EFFECTIVENESS OF THE FLIPPED CLASSROOM METHODOLOGY ON THE LEARNING OF EVIDENCE-BASED PRACTICE OF NURSING STUDENTS: QUASI-EXPERIMENTAL DESIGN

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HIGHLIGHTS

- The flipped classroom model is adequate for the teaching of evidence-based practice to undergraduate nursing students.

- Flipped classroom significantly improved the attitudes, skills, and global competence in EBP of nursing students.

- In the dimension knowledge, both teaching models showed positive results, without differences between them.

ABSTRACT

Background: International organizations recognize the importance of Evidence-Based Practice (EBP) for nurses. The objective of teaching EBP in the Nursing Degree is to train future nurses on this subject. Different teaching models exist for this, from less active traditional models to more active ones such as the flipped classroom.

Objective: To compare the degree of EBP competence of undergraduate nursing students after an EBP course, through the application of a traditional methodology versus a flipped classroom methodology.

Design: Quasi-experimental study of non-equivalent groups.

Setting: The study was composed by a group of students who received training on EBP with the traditional model (face-to-face), and another intervention group with whom the flipped classroom model was utilized, using the online teaching platform EBP-eToolkit.

Participants: The study was conducted with 4th-year Nursing Degree students enrolled in the course Evidence-Based Practice, in academic years 2019/20 and 2021/2022.

Methods: Before and after the course, the students completed a questionnaire about EBP competence (EBP-COQ), and an objective test was given at the end of the year.

Results: A sample of 152 students in the face-to-face group (control), and 143 students in the flipped classroom group (intervention) participated. The intervention group significantly improved its competence on attitude (p=0.01, $\eta2$=0.022), skills (p=0.019, $\eta2$=0.018), and global competence in EBP (p=0.003, $\eta2$=0.030), with respect to those who were taught using the traditional method. However, there were no significant differences in the impact on knowledge, neither through the self-report dimension of the EBP-COQ (p=0.188) nor the final test score, control group 6.89 (SD: 1.35) and flipped classroom group 7.12 (SD: 1.53) (p=0.206).

Conclusions: The flipped classroom model is adequate for the teaching of EBP to undergraduate nursing students. It produced a slight increase in attitude, as well as in skills and global competence in EBP. Nevertheless, this increase was not significantly different from face-to-face learning in terms of impact on EBP knowledge.

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Keywords: Flipped Classroom; Online teaching platform; Nursing Education; Evidence based-practice

INTRODUCTION

International organizations such as the Institute of Medicine of the United States (IOM), and the World Health Organization (WHO), stress the importance of Evidence-Based Practice (EBP) as a basic competence of all health professionals including nurses (IOM, 2019; WHO, 2015). Likewise, the European Higher Education Area (EHEA) specifies, as one of the expected education results of undergraduate nursing students, the acquisition of skills needed to find, evaluate, describe, and apply, scientific information (Lahtinen et al., 2014). The objective of including EBP is to train future nurses to integrate the best results from research into clinical practice (Melnyk et al., 2011). However, the adoption of EBP teaching in nursing curricula is very unequal, varying between countries and levels of education. A study conducted in six European countries showed that the teaching of EBP was conducted in a minority of cases as an independent course in the bachelor and Master's degrees, and the EBP content was mainly integrated in other courses (Skela-Savič et al., 2020).

The learning of EBP during the education of nursing students is somewhat complex, given the difficulties encountered when teaching the content associated to subjects related to critical thinking, interpretation of statistical data, use of bibliographic databases, and research methodologies, and due to the deficits observed in educators, and their lack of connection to clinical settings (Lehane et al., 2019; Malik et al., 2018). Previous studies have shown a special interest for the study of performance in EBP teaching in the last few years, which has resulted in many studies on the effectiveness of diverse education strategies (Larsen et al., 2019). The traditional teaching model (face-to-face), based on in-person teaching, is the most utilized, through the application of different strategies such as lectures, seminars, discussions, exams, assignments, small group works and project works, team-based learning, case-study analysis and individual learning (Patelarou et al., 2020). However, some results have shown that the addition of active dynamics, and innovation technologies, could be effective methods for teaching EBP to undergraduate nursing students (Larsen et al., 2019).

