (2015). Experimental educational methodology of project – based learning at the University of Economics in Bratislava, Journal L'Association 1901 "SEPIKE". Poitiers: L'Association 1901 "SEPIKE", 26-30.

Gallagher, S.A. (1997). Problem-based learning: Where did it come from, what does it do, and where is it going? *Journal for Education of the Gifted, 20* (4), 332-362.

Ivanitskaya, l., Clark, D., Montgomery, G. & Primeau, R. (2002). Interdisciplinary learning: Process and outcomes. *Innovative Higher Education, 27* (2). Retrieved from

https://www.umaine.edu/sustainabilitysolutions/faculty_resources/pdfs/Ivanitskaya.pdf (10.01.2011)

Jones, C. (2009). Interdisciplinary approach - Advantages, disadvantages, and the future benefits of interdisciplinary studies, *ESSAI (7*) Retrieved from http://dc.cod.edu/essai/vol7/iss1/26 (Available 05. 06.2016)

Krajcik, J. S. & Blumenfeld, P. C. (2006). *Project–based learning in: The Cambridge handbook of learning sciences*. Sawyer R.K. (Ed.). Cambridge: Cambridge University Press. Retrieved from https://www.researchgate.net/requests/ (Available 08. 02. 2016)

Larmer, J. & Boss, S. (2013) PBL for 21st century success. California, USA. Buck Institute for Education. Retrieved from http://bie.org/images/uploads/general/8b7e4654e1e2d11ec8aaca30f8d5e2f1.pdf (Available 03.02.2016)

http://www.ltscotland.org.uk/learningteachingandassessment/learningacrossthecurriculum/interdisciplinarylearning/about/what.asp(available 9. 6. 2016)

http://www.qualityresearchinternational.com/glossary/interdisciplinary.htm (available 9.6.2016)

http://serc.carleton.edu/sp/library/interdisciplinary/what.html (Available 30. 05. 2016)

Puklek-Levpuscek, M. & Marentic-Pozarnik, B. (2005). *Group work for active study. Center for pedagogical education*. Ljubljana: Philosophical Faculty.

Thomas, J. W. (2000). *A Review of research on project–based learning*. San Rafael, California. Supported by The Autodesk Foundation. Retrieved from

http://bie.org/index.php/site/RE/pbl_research/29 04. 02. 2016

Viterbo, P. (2007). History of science as interdisciplinary education in American Colleges: Its origins, advantages, and pitfalls. *Journal of Research Practice. 3* (2).

Retrieved from http://jrp.icaap.org/index.php/jrp/article/view/116/96 (available 16.10.2010)

Zavodnik-Lamovsek, A. & Fikfak, A. (2010) *Urejanje prostora: Vaje za sodelovanje v trajnostnem prostorskem razvoju: Informator za ucitelje in sole*. (Spatial planning: Cooperation in sustainable development exercises: Informer for teachers and schools). Handbook for schools. Institute for spatial Policies: Ljubljana

Zavodnik-Lamovsek, A, Mrak, G. & Foski, M. (2016). Student workshops as a successful method of project-based learning in higher education study program, In: Askerc, K., Cvetek, S., Florjancic, V., Klemencic, M., Marentic Pozarnik, B., Rutar, S. (Eds.). Improving the quality of teaching and learning in higher education. Ljubljana Centre of the RS for Mobility and European Educational and Training Programmes.