

Could Faculty Development Initiatives Like Workshops and Community of Practice Favour the Introduction of a Problem-based Approach in Higher Education? A Case Study

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Abstract

This article is dedicated to evaluating the impact of Faculty Development for the introduction of Problem Based Education in higher education. A bachelor's science degree program in Animal Care at the University of Padua has decided to introduce Problem Based Learning in an entire semester, as a first propaedeutic attempt at transforming the entire educational pathway. The transformation process was made possible by several elements: a Faculty Development program that allowed teachers to approach the PBL method and the creation of a Community of Practice (CoP) among the teachers. A preliminary evaluation of the impact of the Faculty Development program was conducted and the article describes some results: Faculty Development initiatives were effective, participants learned meaningfully, and enjoyed formal and in group training activities. Participants increased their motivation to teach according to the PBL approach for an entire semester. Participants were also motivated to create some Faculty Learning Communities (FLC), a special type of CoP in which Faculty members learn informally in group.

Key words: Higher education, Faculty Development, Problem Based Learning, Community of Practice

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Introduction

The Bologna Process aimed to create a European Higher Education Area through the achievement of quality assurance of study programs and student-centred education.

Twenty years later, there are delays in the adoption of a student-centred system.

Change is needed and the European University Association (EUA) recalls that student-centred education is an approach that replaces purely transmissive models with an outcome-based perspective, implemented through new approaches to teaching and learning, and curricula that are more clearly student-centred. It also suggests using teaching strategies such as problem-based learning or research-based learning (Gover et al., 2019).

Introducing change is very difficult in Higher Education institutions, which are bound by centuries of established tradition, where the lecturer is the one who transmits his knowledge via the ex-cathedra lecture.

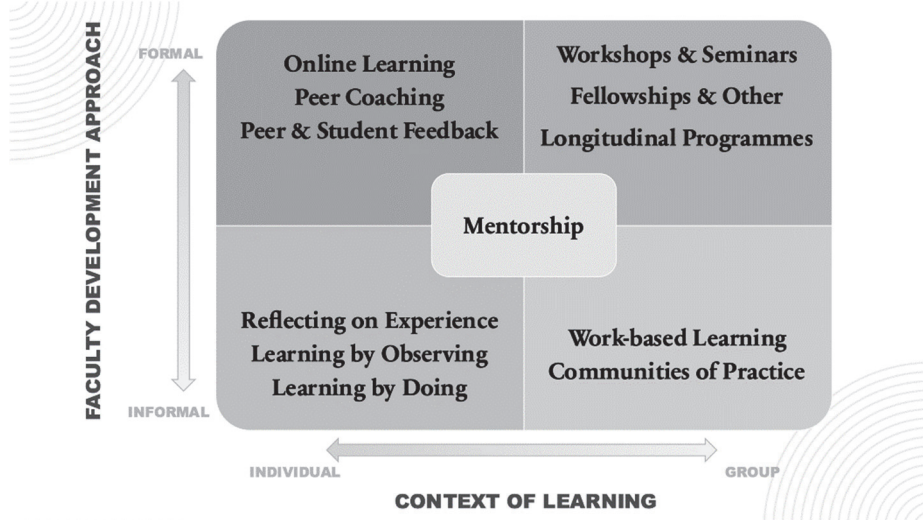
The literature shows that change can be introduced through Faculty Development (FD), i.e. through the development of university lecturers' teaching skills. Steinert, in two systematic reviews conducted 10 years apart, states that lecturers who participate in training activities introduce changes in their teaching (Steinert et al., 2006; Steinert et al., 2016). However, there is very little research dedicated to the role of Faculty Development and the adoption of Problem Based Learning in Higher Education.

FD is a focused term that covers a range of activities designed to improve student learning and to help faculty improve their competence as teachers (Eble & McKeachie, 1985).

There are numerous FD approaches, which can be summarized in five macro-areas, according to Yvonne Steinert's model (Steinert, 2014):

1. Informal individual approaches (reflecting on experiences, learning by observing, learning by doing);
2. Formal individual approaches (online learning, student feedback, peer coaching);
3. Informal group approaches (work-based learning, Communities of Practice or CoP);
4. Formal group approaches (workshops and courses, fellowships and others, longitudinal programs)
5. Mentoring.

Figure 1 - Approaches to FD (Steinert, 2014)



The most popular methods are face-to-face or online workshops, long courses also in the form of retreats, and CoPs.