Presently, there is a call for the addition of teaching models that are more attractive and dynamic for students, using new methodologies that favor the student's self-learning, facilitate distance learning, or the gamification of learning (Özbay and Çınar, 2021). The Flipped Classroom (FC) model is a learning approach centered on the student, in which the students receive the class materials before the in-person session, generally in a digital format, and utilize the class time for more active and collaborative activities. This approach allows them to learn about the subject outside of class, at their own pace, so that once they arrive to class, they are more informed and prepared for participating in debates about the subject and applying their knowledge through active learning activities (Hamdan et al., 2013). In this

way, metacognitive learning is produced through the autonomous work of the student (Youhasan et al., 2021). The design of FC is supported by the theory of constructivist learning. It implies that students can construct their own knowledge when they work independently. Constructivism considers the influence of the content and the context in which the learning takes place, so that the process is truly individual. It sets itself apart from the behavioral theory, which is more direct and centered on the professor (Fosnot, 1996). Among the advantages of the application of FC, we find the increased autonomous learning of students, the discovery of weak points through the prior preparative work of the content before the in-person class, the more flexible presentation of the teaching materials to promote the participation of students in the classroom, and the more efficient use of class time (Chen et al., 2017).

The use of this type of teaching method in health sciences is very recent (Barbour and Schuessler, 2019). Two meta-analyses studied the application of FC in the teaching of different subjects in the nursing degree in China, and showed positive results in favor of learning with FC as compared to the traditional model. More specifically, the score of the student's skills increased, as well as their cooperative spirit, and sense of teamwork (Li et al., 2020; Xu et al., 2019). Another systematic review on the impact of FC on the teaching of nursing students analyzed 27 articles, resulting in mixed results on the performance in exams, although solid evidence was provided that suggested that the FC could increase the motivation, satisfaction, and critical thinking of students (Youhasan et al., 2021).

Research in this area points out that the application of the FC model in the teaching of EBP in undergraduate nursing education could have an important potential. There are previous experiences in healthcare disciplines that have shown an increase in EBP competence in favor of teaching with FC (Huang et al., 2020; Tsao et al., 2022). In nursing, a study compared the traditional model with the FC one in a 5-hour EBP training class directed by nurses from a Taiwan hospital, and the results showed that both methods improved knowledge and self-efficiency in practice, although the FC obtained statistically significant better results (Chu et al., 2019). Up to today, we have not found studies on the application of the FC teaching model to rigorously evaluate the efficiency of learning EBP in the nursing curriculum (Özbay and Çınar, 2021). To provide new evidence, a study was designed whose objective was to compare the level of competence in EBP of nursing students after an EBP course, with the application of the traditional (face-to-face) versus the FC model.

METHOD

Design

A quasi-experimental study of non-equivalent groups was conducted, composed by a group of nursing students who received EBP training with the traditional model (face-to-face), and another intervention group who received training with the FC model.

Setting and participants

The study was conducted at the Faculty of Nursing at the University BLIND, in academic years 2019/20 and 2021/22. The Nursing Degree (Bachelor) in Spain is comprised of 240 ECTs that are obtained in 4 academic years. The study population were 4th-year students enrolled in an EBP course as part of the Nursing Degree. In order to implement different teaching methods, to have a significant sample, and to avoid possible ethical concerns that could arise if different methodologies were applied within the same academic year, it was necessary to use two groups from different academic years.

The control group (traditional classroom) was composed of students enrolled in the 2019/2020 academic year, for a total of 200 students. The intervention group (FC) was composed of students enrolled in the 2021/2022 academic year, for a total of 185 students.

