

Impact of the Initial Training of Engineering Schools' Lecturers*

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Nowadays, initial training courses for lecturers are widespread in universities. However, there are not enough research papers that analyze their impact and effectiveness. This paper focuses on the Universidad Politécnica de Madrid's case. In order to assess if the teaching training received takes effect in the lecturers' daily work, the study has collected data about 198 participants that have finished the Initial Training for University Teaching program. 115 of them answered a survey (adapted from Freixas et al.) analyzing the factors of their training transference. Participants acknowledged the learning value obtained during the program, indicating that they have implemented it in their own teaching practice. They perceive their students' interest, who encourage them to introduce the methodological innovations learnt during their training. On the other hand, they do not perceive support from their departments. They detect lack of support (within the degrees and departments) as well as the lack of provided resources as the main barriers. The weight of tradition on how lecturers face teaching is relevant, restricting the possibilities for changes. Results show very limited institutional recognition to the effort invested in their own training. Nevertheless, participants keep optimistic expectations about the positive assessment of the received training for their teaching career.

Keywords: engineer education; initial training; transfer of teacher training

1. Introduction

The training of engineers in Spain is developed by engineering schools, which emerged in the 18th, 19th and 20th centuries. At that time, the country required professionals with technical skills to address the requirements arisen from the economic growth of the country. These highly qualified professionals needed to combine technical and scientific knowledge to accomplish projects in an optimal and organized way. In the 20th century, the liberalization of these professions triggered the disappearance of these Schools, managed by the government, and the training of these professions was incorporated into the universities. Since then, technical universities assumed the training of engineers and, in some cases, architects. These disciplines are different from others developed in faculties at different universities because of their high applicability and the required study of complex theoretical concepts. Teaching in these areas implies therefore peculiar features that lecturers need to address accordingly.

The Universidad Politécnica de Madrid (UPM) was founded in 1971, although some of the different technical schools' origins date back to the 18th century. Since then, the university has been basically devoted to architecture and engineering education. The Institute for Educational Sciences (ICE—Instituto de Ciencias de la Educación) of the UPM was created in 1972 to organize faculty training actions.

The mission of these type of institutes, approved by the General Education and Financing Reform Act [1], was training lecturers at all levels of education.

It is important to indicate that becoming a teacher in the pre-university level requires specific training, while there is no compulsory pedagogical training for Spanish lecturers at the university level. Nowadays the professional merits to work as a professor include having a research profile, assessed in terms of research projects and scientific publications of recognized prestige as well as having teaching experience. This leaves a modest margin for other merits, including teaching training. The lack of teaching training in lecturers impacts on all the areas of the curriculum. For this reason, the UPM has felt the need to train their faculty in the basic teaching abilities by providing a voluntary initial program for university teaching. There are international initiatives similar to this program, for example the Graduate Certificate in Engineering Education of the Cockrell School of Engineering at the University of Texas [2] or the Graduate Studies in Engineering Education of the Centre for Engineering Education at the Universiti Teknologi Malaysia [3].

This program is conceived from a comprehensive perspective of the lecturer as a professional educator who needs specific training. It is designed to meet young lecturers' needs, based on knowledge, skills and attitudes required for the proper practice of teaching [4]. The objective of this paper is to analyze

the results of the initial training program introduced ten academic years ago at the ICE of the UPM. It is interesting to know the extent to which trainees have been able to transfer the received training to their career and if the professors have usefully applied the knowledge acquired in the program.

This paper is organized as follows: First, a state of the art of the studies about the efficiency of faculty training and the transfer of this training is presented. In section 3, the design of the initial training program is detailed. Then, in section 4, the purpose of the study and objectives are presented followed by the design of the study and tools. Section 5 summarizes the results of the study. Finally, conclusions are presented.

2. Transfer of lecturer training

Teaching quality has been a traditionally studied subject. Kirkpatrick developed a four-level training model that included the participants' response to the different elements that comprise the formative action, the knowledge and abilities acquired by the students along the course, the transference generated by the developed competencies and the impact produced by the formative improvement in economic or innovation terms [5]. Marshall and Shriver showed in their findings a five-level evaluation model: the professor, the materials, the curriculum, the modules of the course and the learning transference. In this case, the professor is considered the protagonist of the training, as (s)he will follow the student along the process and their interaction will determine the success of the formative action [6].