The workshops are a usually brief, intensive educational program for a relatively small group of people in a given field that emphasises participation in problem solving efforts. Steinert states that “workshops are a common format for facilitating knowledge acquisition, attitudinal change, and skill development for learners at all levels of the educational continuum. Workshops rest on the premise that active participation and involvement are a prerequisite for learning and that “learner must be attentive and motivated for learning to occur” (Steinert, 2010).

The Community of Practice (CoP) is a concept coined by two anthropologists, Etienne Wenger and Jane Lave, in the early 1990s that defines groups of people, united by the same domain or field of interest, who come together to exchange practices, learn from each other, and develop a sense of belonging and community (Wenger, 1998). Within universities, CoP are also used in the version introduced by Michael Cox more than forty years ago and are characterized by the creation of a group of lecturers who commit to working together for a certain period (usually an academic year) to explore a topic of common interest or to design a new curriculum together, as in the case of the introduction of PBL (Cox, 2004).

EUA suggests introducing PBL which is both a teaching method and a curriculum organizer.

PBL is a teaching strategy that has its roots in the thought of John Dewey (1933) and that was first introduced in the university sphere in the early 1970s at McMaster University in Canada (Barrows & Tamblyn, 1980). This first experience allowed to discover the possibility of training future physicians by means of an interdisciplinary module curriculum in which students, divided into small groups and led by a tutor, learned in a self-directed way the basic and clinical disciplines, starting from the analysis of complex clinical situations of realistic patients (Albanese & Mitchell, 1993). As early as the 1970s and 1980s, degree courses organised in interdisciplinary modules began to spread, favouring PBL for the training of physicians in the Netherlands in Maastricht, in the USA and in Australia, and subsequently for the training of engineers, economists, health professions, psychologists and veterinarians on all continents.

The wide diffusion of PBL has caused great diversity in the adoption of the model and today we can count numerous reference models, which differ in the extent to which PBL is used as a teaching and learning method for the entire degree course, or simply as a teaching method within a discipline, in the size of the groups, in the style of the facilitators' conduct, in the process proposed to the students, and in the breadth of the problem (e.g. one problem per week, one problem per semester, one problem per day). Nevertheless, there is a common agreement in stating that PBL is characterised by the presence of the following key elements:

- the use of problems as the starting point of learning;
- students collaborate in small groups for part of the time;
- flexible guidance by the tutor;
- number of lectures is limited;
- learning is student-centred;
- ample time for independent study must be provided.

This complex advancement of PBL, and the difficult implementation of the approach makes it particularly challenging for academics without experience in active methods. Specific content creation to address the students' activity, the orchestration of the students around the problems, the interdisciplinary configuration of the problems, require careful attention not only in designing a PBL intervention, but also in training the teaching staff that will implement it (Lotti, 2018).

Context of the Intervention

The University of Padua is very attentive to the quality of teaching and promotes the introduction of student-centred education through the adoption of

non-transmissive teaching models and supporting innovative two-year projects proposed by its departments. It has established a strategic action aimed at introducing active teaching in Higher Education, namely “T4L” (<https://www.unipd.it/teaching4learning>). The PBL’s skills-oriented professional development program is indeed closely related to the redesign and retraining of an entire “Animal Care” university course (<https://www.unipd.it/en/educational-offer/first-cycle-degree/agricultural-sciences-and-veterinary-medicine>). The Department of Comparative Biomedicine and Food Science in 2021 proposed a two-year project aimed, among other things, at conducting a one-semester trial to test the effectiveness of student-centred teaching, using PBL as a curriculum organiser and teaching strategy.

The aim of the project was to plan the semester in a sequence of interdisciplinary modules lasting three to five weeks in which the students, divided into small groups, would analyse and discuss an emblematic problem.

The Faculty members therefore had to change their role as lecturers passing on their knowledge in lectures and play four new roles: planners of interdisciplinary modules, creators of problems to propose to their students, facilitators of small learning groups and evaluators. The project included many FD activities: PBL retreats, workshops on assessment and the launch of a Faculty Learning Community, or Community of Practice (CoP).

The retreats took place in January and June 2022, and lasted two days each, the workshops took place both in-person and online and were 4 in number. The CoP was created after the first retreat and continues throughout the project.

By the end of the first retreat, the participants had decided to adopt the Dutch model of the Maastricht PBL, which involves one problem per week for each group of students. In addition, the participants planned the semester in 4 interdisciplinary modules dedicated to four professional competences of the animal care keeper: update, research, management and clinical (Table 1).