Intervention: Teaching modalities

The EBP course is a mandatory course of 6 ECTs that is taught in the last year (4th) of the Nursing Degree. It is delivered in the first quarter (September-December), for 15 weeks, for a total of 150 hours, of which 40 hours are face-to-face, and 110 hours are independent student work. The course is taught by 5 professors with specific training on EBP. The students are organized into groups of 45-50 students to attend seminars, in which the content of the course is presented, and in groups of 18-20 students for practical laboratory work.

The intervention group received training following the FC model. Table 1 details the training program utilized. The students, before going to the in-person seminars and laboratories, accessed the EBP eToolkit online learning platform (pre-class asynchronous activities), according to the previously described chronogram in Table 1. The platform is organized into 7 open access modules that require prior registration, available at: https://europeannursingebp.com/. The content of each module was developed using interactive multimedia, videos, clinical scenarios, questionnaires, interactive games, and many other activities to facilitate the self-learning of the students. At the end of each module, the students answered a set of questions related to the content studied, to ensure that they completed the tasks outside of the class, and to obtain information on their understanding of the content. During the face-to-face classes (in-class synchronous activities), the professors delved into the more important concepts, provided feedback to the students, and monitored their work. Techniques such as group discussion, development of skills such as posing PICO

questions, real searches in databases, critical appraisal of articles, discussion of the biases and data interpretation, and presentation of the works created as a team, were utilized.

The control group received information following the traditional teaching model (face-to-face). The students attended the face-to-face class to receive theoretical classes, practical classes with access to computers, and seminars to facilitate discussion in small groups. A detailed description is found in a previous study (BLIND et al., 2016).

The number of in-person hours, content, and system of evaluation were similar in both modalities. A summative evaluation was utilized starting with the individual tasks performed by the students throughout the academic year, and a team task that ended with its oral presentation. Also, the students had to pass a final exam of 50 questions with 4 answer options.

Variables and data collection instrument

Sociodemographic variables: age, sex (female, male), type of admission to the degree (high school, practical training, special admission), previous level of education (none, practical training, diploma (3-year degree), bachelor´s (5-year degree), bachelor´s (4-year degree), master´s), and class attendance. Training variables: previous training on EBP and reading of articles.

Main variable: competence in EBP, composed of the dimensions "attitude", "skills", and "knowledge". The main variable was measured with the previously validated EBP Competence Questionnaire for nursing students (EBP-COQ) (BLIND et al., 2013). The EBP-COQ is composed of 25 questions. The responses range from 1 to 5 (1 no competence level, and 5 highest competence level), for the three dimensions and the global competence in EBP.

Secondary variable: the learning of students was evaluated through the final evaluation test at the end of the course. This test had been previously shown to have a moderate positive correlation with EBP-COQ (BLIND et al., 2021). The objective test was composed of 50 multiple-choice questions, with each having four response options, with only one being correct. The maximum score of this test was 10.

Data collection procedure

The data collection procedure was similar for both groups studied. Before and after the course, the students filled out a digital data collection notebook. For the control group, the first collection took place in September 2019, and the last collection in January 2020, while for the intervention group, the first collection took place in September 2021, and the final collection at the end of the course in December 2021. In both cases, the final evaluation test of the course was carried out 5 days after completing the self-reported questionnaire. The test was taken in person, and the students had 1 hour and 40 minutes to finish it.

Data analysis

The qualitative variables are shown as frequencies and percentages. For the quantitative variables, the mean and standard deviation (SD) were calculated. The comparison of proportions was performed with the chi-square (X^2) test. To compare the evolution of the level of competence in EBP over time, the assumptions of normality were verified. If these complied with the prerequisites, a repeated measures analysis of variance (ANOVA) parametric test was performed. As the measurement of the effect, the differences in means (DM) were utilized, with confidence intervals of 95% (95%CI) for the scores of the dimensions studied. The partial η^2 value was obtained to measure the effect size. The data were analyzed with the statistical packages Jamovi v.2.0.0.0 and SPSS v26.0. A level of significance of 5% ($p \leq 0.05$) was considered for the statistical analysis.