However, with the European Higher Education Area (EHEA) the learning methodologies have evolved. At present, most of the training programs combine face to face learning with e-learning in a blended learning method and professors are now considered facilitators or guides. This places students at the center of the teaching-learning process. The quality management agencies evaluate these courses by analyzing the improvements in students' learning results [7]. The introduction of this new educational environment has been carried out by lecturers who were themselves students in a very different reality. They had to adopt new pedagogical and technical skills in order to adapt their courses. This way, faculty training programs became a key process to encourage the change.

The impact of these training programs has been analyzed by several authors concluding that their success depends mainly on the length of the course. Prebbel et al. [8] identified five categories: short training courses; in situ training; consulting, peer assessment and mentoring; student assessment of teaching and intensive staff development. In a

different classification, Southwell and Morgan [9] grouped faculty training in two categories: group-based academic staff development programs (short training courses, intensive staff development, in situ training/collegial communities/communities of practice) and individual-based academic staff development programs (mentoring, peer observations of teaching). Both studies concluded that short courses do not have a high impact on teaching abilities because their duration restrains the opportunities to apply the knowledge and techniques acquired. Besides, long and intensive programs grant an impact on beliefs and behaviors of professors and result in a more student-centered model. Complementing the above, other studies show that faculty training programs are more effective when lecturers are tutored, participate in community and accomplish a reflexive practice [10–12]. All studies agree in the difficulty in estimating the impact of the training and the measurement of the transfer of learning [13].

The analysis of the transfer of lecturer training has been traditionally based on the study of Baldwin and Ford about organizational psychology, management and human resources, in which three categories were identified: trainee characteristics, training design and work environment [14]. From this model, other ones have been developed, which classify the transferring factors in training design factors, work environment factors and personal factors [15–19]. Different authors have analyzed the impact of training, using self-perception questionnaires [20–24]. Holton and Bates developed a validated questionnaire globally named “Learning Transfer System Inventory—LTSI” [15]. This instrument was structured in 16 factors and was applied in 17 countries. The success of the tool awakened the interest to adapt the instrument to the national context. Pineda, Quesada and Ciraso developed the FET model (Evaluation Transfer Factors, in Spanish: *Factores para la Evaluación de la Tránsferencia*) [25]. FET model reduced the factors to 8 and the final version had only 7. Another contextualized model was developed by Feixas and Zellweger [26]. This model was adapted from the LTSI to the Spanish context and focused on higher education. The final instrument was called LTSI_HE (Learning Transfer System Inventory for Higher Education) with 72 items and 16 factors. Recent studies have validated the questionnaire in collaboration with 18 Spanish universities. After the process, the model was optimized and the final instrument was reduced to 8 factors with 50 items [19].

3. Initial training program design

The ICE of the UPM introduced in 1976 a training

program for lecturers that started their academic career. This program has been corrected and adapted and is currently taught in its tenth edition under the name of *Initial Training for University Teaching* [27]. At the beginning, this program was entitled “Update in Pedagogical Techniques”. In 1992, after a needs analysis, the course was restructured in five modules with 130 hours of face to face class and renamed to “Higher Training Course for University Teaching”. In 2007, after two years without offering the course, it was updated again with the implantation of the European Higher Education Area (EHEA), and the new name of the course was “Initial Teacher Training within the framework of the European Higher Education Area”. According to the recommendations of the EHEA, the course was redesigned to a blended learning methodology: the face to face classes were reduced to 96 hours and the modules were increased to 8 with a total amount of 14 ECTS. A study about the success of the blended learning in the initial training was carried out [28] with data from trained lecturers for ten years—(5 years before and 5 years after the blended learning inclusion). The perceived effect was a 20% increase in the graduation rate. The course was again reviewed in the academic year 2015/16 and it kept the 8 modules structure, but the program was extended to 15 ECTS and the name of the course changed to the current denomination. Fig. 1 shows the historical evolution of participants in the *Initial Training for University Teaching*.