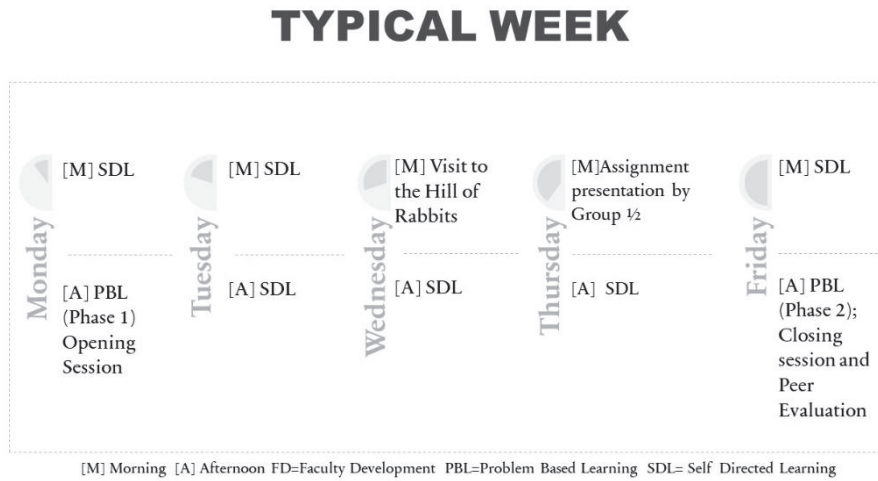
Table 1 - The semester organised in modules

Module/ Block	Module Dr. Google vs Pubmed	Module Management	Module Clinical	Module Research
Length	1 week	4 weeks	3 weeks	5 weeks

During the works of the Faculty Learning Community, the groups of teachers have planned the weeks according to the model of the typical week which foresees that each group opens the problem on Monday and closes it on Thursday. Between the first and second sessions, students can study in a self-

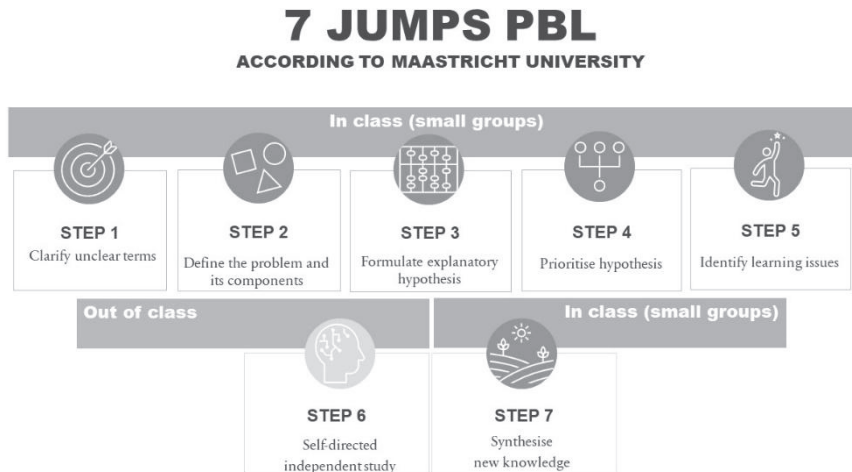
directed way and participate in field visits and practical activities in the laboratory (Fig. 2).

Figure 2 - A typical week



The problem is analysed and discussed according to the 7 jumps method of the PBL of Maastricht University (Fig. 3).

Figure 3 - Seven Jumps PBL at Maastricht University



Methodological Approach

The effectiveness of FD has been linked in the literature to projects that evolve over time and that are attributable to the logic of institutional transformation (Grover et al., 2016; Ranieri et al., 2019). The idea of separate or focused courses has been largely overcome by approaches based on peer-coaching, professional learning based on problem solving and in particular on CoP (Steinert, 2020) as it has been consolidated as an approach for adult learning in general (Schreurs et al., 2016). However, the evaluation of integrated and longitudinal interventions imposes several methodological difficulties (Charlier & Lambert, 2020). In particular, the adoption of mixed methods that can sometimes be intrusive for an extremely high and autonomous level of professionalism, such as that of the university teacher, implies an accurate planning of the moments and the tools aimed at the collection of essential data that certify the effectiveness and impact of training interventions. Nevertheless, the number of participants depends very much on the characteristics of the projects and levels of specialization in training. Sometimes, numbers that allow inferential statistical analysis are not reached. In fact, the literature reports integrated approaches that invite “complexity” (Fernandez & Audétat, 2019). In short, FD strategies that grasp moments, products, reflections, not in a definitive way but in relation to the objectives of institutional development. Leadership also appears to be a fundamental component when obtaining participation and therefore systematic data collection along the various phases of a program (Tsoh et al., 2019).