Ethical compliance

The study was approved by the Ethics Committee from the University BLIND (256/18). All the procedures followed the ethical guidelines from the Declaration of Helsinki. The participation of the students was voluntary, after an explanation of the object of study and the ethical guarantees were provided. The anonymity of the students was maintained, and the confidentiality of the data obtained was ensured through the creation of a personal code.

RESULTS

The study sample was composed of 294 4th-year nursing students. Of these, 152 were placed in the face-to-face group (control), while 143 were placed in the FC group (intervention). The characteristics of both groups were very similar; the mean age was 23 years old, and 84% were women (table 2). The admission to the Nursing Degree for both groups was after high school, although in the FC group, a higher percentage was observed (X^2=7.85; p=0.002). On the other hand, the control group had a higher percentage of students with another university degree (X^2=38.2; p<0.001). Lastly, class attendance for both groups was similar, with most students attending more than 75% of the classes. Likewise, both groups indicated not having previous training on EBP, with a somewhat higher percentage of students with EBP training of less than 40 hours observed in the face-to-face group (table 2). In general, at the end of the course, in both groups, most of the students indicated having read between 1 to 3 articles, and more than 3 articles in the previous month (Table 2).

The two EBP teaching methods obtained statistically significant increases before and after the course in the dimensions knowledge, skills, and global competence in EBP (Table 3). In the control group, there was an increase of 1.48 points in the knowledge dimension, while in the experimental group, an increase of 1.8 points was observed. Regarding skills, there was a somewhat smaller increase of 0.96 points in the control group and 1.09 points in

the experimental group. Finally, in global competence, there was an increase of 0.59 points in the control group and 0.97 points in the experimental group.

On the other hand, the results of the effect of the time*group interaction showed statistically significant differences in favor of students who received training according to the FC model in the dimensions attitude, skills, and global competence in EBP. The effect size was small in the 3 dimensions, in the attitude dimension, the eta square (η2) was 0.22 (p=0.01), in the skills dimension, η2 was 0.016 (p=0.019) and in global competence, η2 was a somewhat high 0.030 (p=0.003) (Table 3 and Figure 1 Supplemental material).

Lastly, statistically significant differences were not obtained in the score from the final exam, with a mean score of 6.89 (SD: 1.35) out of a maximum of 10 for the control group, and 7.12 (SD: 1.53) for the FC group (p=0.206).

DISCUSSION

The objective of the study was to discover if teaching an EBP course to students using the FC method improved their EBP competence with respect to the face-to-face method. In our study, 4th-year nursing students were compared. These students had a mean age of 23 years old, and 84% were women, the sociodemographic characteristics were similar between the groups compared, and in those shown in other studies conducted in Spain and other countries (Choi et al., 2021; Dong et al., 2021; BLIND et al., 2016). The findings showed that both teaching EBP using a traditional classroom, as well as FC, significantly increased the dimensions knowledge, skills, and the global competence in EBP. These results agree with previous studies that evaluated the competence of EBP with diverse education strategies of varied duration (Patelarou et al., 2020).

In response to the hypothesis posed in the present study, it was observed that students who received training on EBP following the FC methodology, significantly improved their competence in the dimensions attitude, skills, and the global competence in EBP, with respect to those who were taught using the traditional method, although the effect size was small. These findings could be explained by several reasons. In the first place, the increase in the attitude of the students could be due to FC being a more constructive and motivational method for the student (Youhasan et al., 2021). Also, the online teaching platform EBP eToolkit utilized in the FC methodology used interactive multimedia tools, which increase the satisfaction of students, as compared to more traditional methods that are more centered on the teacher, and these tools could have had a positive influence on attitude (Hsieh and Chen, 2020). Also, as pointed out, the FC method improves the commitment of the students, both in and out of the classroom (O'Flaherty and Phillips, 2015). In spite of this, we must consider these results with caution, as the effect was small, given that the dimension attitude towards EBP obtained high scores initially, so that the margin for improvement was smaller. The attitude towards EBP of the students in our study was higher than in other countries, as shown in a multi-country study that utilized the EBP-COQ. This study associated the

differences in attitude to factors such as the integration of EBP in the curriculum of the Nursing Degree, and the teaching methodology utilized (Labrague et al., 2019).