The ICE of the UPM works to keep the training program updated for lecturers that start their academic career and some questions always need to be answered. What do they really need to know in

order to provide a quality teaching in demanding and complex subjects as those taught in engineering schools? Are these lecturers different to those in other fields? The answer to this second question has always been yes, because there has been agreement about the singularities of their subjects. But the same could also be true for medicine, law or geology lecturers. The important question is the knowledge they need to acquire in order to provide quality teaching and in this sense, according to specialized research ([29–30] among others) we have achieved a consensus about the basic points that training for these lecturers should include:

- General pedagogical training. Most of the lecturers start from scratch because until this moment nobody has taught them the didactic basis of their subjects.
- Use of new teaching methodologies based on the knowledge about students’ learning process. Lectures need to make way to other more active methodologies that are centered on students’ work and collaboration.
- Proper use of Information and Communication Technologies (ICT) that triggers the learning process. In this sense, we hope to reject the affirmation that the use of ICTs in higher education *favors a situation in which new technologies are included but the old pedagogy stays*. It is not enough to introduce new technological resources into the classroom. It has to be done in a proactive way, favoring the student and, above all, centered on the learning process.
- Positive attitude towards innovation that takes students into account. Lecturers need to be cap-

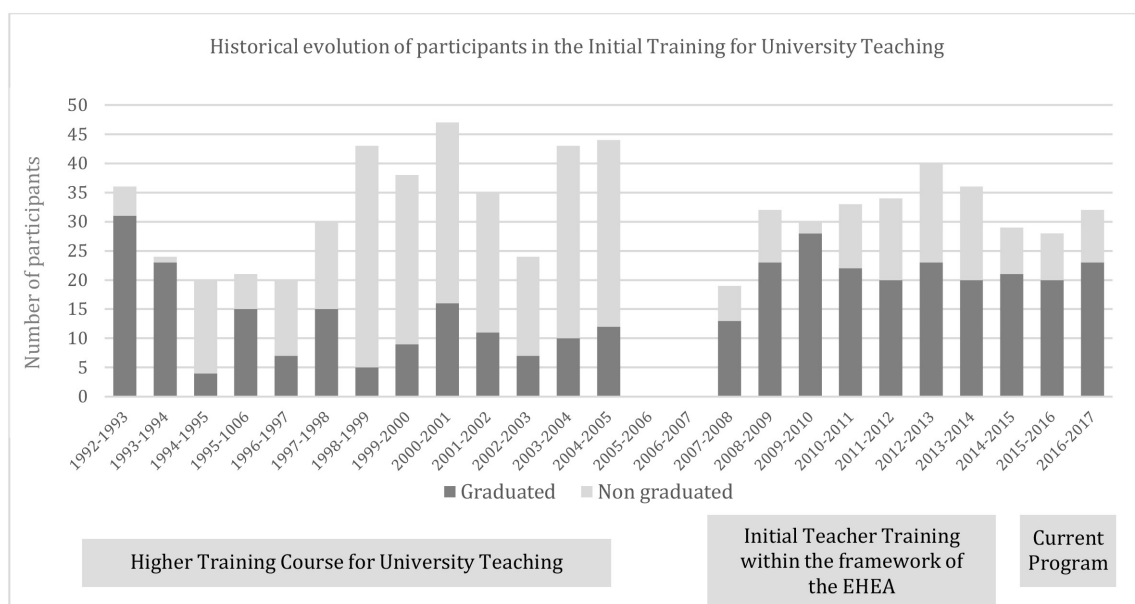


Fig 1. Historical evolution of participants in the *Initial Training for University Teaching*.

able of addressing new ways of teaching that facilitate the learning and raise the interest of their students. This should be followed by an experimentation that provides feedback about the effectiveness of the own innovation.

- Specific didactics linked to their particular engineering fields that cannot be addressed by the general didactic training.

In summary, a training model attractive enough for novel lecturers needs to be established, as it is neither compulsory nor recognized for career development at university. Furthermore, the presence of these lecturers in their departments of different engineering fields is expected to be beneficial for the general improvement of teaching, as their acquired knowledge and abilities may spread among their colleagues.

In any training program, it is critical to establish the competencies that the participants should develop, but this is especially important in a program that has higher education teaching at its core. The competencies to be developed should be those central to the university teaching career, namely:

1. Plan the teaching-learning process based on the general and specific competencies their students need to achieve.
2. Use diverse teaching methodologies based on the specific objectives of each subject.
3. Employ technological resources and ICTs directed towards knowledge and learning.
4. Assess students' learning.
5. Program their activities as tutor and counsellor, using specific strategies to guide students in their academic, personal and professional spheres.
6. Apply psychological theories to the reality of higher university teaching such as teamwork, the understanding of students' learning process or the development of social skills and personal coping strategies.
7. Design and carry out innovations and educational research to their teaching practice.

As most of the lecturers that attend this program are on active duty, their training must be measured in time, calculating how long it will take them to complete the courses and associated tasks. In order to develop the indicated competencies, our program establishes that lecturers need to work between 357 and 450 hours, which is equivalent to 15 ECTS (Europeans Credits Transfer Systems).