Having considered these assumptions, we carried out a study contextualized within the major T4L Padova University teaching innovation project and the Animal Care course. This context lays the foundations for a systematic and longitudinal analysis, of which this article reports the first phase. Such phase consisted in the direct training of the participants by expert teachers in PBL and the consequent first phase of informal professional learning aimed at deepening the design of PBL paths to be implemented in the immediately following semester.

Data collection

The research questions (RQ) that guided this preliminary work were:

RQ1 - Considering the different profiles of the participants, was the direct training intervention effective in terms of understanding the topic (PBL) and intention of applying it in class?

This question sought to explore the following subsidiary research questions:

- What are the profiles of the teachers involved in didactic innovation, and in experimenting with teaching in interdisciplinary modules that favour PBL as a teaching method?
- What attitude do these teachers who participate have towards teaching: are they more teacher-centred or more student-centred?
- Do the lecturers appreciate FD activities?
- Are formal and group-based FD activities effective in imparting knowledge and skills in innovative didactics, particularly on PBL?

RQ2 - After the direct and formal meetings, does the self-directed and group informal professional learning activity indicate basic forms of consolidation of a CoP aimed at improving PBL-mediated teaching?

This second question aimed at getting answers to the following subsidiary research questions:

- Do Faculty Development activities motivate teachers to undertake teaching experimentation involving redesigning their course and changing their teaching style?
- Do informal Faculty Development activities, such as Communities of Practice or Faculty Learning Communities, support teaching change?

Table 2 displays the variables explored and the tools used to answer these two questions.

Table 2 – Variables adopted in the study

RQ 1		
Variables	Instruments	Levels and descriptors
Participants' profiles: Gender, Experience in Teaching, Conceptions on Learning and Teaching	Test COLT (Conceptions On Learning And Teaching) (Jacobs et al., 2012), Italian standardized version (Rampoldi, 2021)	Female, Male, Other Years of teaching 0-2, 3-5, 6-10, 11-15, more than 15. The teacher conception of teaching, addressing three types of approaches: Active Learning conception, Traditional conception, Mixed conception <i>Self-reported measures, voluntary, anonymous</i>
Topics Knowledge and Understanding	Pre and Post-Test On PBL concepts	Test consisting of 10 questions relating to the topics of training delivered formally by expert teachers.(Grades, 1 to 10) <i>Objective measures, Voluntary, non- anonymous</i>

Perceived impact of the training on professional learning	Final Participants' Survey	Opinion of the teacher collected with Likert scale starting from direct questions related to the quality of the trainer, of the content, of the average time dedicated to the main activities and concepts on PBL.
Intention to use (apply the specific knowledge achieved to further professional practice)		Opinion of the teacher collected with Likert scale with respect to their intentions to apply the PBL and to socialize it with other colleagues. <i>Self-reported measures, voluntary, anonymous</i>

RQ 2

Variables	Instruments	Levels and Descriptors
Participation in informal professional learning activities.	Three-month follow-up questionnaire after the formal training provision	Number of meetings as option between: 0-2, 3-5, more than 5
Type of activity developed among peers and perceived professional learning		Themes of the meetings, multiple answers possible: <ul style="list-style-type: none"> • Design supplementary PBL activities • Selection of evaluation methods and construction of assessment tools • Syllabus Design • Design problem situations for PBL sessions • Design of interdisciplinary training modules • The role of the PBL tutor and the facilitation of PBL groups.
Impact perceived from involvement in informal professional learning activities.		Agreement/Disagreement Likert Scale <i>Self-reported measures, voluntary, anonymous.</i>

Data Analysis

As regards the analysis of the data, descriptive techniques of mono- and bi- or multivariate statistics have been applied to all variables. The graphs have been created with the aim of analysing trends or phenomena of relevance that guide the inferential statistics and the discussion. The learning level was analysed by means of a non-parametric comparison test between two means (Wilcoxon). The relationship between the perceived impact and the intention of using the PBL or socialization was analysed with the non-parametric test of correlation between Spearman variables. The Kruskal-Wallis test was adopted as robust, non-parametric test to analyse multi-level variance. The inferential techniques are basic given the low number of cases in the sample and the

impossibility of connecting cases imposed by ethical limitations with respect to the identification of participants in the case of detecting sensitive information. It should be considered that the data collected, although adopted only for the evaluation of the program and aggregated, can be perceived by the teacher as an element of surveillance with an impact on the concept relating to his/her work performance and consequent career advancement.