The results also showed that FC significantly improved the EBP skills of the students, which implies improvements in aspects such as the search for scientific resources in electronic bibliographical databases, critical appraisal, and interpretation of study results. Similar evidence was found in a meta-analysis, which evaluated the improvement in skills due to the use of FC, as compared to the face-to-face methodology, of undergraduate nursing students in various courses (Xu et al., 2019). The improvement in skills could be due to the FC method facilitating the autonomous learning of the student, thereby stimulating the work prior (independent) to the seminar and practical laboratories (Chen et al., 2017). In our study, the online teaching platform EBP eToolkit allowed work to be performed at home prior to the class, favoring the flexibility in learning, and the adaptation to individual needs and personal work rhythms (O'Flaherty and Phillips, 2015). In addition, the global EBP competence of nursing students was higher in the FC group, obtaining the highest effect size of the three factors with significant effects. These results, together with the existing evidence that showed that both the self-confidence and self-efficacy of nurses can be increased thanks to the FC (Chu et al. 2019), allowed us to think that there will be a positive impact when the students develop their clinical practice.

Lastly, an important increase in knowledge acquisition was observed with both teaching models, without significant differences, as evaluated with the EBP-COQ tool, as well as the objective test utilized. Previous studies pointed to mixed results on this aspect, in different areas of knowledge in nursing (Youhasan et al., 2021). The intervention in our study included a large number of dedicated hours (150h), including seminars and theoretical-practical laboratories with contents that were similar in both groups. Also, in both groups, around 80% of the students indicated having attended all the face-to-face classes. This homogeneity between groups could explain why the FC was not superior to the face-to-face methodology in the acquisition of knowledge. The studies that found significant differences in EBP knowledge included more heterogeneous experimental and control groups, with only a few hours of training for both groups (<10h) and scarce class work (Chu et al., 2019), which could explain the superiority of one method as compared to the other.

Until today, a single FC model has not been identified (Özbay and Çınar, 2021). In our study, the basic elements proposed in this model were applied: previous asynchronous content, knowledge of the educator about the understanding of the students, and higher order learning during classroom time (O'Flaherty and Phillips, 2015). As demonstrated in previous studies, the application of this teaching model requires the design and application of online contents, search for significant resources, and the preparation of tests, which requires careful planning and preparative work (Missildine et al., 2013; Schlairet et al., 2014). Also, it requires financing to cover the cost of resources needed before the start of the class, and

continuous informatics support (Kurup and Hersey, 2013), aspects that should be considered for its utilization.

In future studies, it would be interesting to conduct temporal follow-up studies to evaluate the efficacy of FC in the long-term. The bibliography on this matter is scarce, which indicates that the changes in time may not vary from one method to the next (Hsieh and Chen, 2020). Another recommendation is to evaluate the other outcomes, such as viability and acceptability of FC as a strategy centered on the student, and the changes produced in the perception of their practical learning (Choi et al., 2021).

The main limitation of the study was the design utilized, as the assignment of the participants did not allow it to be random. Thus, in some cases, the characteristics of the participants were different, and even then, homogeneity was observed between groups in most of the variables studied. On the other hand, the study was conducted in a single education center, which could limit the extrapolation of the results, assuming that the context and the characteristics of the students could vary between institutions.

CONCLUSIONS

The FC model is adequate for the teaching of EBP to undergraduate nursing students. Although the traditional model also improved the EBP competence of students, the application of the FC, as compared to the traditional model, produced a slight and significant increase in the attitude towards EBP, as well as in the skills and global competence in EBP. However, FC did not have an effect that was superior to the traditional model on the acquisition of knowledge.