A whole academic year (October to June) was deemed appropriated for its development. The cited competencies are organized in different modules, so that each of them may be assessed separately. Lecturers are required to attend class once a week

for a total of 104 hours of face-to-face classes that address the theoretical and practical contents of each subject. The remaining contents of the program are taught in an e-learning format. Attendants must manage and study the theoretical documentation provided in each subject and complete the tasks and activities proposed. This way, the training objectives are achieved and the total amount of training hours is reached.

As a complement of the training and with the objective of trainees implementing their new knowledge in a real environment, they may choose to carry out a Practicum. This experience is developed in the second half of the program. Trainees choose an experienced mentor of their research field as professional tutor and the ICE designates an academic tutor that monitors the experience. This Practicum is equivalent to 5 ECTS.

4. Method

4.1 Purpose of the study and objectives

The teaching training of professors is a complex issue. To accomplish this task, it is necessary to know which skills we want to train. But above all, once the training is completed, we must verify how this training has been transferred to the courses, departments and, ultimately, the students. We consider three research questions in this study; 1. Is the initial program of the ICE UPM transferred to the faculty's career? 2. Are there significant differences in this transfer according to personal variables (gender and age) or professional experience? 3. What are the reasons to choose the program and what is the contribution best perceived by participants? In this context, the objectives of the study are:

1. To analyze the factors that are transferred from the professor training in the initial program of the ICE UPM in comparison to other studies. The studied factors are the following:
 - Checking the effectiveness of the design of the performed training and learning.
 - Demonstrating the support lecturers receive and the approval by the leading professors.
 - Analyzing the possibilities of change after the received training.
 - Assessing the resources of the environment where trained lecturers evolve.
 - Studying, from the point of view of the trained lecturer, the students' feedback.
 - Measuring the institutional recognition of the professors who received the training.
 - Evaluating to what extent the trained lecturer feels the support of his colleagues to implement the acquired competencies.

- Estimating the personal organization of work.
2. To analyze differences in the factors of the professor training transference regarding gender, age, teaching experience and practicum achievement.
 3. To study, in a qualitative analysis, the perceptions of the participants, the reasons why they chose the program and how it has contributed to their role as lecturers.

4.2 Design and sample

The study, with an exploratory and descriptive design, uses a mixed-method approach combining quantitative and qualitative data analysis. The research was carried out with an incidental sample of 115 participants (population size 198, so 58.08% of the total). All of them had enrolled and finished the program in the last decade, between 2006–07 and 2015–16 academic years. They are employees of the Universidad Politécnica de Madrid (UPM) in different professional categories. Table 1 shows the principal distribution of the participants according to: current professional category, teaching experience, gender and field of study.

The average of teaching experience was 7.74 years and the standard deviation 5.74. Regarding age, the mean in the sample is 36.27 and the standard deviation 12.57. A predominant population of young lectures may be observed, most of them

from different engineering fields (73.9%). Preliminary data indicate that there is a positive impact of the training on the labor situation (68% of the sample holds now a teaching position at university, opposed to 54.8% when they were taking part of the training program).

4.3 Instrument

In order to reach the goal of this work, the questionnaire LTSI_HE (Learning Transfer System Inventory for Higher Education) developed by Freixas and Zellweger [26, 19] was adapted, reduced and used for data collection. This questionnaire allows us to delve into the teaching transfer, and how lecturers themselves assess the impact in their own professional reality. It includes 8 factors called: Training design and acquired learning, Support by the department, Change possibilities, Available resources, Student feedback, Institutional recognition, Support by colleagues and Personal work organization (see Table 2 for descriptions). A high reliability was found (Cronbach Alpha 0.91), and the reduced version of this study improved the results (0.938). The analysis by item showed the convenience of keeping the structure in 8 factors and 40 items.