Results

Impact of formal learning activities (RQ1)

Table 3 reports the descriptive statistics of the main characteristics regarding the 19 (nineteen) university teachers' taking part to the formal training on PBL. This table is integrated with two bivariate graphs (Fig. 4 and Fig. 5) which explore the relationship between the teaching approach (COLT) and the participants' characteristics in terms of gender and teaching experience.

Table 3 - Descriptive statistics of the participants' profiles

N	Variable	Stats/Values	Freq (% of Valid)	Valid	Missing
1	Gender	Female	11(57.9%)	19 (100%)	0 (0%)
		Male	8 (42.1%)		
2	Colt	Active Learning Approach (ALA)	8 (57.1%)	15 (79%)	4 (11%)
		Mixed Approach (MIXED)	5 (35.7%)		
		Traditional Approach (TRA)	2 (14.2%)		
3	Experience (yrs. of teaching)	11-15	1 (7.1%)	14 (73.7%)	5 (26.3%)
		6-10	5 (28.6%)		
		3-5	4 (35.7%)		
		0-2	4 (28.6%)		

As we can observe, the participants compose a balanced group in relation to gender and experience. Though there are more female participants (n = 11; 58%), the group of males is also consistent (n = 8; 42%). Only one teacher has 11-15 years of experience and there is a relevant group of teachers with middle-high experience (cumulative percentage of 6-10 and 3-5 reaches the 64.3%). There is also an interesting group of young teachers with less than 2 years (29%, 4 cases) of experience, who presumably might benefit with the interactive planning and interactions with more experienced teachers.

Figure 4 - Gender and Teaching Approach

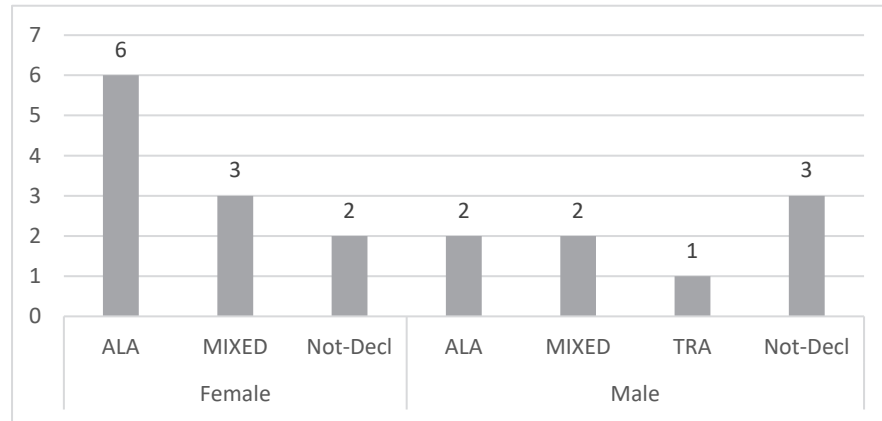
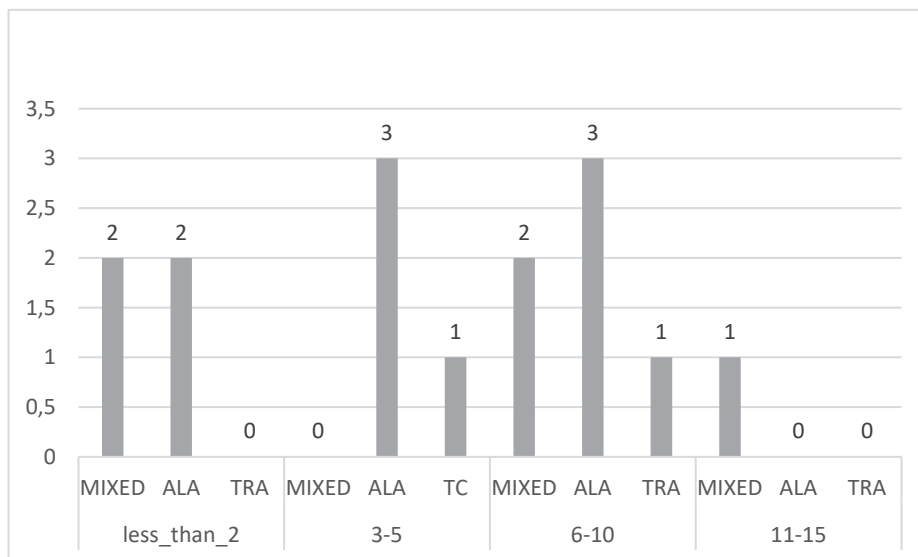


Figure 5 - Years of Teaching and Teaching Approach



As for the COLT we observe that most female participants prefer active learning methods (6/11 females and 6/19 teachers) whereas the teachers with a MIXED approach (namely, one that embraces a traditional perspective on teaching but has also a positive disposition towards active learning methods) are distributed between females and males (3 and 2 respectively).