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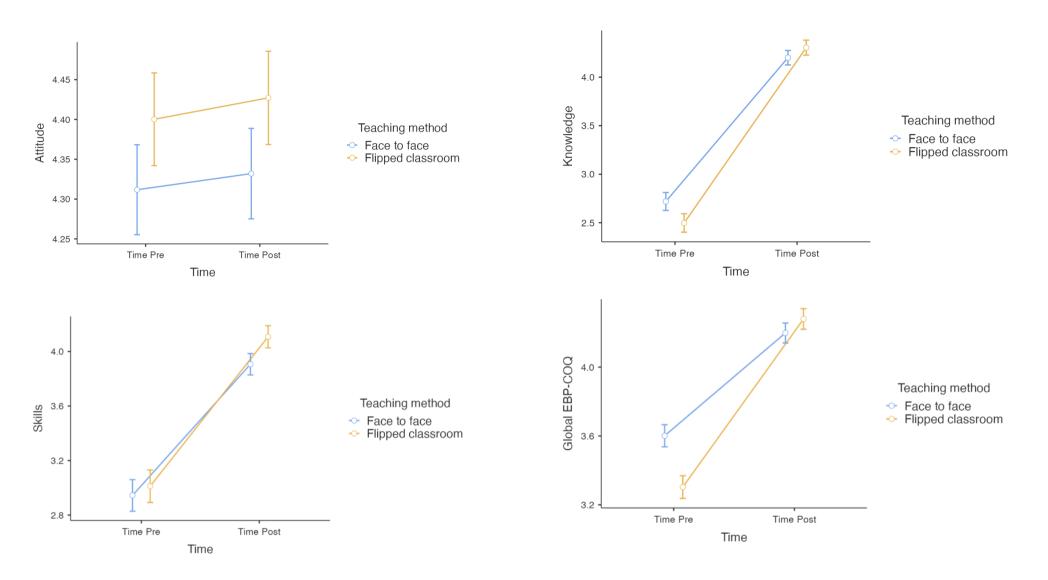
Figure 1

Figure 1. Differences in means between the face-to-face and flipped classroom groups.

Table 1

Table 1. Flipped classroom programmed activities

Pre-class asynchronous activities	In-class synchronous activities	
Module 0: Cultivate a spirit of inquiry within an Evidence-based Practice (EBP) culture and environment	Laboratory (1h)	Discussion about the concept of EBP, advantages and disadvantages. Groups for and against. Review of clinical variability examples.
Module 1: Ask the burning clinical question in PICOT format	Laboratory (1,5h)	Students pose PICOT questions based on clinical scenarios. They discuss the clinical domain of the questions.
Module 2: Search for and collect the most relevant best evidence	Laboratory (5h)	Search the Cochrane library. Perform searches using different search strings in PubMed. Analysis and discussion of the findings
Module 3: Critically appraise the evidence	Seminar (2.5h)	Data interpretation. Discussion of data starting with studies published
	Seminar (2.5h)	Work in groups of 3-4 students to discuss the most common types of bias in primary and secondary studies.
	Seminar (2.5h)	Practical work of the evaluation systems of study quality, classification of the levels of evidence and degrees of recommendation. Practical example of the use of the GRADE system in clinical practice guidelines and systematic reviews.
	Seminar (2.5h)	Critical reading of cross-sectional analytical studies and diagnostic tests. Pre-reading of an article and class discussion in a small group about biases using the CASP checklist.
	Seminar (2.5h)	Critical reading of case and control studies. Pre-reading of an article and class discussion in small groups about biases using the CASP checklist.
	Seminar (2.5h)	Critical reading of cohort studies. Pre-reading of an article and class discussion in a small group about biases using the CASP checklist.
	Seminar (2.5h)	Critical reading of a randomized clinical trial. Pre-reading of an article and class discussion in a small group about biases using the CASP checklist.
	Seminar (2.5h)	Critical reading of a systematic review. Pre-reading of an article and class discussion in a small group about biases using the CASP checklist.
Module 4: Integrate the best evidence with one's clinical expertise and patient/family preferences Module 5: Evaluate outcomes of the practice decision or change based on evidence	Laboratory (5h)	Group discussion on the implementation of a Clinical Practice Guideline. Review of factors in favor, barriers and implications in decision making in practice.
Module 6: Disseminate the outcomes of the EBP decision or change	Laboratory (5h)	Presentation of results in response to a clinical question. Carrying out group preparatory work and group presentation.