The items in the questionnaire were answered through a Likert scale on six points using numerical values: (1) Totally disagree, (2) Disagree, (3) Slightly disagree, (4) Slightly Agree, (5) Agree and

Table 1. Distribution of the current professional category, teaching experience, gender and field of study of the participants

Professional Category	Frequency	Percentage
Missing data	9	7.8%
Lectures with temporary contract	60	52.1%
Professors with unlimited contract	18	15.7%
Researchers	28	24.3%
Teaching experience	Frequency	Percentage
Up to 5 years	54	39.1%
6 to 10 years	26	32.2%
11 to 15 years	10	8.7%
16 to 20 years	9	7.8%
More than 20 years	3	2.6%
Gender	Frequency	Percentage
Male	68	59.1%
Female	47	40.9%
Field	Frequency	Percentage
Missing data	2	1.8%
Engineering	85	73.9%
Experimental Sciences	19	16.5%
Social Sciences	8	7%
Humanities and Arts	1	0.9%
Practicum achievement	Frequency	Percentage
Yes	75	65.2%
No	40	34.8%

Table 2. Factors of the transference of professor training [19]

Factor	Description
Factor 1. Training design and acquired learning	This factor includes: the self-perception about the learning acquired in training, the belief and expectative of applying the new concepts learnt in order to improve teaching and the measure of how the training is designed to ease its application.
Factor 2. Support by the department	It estimates how the leading professors (in this case the head of the department or the coordinator of the degree) support the transfer of the learning in the training.
Factor 3. Change possibilities	It measures the willingness to change in the environment of lecturers. This includes identifying resistance to change in the department, degree, center/faculty or university and analyzing the possibility to transfer what has been learnt.
Factor 4. Available resources	It defines the set of resources, facilities and support of the environment that is offered to apply what has been learnt.
Factor 5. Student feedback	The way in which professors believe that feedback and comments of students about teaching drives new learning.
Factor 6. Institutional recognition	Expectations that the institution recognizes and values the effort of the professors to transfer the training, resulting in an impact on academic promotion.
Factor 7. Support by colleagues	The support and collaboration provided by their colleagues or reference group to apply the learning to the classroom.
Factor 8. Personal work organization	It indicates the possibilities of the professors in terms of workload, time and level of priority that permits them to transfer new knowledge received during their training.

(6) Totally Agree. It is important to point out that it is a self-perception scale. The final questionnaire included several qualitative items to collect the opinion of the participants about the reasons why they chose the training program and their main performance. Besides, it was asked if they would recommend the program to another colleague.

4.4 Procedure

The survey was sent by e-mail to all the participants who finished the Initial Training Program in the last decade. The questionnaire included 40 items, excluding demographic and qualitative items. The duration estimated to complete the survey was around 15 minutes. Data collection was accomplished from January to April 2017.

4.5 Data analysis

The statistical software SPSS/PC+, 20.0 was used to analyze data. Descriptive analysis was performed and the normal distribution of the 8 factors was reviewed using the Kolmogorov-Smirnov test. Its purpose was to check the normality of the data in order to know which statistical method should be

used. According to results, mean differences were studied with parametrical test (Student t or ANOVA, depending on the number of groups) or non-parametrical test (Mann Withney U or Kruskal Wallis).

5. Results and discussion

The descriptive analysis of each factor is shown in Table 3. Minimum, maximum, mean and standard deviation of the perceptions of participants are exhibited in this table.

The results of these factors have been analyzed in comparison with the findings of Freixas et al. [19]. Fig. 2 represents the mean of each factor in both studies. The lecturers analyzed in this study present significantly lower results regarding Factor 4 *Available resource* ($t = -4.46$, $p = 0.000$), Factor 6 *Institutional recognition* ($t = -8.73$, $p = 0.000$), Factor 7 *Support by colleagues* ($t = -2.05$, $p = 0.043$) and Factor 8 *Personal work organization* ($t = -2.018$, $p = 0.046$). In the same way, professors show significantly higher results than in the sample of Freixas et al. [19] with respect to Factor 5 *Student*

Table 3. Descriptive analysis of factors.

Factor	N	Min	Max	Mean	Sd
Factor 1. Training design and acquired learning	114	2.12	6.00	4.73	0.88
Factor 2. Support by the department	107	1.00	6.00	3.86	1.19
Factor 3. Change possibilities	107	1.00	6.00	3.54	1.08
Factor 4. Available resources	109	1.00	5.50	3.17	1.01
Factor 5. Student feedback	106	1.50	6.00	4.34	1.05
Factor 6. Institutional recognition	112	1.00	6.00	3.83	1.03
Factor 7. Support by colleagues	104	1.00	6.00	3.61	1.16
Factor 8. Personal work organization	108	1.00	5.67	3.15	1.06