The two approaches are equally distributed between the teachers with different levels of expertise. Nonetheless, most teachers' preferring an active learning approach are in the middle of their careers, (3 respondents ALA have 3-5 years of experience and 3 have 6-10).

Having analysed the group's main characteristics, let us consider the learning achievements in terms of knowledge and understanding of the PBL. Outcomes of the pre- and post-test design are reported in the Table 3. This exploration already displays a consistent difference, taking into consideration the different grades got between the pre- and the post-tests, and the close values of the mean and the median with rather low standard deviation and IQR. The skewness moves from a little orientation to the left (positive) distribution (i.e. lowest grades) to a more evident right (negative) distribution (i.e. highest grades). The distribution can be considered platykurtic (for both cases, > 3.0), which highlights that there are rarely or no outliers, with scores concentrated near the central tendency measures.

Nonetheless, given the little number of participants and the non-randomized composition of the group, robust statistics were preferred for testing the hypothesis of impact of the professional development intervention over participants learning.

Table 3 - Participants learning outcomes – Descriptive statistics

N=19	Mean	Std. Dev	Min	Q1	Median	Q3	Max	IQR
Pre-test	5.89	1.13	4.00	5.00	6.00	6.00	1.48	1.00
Post-test	8.77	1.17	7.00	8.00	9.00	10.00	1.48	2.00

(Table continues)

N=19	CV	Skewness	SE. Skewness	Kurtosis	N. Valid	% Valid
Pre-test	0.19	0.20	0.54	0.61	18.00	94.74
Post-test	0.13	-0.46	0.62	-1.38	13.00	68.42

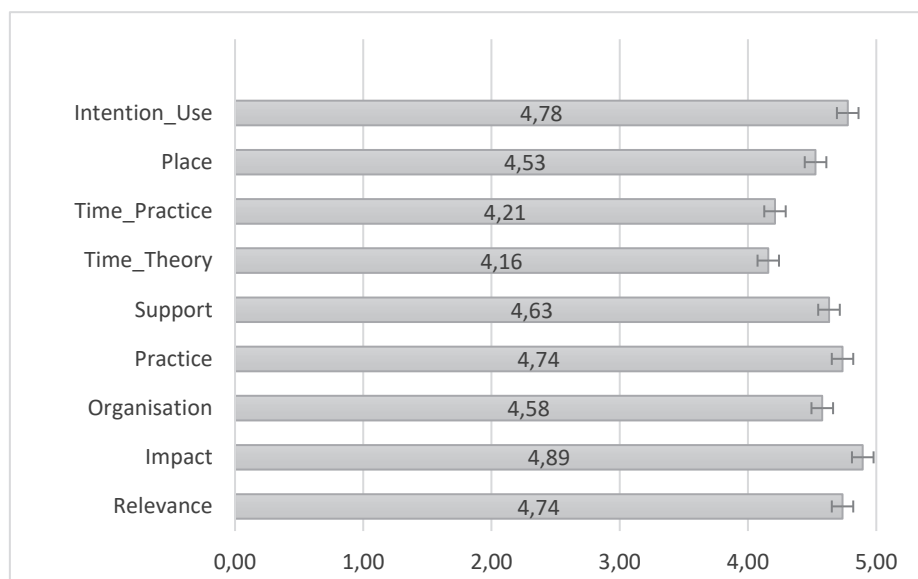
The results of Wilcoxon rank sum test with continuity correction were significant at the cutoff level of .05 ($W = 10$, $p = 1.498e-05$) showing that the participants improvement on knowing and understanding PBL was not due to the case but to a clear effect of the intervention.

The participants' perceptions about the course' effectiveness were also explored, considering the self-reported measures also as a good proxy of motivation and particularly of intention to adopt the knowledge achieved. The Figure 6 display such results.

We observed in this case that all the measured parameters were high in the scale 1-5. However, the Impact (mean score 4.89), the Relevance of the topic (4.74), the possibility of practicing some techniques relating to the PBL (4.74) and the intention to use the knowledge achieved (4.78) were consistently

evaluated with the highest scores. There were slightly fewer positive opinions around the time available to achieve the course contents, both for the practice and the theory of PBL.