Table 2

Table 2. Characteristics of the participants

		Teaching method		
		Face-to-face (2019/2020)	Flipped classroom (2021/2022)	P value
Age (Mean; SD)		23.22 (6.15)	22.29 (5.11)	0.160
Sex %(N)	Female	83.6% (127)	83.9% (120)	0.933
	Men	16.4% (25)	16.1% (23)	
Type of admission %(N)	High School	77% (117)	88.8% (127)	0.002
	Practical training	14.5% (22)	8.4% (12)	
	Special admission	8.6% (13)	2.8% (4)	
Other education[1] %(N)	None	75.7% (115)	88.8% (127)	<0.001
	Practical training	2.6% (4)	9.8% (14)	
	Diploma (3-year degree)	19.1% (29)	0% (0)	
	Bachelor's (5-year degree)	1.3% (2)	0.7% (1)	
	Bachelor's (4-year degree)	1.3% (2)	0% (0)	
	Master's	0% (0)	0.7% (1)	
Class attendance %(N)	<24%	2% (3)	0.7% (1)	0.756
	25-49%	5.3% (8)	4.2% (6)	
	50-75%	15.8% (24)	14.8% (21)	
	>75%	77% (117)	80.3% (114)	
EBP training %(N)	None	84.9% (129)	93% (133)	0.032
	<40h	11.8% (18)	6.3% (9)	
	40-150h	3.3% (5)	0% (0)	
	>150h	0% (0)	0.7% (1)	
Reading of articles per month %(N)	None	2% (3)	0.7% (1)	0.404
	1-3 articles	34.9% (53)	30.1% (43)	
	>3 articles	63.2% (96)	69.2% (99)	

[1]Diploma and Bachelor's (5-year degree) refer to the old education system, which were replaced by the current Bachelor's (4-year degree), beginning in 2008.

Table 3. Comparison of the scores of the dimensions from EBP competence and the global score of the EBP-COQ between the control (face-to-face) and experimental (flipped classroom) groups.

	PRE		POST		MD	CI 95%		Within subjects			Between subjects AxB		
	M	SD	M	SD		Low limit	Upper limit	F	p	η2	F	p	η2
ATTITUDE													
Face to face	4.31	0.318	4.33	0.327	-0.0202	-0.0720	0.0315	0.478	0.490	0.002	6.65	**0.01**	0.022
Flipped classroom	4.40	0.388	4.43	0.384	-0.0269	-0.0926	0.0388	0.794	0.373	0.003			
KNOWLEDGE													
Face to face	2.72	0.582	4.20	0.431	-1.4814	-1.5910	-1.3717	642.22	**<0.001**	**0.687**	1.74	0.188	0.006
Flipped classroom	2.50	0.574	4.30	0.506	-1.8065	-1.9317	-1.6813	898.55	**<0.001**	**0.754**			
SKILLS													
Face to face	2.94	0.674	3.91	0.419	-0.9627	-1.0724	-0.8530	246.3	**<0.001**	**0.457**	5.52	**0.019**	0.018
Flipped classroom	3.01	0.778	4.11	0.560	-1.0967	-1.2333	-0.9602	300.72	**<0.001**	**0.507**			
GLOBAL COMPETENCE													
Face to face	3.60	0.343	4.20	0.302	-0.5971	-0.6539	-0.5403	261.88	**<0.001**	**0.472**	9.10	**0.003**	0.030
Flipped classroom	3.30	0.457	4.28	0.418	-0.9767	-1.0663	-0.8872	659.22	**<0.001**	**0.692**			

M= Mean; SD= Standard Deviation; MD= Means difference; η2= eta square.

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