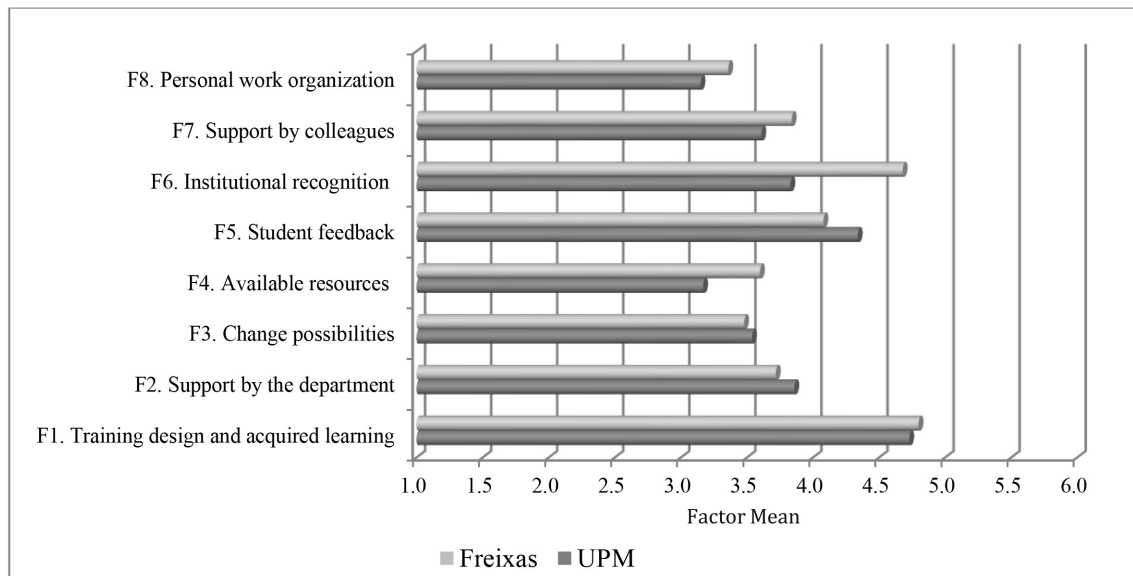


Fig. 2. Comparative results with Freixas et al. [19] by factor.

feedback ($t = 2.54$, $p = 0.012$). The rest of the factors do not display significant differences.

Freixas et al. [19] classified the factors according to their score. When this was lower than 2.4 the factor was considered a barrier for the transfer of the training. If the score of the factor was between 2.4 and 3.6 it was labeled as risk, between 3.7 and 4.8 as weak facilitator and when it was higher than 4.9 it was considered a strong facilitator. According to this qualitative classification, the analyses by Freixas et al. [19] showed that all factors were considered weak facilitators, except Factor 3, 4 and 8, which showed risk for the transference. Next, each factor is briefly analyzed. Factors 1 and 5 present high scores, whereas Factors 4 and 8 draw attention because of their low scores.

5.1 Analysis by factor

Factor 1 *Training design and acquired learning* indicates the self-perception about the learning acquired in the training, the belief and expectation of applying the new concepts learnt in order to improve teaching and the measure of how the training is designed to ease its application. Results show a value of 4.73 over 6. This indicates that this factor facilitates the transfer, the training is considered well designed and allows the lecturer to apply what has been learnt. The items, which compose the factor present 3.9 as the minimum value and 5.15 as the highest value. The item with the lowest score is number 27: “The trainer’s monitoring has allowed me to understand how to apply the learning”. The items that stand out with values above 4.9 are number 6: “Thanks to the training I learnt new ways to work with students”, number 14: “Training has allowed me to update knowledge”,

number 18: “This training has provided me confidence to innovate in the classroom”, number 20: “The trainer has given me new ideas to apply to my teaching”, number 28: “Thanks to this training my awareness of what it means to teach at university has increased”, number 34: “The training has helped me to reflect on what I do” and the item number 39: “Training has allowed me to learn new approaches to teaching”. These scores show the success of the training offered: participants value it positively and feel able to apply the new knowledge to their classrooms, therefore they feel that they can transfer what they have learned.

Factor 2 *Support by the department*, estimates how the leading professors (in this case the head of the department or the coordinator of the degree) support the transfer of the learning in the training. Results show that Factor 2 is a weak facilitator with a value of 3.86.

Factor 3 *Change possibilities* measures the willingness to change in the environment of the lecturers. This includes identifying resistance to change in the department, degree, center/faculty or university and analyzing the possibility to transfer what has been learnt. Results show that Factor 3 has to be considered as a risk, although, with a 3.54 value it is close to being a weak facilitator. The item with the highest value (4.69) in this factor is number 19: “A great deal of enthusiasm is needed” in my teaching team to innovate”.