Figure 6 – Participants opinion on the course



The Spearman Rank Correlation Rho test yielded a significant result at the cutoff value of .05 ($S = 466.21$, $p = 0.02735$) for the relationship between perceived workshop's impact and relevance and intention to use the knowledge achieved both in their classroom and their networks.

Prosecution of informal learning activities: basis for the Faculty Learning Community (RQ2)

The analysis of the teachers' self-reported indications about their informal learning activity yielded relevant results relating the main topics dealt with and the relationship between the number of encounters and the perceived learning outcomes.

The descriptive statistics reported in Table 4 point out at the relevant number of meetings carried out, demonstrating the continuity of the activities. Indeed, we observe that almost 50% of participants ($n = 9$; 47%) engaged in more than 5 successive meetings in order to deepen their approach to PBL, to be applied in class. There was a less but relevant group ($n = 6$; 32%) who took part in at

least 1 or 2 meetings. As for the topics, we observe that the group was splitted between a subgroup of 7 (37%) who decided to focus more on less topics, whereas the other subgroup decided to deal with almost all the topics relating planning a good PBL (n = 8; 42%). The most relevant topics are displayed in the Figure 4, where we can see that the teachers were concerned about a good definition of the PBL situations (15/19) and a careful planning of interdisciplinary modules (13/19). As expressed in the introduction, we infer theoretically that this continuity puts the basis for a CoP, aimed at providing support and circulate professional knowledge about PBL. The less relevant topic, though appearing in 7 (37%) of cases, was the Syllabus design.

Table 4 - Descriptive Statistics on Informal learning meetings

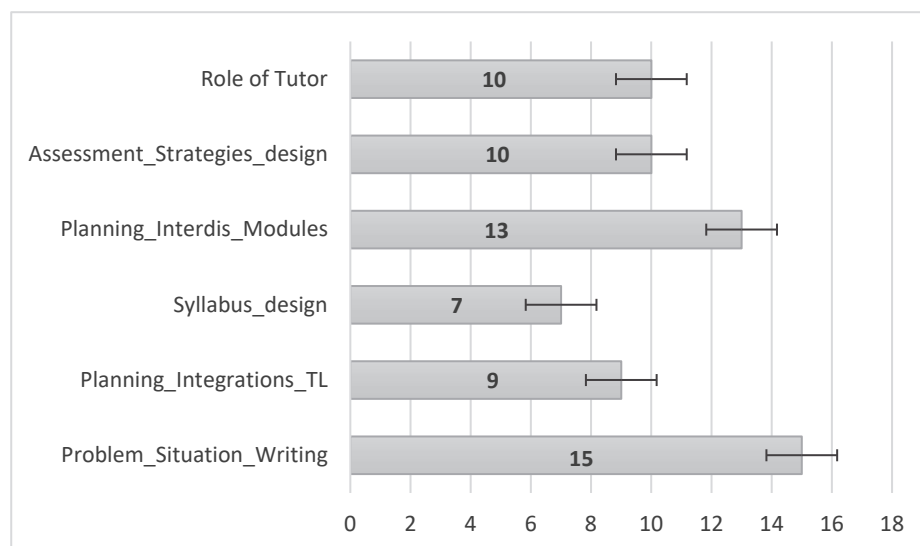
N	Variable	Descriptors	N	%	Valid	Missing
1	Freq IM	1-2	6	31.6%	19 (100%)	0 (0%)
		3-5	4	21.0%		
		More than 5	9	47.4%		
2	N Topics	2-3 topics	7	36.8%	19 (100%)	0 (0%)
		4-5 topics	8	42.1%		
		All topics	2	10.5%		
		One Topic	2	10.5%		
3	Further-Learning	Fully Agree	15	78.9%	19 (100%)	0 (0%)
		Rather agree	4	21.0%		
		Neither agree nor disagree	0	0.0%		
		Rather disagree	0	0.0%		
		Fully disagree	0	0.0%		
4	Participate Further FLCM (Participation in the Faculty Learning Community)	Fully agree	14	73.7%	19 (100%)	0 (0%)
		Rather agree	4	21.0%		
		Neither agree nor disagree	1	5.3%		
		Rather disagree	0	0.0%		
		Fully disagree	0	0.0%		
Total			19	100.0%	100%	0%

Most importantly, after this activity, about two thirds of the participants declared they had continued learning during and were willing to further participate in the informal meetings (79% and 74% “fully agree”, respectively). The others “rather agreed” (n = 4; 21%) with both claims, and none of the participants disagreed (rather or fully) about the continuity of learning or participating in informal teachers’ meetings.