Factor 4 *Available resources* defines the set of resources, facilities and support of the environment that is offered to lecturers to apply what has been learnt. Results show a score of 3.17 over 6, so it could be a barrier for the transference.

Factor 5 *Student feedback* is focused in the way in

which professors believe that feedback and comments of students about teaching drive new learning. Results show that this factor is also a weak facilitator of the training transfer with a value of 4.34. In the current scenario, where the student is at the center of the learning process, it is interesting to note that the participants perceive student contributions as a source of improvement for their teaching skills.

Factor 6 *Institutional recognition* values the extent to which the institution recognizes and values the effort of the professors to transfer the training, resulting in an impact on academic promotion. Scores show that Factor 6 is also a weak transference facilitator with a value of 3.83. A more detailed analysis of the items shows the lack of recognition of the institution for item 36 with a value of 2.41 and, on the opposite side, the expectations that the training will be considered for promotion (item 40) is valued with 4.96.

Factor 7 *Support by colleagues* analyzes the support and collaboration provided by the colleagues or reference group of the professor to apply the learning in the classroom. Results show that Factor 7 is a weak transference facilitator with a value of 3.61.

Finally, Factor 8 *Personal work organization* indicates the possibilities of the professor in terms of workload, time and the priority level he establishes to transfer his new knowledge. The score of this factor is the lowest with a value of 3.15, showing therefore the risk of becoming a possible transfer barrier.

5.2 Factor analysis by gender, age, teaching experience and practicum achievement

Different analyses were accomplished regarding gender, age, teaching experience and practicum achievement. To this end, statistical analyses were developed comparing means/ranges of two or more groups according to the data. Only the Factor 6 *Institutional recognition* did not overcome the normality test ($K-S = 1.53$, $p < 0.019$). Regarding gender, the Mann Whitney U test did not show significant results. Table 4 summarizes the factors' results, which show significant differences in Factors 3 and 7. Males perceive higher change options, in opposite to females, who feel higher support by their colleagues to transfer the training outcomes.

Regarding age, the sample was distributed by groups to accomplish the analysis. Group 1 with participants aged under 31, Group 2 with participants aged between 31 and 40, and Group 3 with participants older than 40. ANOVA results only showed significant results for Factor 7 *Support by colleagues* ($F_{2,103} = 4.62$, $p = 0.034$). Subsequent analyses revealed that younger participants perceived higher support than older ones (Group1 = 4.22; Group2 = 3.54; Group3 = 3.46).

Regarding teaching experience, participants were distributed in 5-year-experience groups as shown in Table 1 (Group 1: Up to 5 years; Group 2: 6 to 10 years; Group 3: 11 to 15 years; Group 4: 16 to 20 years; Group 5: More than 20 years). ANOVA showed significant differences for Factor 8 *Personal work organization* ($F_{1,4} = 7.9$, $p = 0.000$). A better

Table 4. Factor analysis by gender

Factor	Gender	N	Mean	Sd	t	p
Factor 1. Training design and acquired learning	male	68	4.7	0.88	-0.43	0.663
	female	46	4.77	0.89		
Factor 2. Support by the department	male	66	3.76	1.08	-1.04	0.299
	female	41	4.01	1.34		
Factor 3. Change possibilities	male	65	3.72	1.06	2.28	0.024*
	female	42	3.24	1.06		
Factor 4. Available resources	male	67	3.24	0.97	0.92	0.359
	female	42	3.05	1.05		
Factor 5. Student feedback	male	66	4.35	1.10	0.195	0.846
	female	40	4.31	0.95		
Factor 6. Institutional recognition	male	67	3.81	0.94	-0.15	0.877
	female	45	3.84	1.16		
Factor 7. Support by colleagues	male	65	3.40	1.04	-2.35	0.020*
	female	39	3.94	1.25		
Factor 8. Personal work organization	male	67	3.11	1.13	-0.49	0.619
	female	41	3.21	0.92		

* $p < 0.05$.

work organization was found when the teaching experience increased. In Factor 6 non-parametrical Kruskal Wallis analysis did not present significant differences.

The impact of accomplishing the Practicum does not show significant differences in any factor. However, participants stated the importance of this opportunity.

5.3 Qualitative analysis

This part of the study analyzed the reasons why students chose the program. Responses of the participants highlighted the interest of the program to improve the teaching skills as a professional requirement. All participants answered the item, 89 of them (77.4%) exposed reasons exclusively related to the teaching training. 6 of them (5.2%) included reasons about accreditation agencies requirements. 10 of them (8.7%) combined accreditation with teaching training reasons. 5 of them (4.4%) emphasized the course recognition and recommendations of other colleagues. 3 of them (2.6%) combined recommendations with teaching training reasons and 2 of them (1.7%) answered with exclusively personal reasons.

It was interesting to analyze the answers to this item along with the question about the perception of the program's usefulness referring to its contribution to their role as lecturer. 80% of the participants answered the item. All answers emphasized the recognition of the value of teaching education, in particular these specific aspects: new approaches and techniques that help in the teaching planning and organization, tools for the assessment of learning and monitoring the studying process, the possibilities of on-line learning, and the opportunity to share the experience with professors from different backgrounds (schools, departments or research fields). 10.4% of the answers recognized that they had increased self-confidence to accomplish the teaching profession. And 11.3% indicated the convenience of making this training compulsory for professors and congratulated the teaching team for the implementation of the program.

Suggestions were also collected in the answers identifying improvements. Some modules were considered unnecessary or unsatisfactory (tutoring and psychology) by a few respondents. However, the main suggestion was the overload of assignments as a result of blended learning. Some commentary showed the loss of motivation due to the scores not being discriminant. However, this fact has been solved in the last years by including an award to the best students. Finally, overall satisfaction with the program was positive with 96.5% of the participants, who recommended it.

5.4 General discussion

The impact of professor training remains a pending issue. It is difficult to achieve complete and reliable data [13]. Most of the studies have managed incidental samples with tendencies in some measure (always unknown) affecting results. However, in spite of applying self-perception scales, the data collection is an effective tool to estimate the transference of lecturers' training.

Regarding to the first research question, results of the study have indicated that the training is transferred and participants have not perceived high barriers in this transfer process. The lowest value was Factor 8 *Personal work organization*. This result could be motivated by the pressures suffered by novel professors. The increasing requirements of the accreditation agencies involve a great dedication. Therefore, the available time for improving and accomplishing innovative experiences, which are poorly valued by institutions to progress in the professional career as a professor, is limited. The next lowest factor was Factor 4 *Available resources*. It is a reasonable barrier in a country still affected by the recovery of an important financial crisis.

In general, the other factors have been valued as weak transfer facilitators. There are improvement opportunities in the organization and implementation of the training activities. The results suggest that, after training, participants feel more prepared to face the challenges of teaching, with greater confidence. A clear aspect of improvement was identified: the monitoring of training once the program had ended, which could provide new indicators of the real impact of the training.

The level of institutional support and recognition, resistance to change, and available resources (human, technical and material) limit the options for transferring training. From management teams (universities, centers, and departments) greater efforts must be carried out to support those who strive to innovate and improve the educational outcomes of students.

The perception of the students' support for innovations and proposals for changes in teaching activity is of great interest. Coupled with the feeling of greater training of the participants, the results of meeting the needs of the students, always changing, is motivating and stimulating. The second research question analyzed differences according to personal variables and professional experience. Factor 3 *Change possibilities* showed significant differences with higher values in male than female participants. However, in Factor 7 *Support by colleagues*, highest values are showed for women. In this Factor, significant differences according to age have been noted too, with higher values for the younger respondents. Regarding to the third research ques-

tion, the main reasons that impulse participants to join the program were the need of psycho pedagogical knowledge and methodology to face the teaching profession at university. Most participants recommend the training program.

6. Conclusions

Based on the results, we conclude that Initial Training course participants place the transfer factors in the central categories. This implies that none of them may be considered a barrier or a strong facilitator for the transfer of the training. The means indicate risk for the transfer in relation to (F8) personal work organization, (F4) available resources, (F3) change possibilities and (F7) support by colleagues. On the contrary, (F1) training design and acquired learning, (F5) student feedback, (F2) support by the department and (F6) institutional recognition are considered facilitators of the transfer.

As a final conclusion, participants have a positive perception of the Initial Training Program for lecturers in the ICE of the Universidad Politécnica de Madrid, regarding the transfer of the received training. Therefore, attendees feel more confident to face the teaching of their courses and, in a very high percentage, recommend the program to their colleagues. The future of the teacher training presents a wide number of possibilities. New technologies like virtual reality, innovative methodologies like Flipped Classroom or new program designs like MOOC are getting encouraging results. All these innovations could be applied to teacher training; however, they must be studied carefully and they have to offer professors a practical training adapted to their needs.

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