In order to further explore the teachers’ perception of informal learning we considered the influence of the number of topics the groups dealt with on the

perceived professional learning (further learning). The Kruskal-Wallis Test resulted significant at the cutoff level of .05 (chi-squared = 8.2286, df = 3, p = 0.042). The post-hoc analysis (Wilcoxon Rank sum test with continuity correction) yielded only one significant difference (W = 12, p-value = 0.02), relating the higher perceived learning by those engaging in 2-3 topics with regard to those engaging in 4-5 topics. A possible interpretation of this result is that the focus on a relevant number of topics (4-5) encompassed a higher cognitive effort, occasionally accompanied by discussion between the group's members. Such a situation could end up in a more intense perception of learning effort. No significant differences were found between those dealing with one and 4-5 topics or all the topics. Apparently, in these situations too little coverage or dispersion of the attention in all the topics is less effective in producing a feeling of professional learning. Interestingly, the number of meetings did not have impact on the perceived learning (the Kruskal-Wallis test did not yield significant results). Therefore, the frequency of the meetings was less important than the number to the topics to improve perceived learning. Nonetheless, these results have to be taken into consideration with a grain of salt, given the fact that the sample was very little.

Figure 7 - Topics analysed during the informal meetings



Discussion

The analysis of the results shows that the participants, mostly female in the

middle of their professional lives, enjoyed the training activities offered through a formal approach and emphasizing groupwork.

The data also reveal that the FD activities were effective in terms of learning about the PBL method as a teaching strategy and curriculum organizer.

These initial data are in line with systematic reviews on impact evaluation, which confirm the participants' positive reaction and appreciation of training events, which is a motivational response. Our results confirm through objective measures (pre-test and post-test comparisons) that also understanding and knowledge can be promoted through this type of interventions (Steinert et al., 2006; 2016).

One finding that seems important to us is that the Faculty Development activities motivated the lecturers to re-design their teaching and to participate in team-teaching, paying attention to interdisciplinary collaboration. Indeed, interdisciplinary approach in teaching and research is crucial when inviting the students to work on problems, not topics or content (Ranieri et al., 2019). As a result, the participants, furthered during the informal work group through the interdisciplinary perspectives, devoting particular attention to it after an initial design during the formal training.

Finally, the participation in Faculty Learning Communities, as specific type of CoP, allowed the lecturers to exchange experiences, plans, and learn from each other. In fact, the lecturers all participated in the numerous meetings aimed at planning interdisciplinary modules in detail, constructing problems, constructing assessment tests, and acting as facilitators of small learning groups.

These data are also in continuity with what was found in the literature: the adoption of an innovative interdisciplinary curriculum, with modules or educational blocks, requires teachers to adhere to a different teaching model, and this transformation is made possible by FD initiatives that offer the opportunity to acquire a different vision of higher education, to learn new teaching strategies and new assessment methods (Des Marchais, 2001; Snell, 2014).

Conclusions

Our research focuses the role of FD as part of the modernization of higher education. For this purpose, we purported that FD could be a relevant driver of change. We found this assumption to be supported by the research in the field, in a specific way: if the professional learning activity goes far beyond the simple course, towards a concatenation of strategies and interventions aimed at the situated development of university lecturers' teaching skills, then, the

effectiveness of FD is ensured. In this article, we focused particularly in two forms of interventions: formal group activities such as workshops and retreats, and FLCs, i.e. informal group meetings.

Therefore, our study attempted to display to which extent such a FD activity might be effective in introducing PBL in the context of a three-year degree course at the University of Padua. The activity focused one of the semesters as part of a strategic, longitudinal project that should have a prosecution in further semesters.

Preliminary data seem to indicate the importance of FD, in terms of teachers' satisfaction, orientation to apply their knowledge and engagement in further group activities to polish and improve their teaching projects.

The results are to be deemed preliminary, but they lay the foundations to follow up the case and produce a longitudinal study. Indeed, the lecturers will apply what has been planned in the first semester of the third year, and only in a few months' time will we be able to verify the impact of the training on the lecturers' behavior in the classroom and on the results, i.e. the students' performance.

The limitations of this work are the small number of subjects examined, 19 participants. However, the data is consistent with work found in the literature and encourages us to go further down the road of introducing change through formal and informal FD.

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