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Influence of active methodologies: Projects and cases in the development of digital competences with mobile devices

Abstract

Purpose

The research purpose is to analyze the influence of two active methodologies on digital competences development using mobile devices. The first methodology is Project-Oriented Learning (POL); the second one is Case-Based Learning (CBL). The analyzed digital competences belong to the communication and collaboration area of Framework DIGCOMP.

Design/methodology/approach

This article shows the results of the quantitative stage with a design pre-experimental pre-test post-test. A questionnaire was designed and applied to an intentional sample from two different courses. 178 students completed the questionnaire in the pre-test, after five months 38 students completed the questionnaire in the post-test.

Findings

Results show that students to whom POL was applied increase by 7% competence of interaction with mobile technology. The results also show that the students to whom CBL was applied to increase all four competencies (Interaction +8%, Share +6%, Collaboration +5%, Netiquette +4%)

Originality/value

The rapid advance of technology and the results of various investigations make evident the need for digital competences development. The most common process is digital literacy through techno-functional training. However, these research results confirm that it is possible to promote these digital competences from a practical view and implicitly in active methodologies educational practices.

Research limitations/implications

Self-perception for the evaluation of digital competence and the short study time are limitations to generalize the results, so a longitudinal study is necessary and complemented with qualitative analysis, to present a better validation of the contribution of active methodologies to the development of digital competences.

Keywords
Digital competence, active methodologies, project-oriented learning, case-based learning, mobile device, higher education, mixed methods.

Digital competence in mobile contexts

In this research, we use the term digital competence as the set of knowledge, skills, attitudes that are required when using ICT and digital media (Ferrari, 2012). In recent years, digital competences have been examined applying different perspectives, and some models have been generated, which focus either separately or in an integrated way, on the aspects of knowledge, skills, and attitudes concerning four basic domains: literacy studies, a societal approach, media studies, library studies and technology studies. (Ilomäki et al., 2016).

This includes the DIGCOMP reference framework, which is oriented to citizens in general. This framework was first used in 2011 in the development of a conceptual model of digital competence (Ala-Mutka, 2011) and was formalized in 2013 (Ferrari, 2013). The most current version is Version 2.1 (Carretero et al., 2017). The latest version of the model structures 21 competences organized into five areas: 1) Information and data literacy, 2) Communication and collaboration, 3) Digital content creation, 4) Safety and 5) Problem solving) and with four levels of mastery, namely, basic, intermediate, advanced, and highly specialized.

DIGCOMP model has been used in various contexts and countries within the European Union. In *DIGCOMP in Action* 2018 guide, model implementations are shown in different contexts and various forms either as cases or tools. For example, Samsung Digi Pass is a training program developed in Estonia. It allows 30 students to prepare themselves during 4 months and develop a prototype application in their professional area (Samsung, 2016). Another case is the eLene4work project, which was developed in 10 European countries. This project offers a soft skills test and digital soft skills for students before they enter the workforce, allowing them to diagnose themselves and establish their learning agenda through MOOCs (Massive Open Online Courses) and OERs (Open Educational Resources), which were also developed by the project (Cinque et al., 2019).

Although digital skills are not only focused on devices, the widespread use of mobile devices in our daily lives has promoted the increase in the number of studies focused on digital competences in mobility contexts or mobile learning. (Molina and Chirino, 2010; Siiman et al., 2016; Aguirre et al., 2019), even giving rise to the theme of mobile digital literacy (Frawley and Dyson, 2018; Ng and Cumming, 2015) or mobile literacy (MacCallum et al., 2014). There have also been further specifications, such as mobile information literacy, which are discussed in the City University of New York project in which librarians presented information literacy services through mobile devices (Havelka, 2013). This research, in one way or another, is formulated based on general models of digital competencies, but the indicators and therefore the instruments are center around mobile contexts.

Within the areas of digital competence and due to the same influence of mobile devices on a more specific level, research or discussions of a mobile communication competence model have emerged. This model assesses a series of cognitive constructions in which the mobile preference of users, their comfort with technology, and their level of asynchronous communication competence form a motivating and energizing factor that leads to the application of appropriate, effective, and affective mobile communication (Bakke, 2010).

Digital competences and their relation with active methodologies

There are a variety of alternatives for the development of digital competences, including direct digital literacy based on an initial evaluation, such as the strategies implemented by projects such as IKANOS (Gobierno Vasco-Departamento de Desarrollo Económico e infraestructuras, 2015), which uses a test to evaluate competences, and National Institute of Technology and Professional Development (INTEF), which not only evaluates but also proposes digital certification in passport mode through a common framework of digital teaching competence (INTEF, 2017). Another alternative is the inclusion of digital competency training within an educational curriculum, applying the resources or strategies framed within given teaching and learning methodology (Guzmán-Simón et al., 2017). Among these alternatives, which are recorded in the DIGCOMP user guide (Vuorikari et al., 2018), one stands out for potential use at the university level and another at the school level. Anglia Ruskin University project is an example where learning activities are designed according to the classifications of DIGCOMPv0 framework and are undertaken to deliver parts of a curriculum in a technology-enabled way in two environments, namely, in a virtual learning environment and on tablets, to enhance digital skills (Evangelinos et al., 2016). Likewise, in "National Education Institute Slovenia", a project is implemented that supports teachers in defining indicators for planning activities to develop students' digital competence from kindergarten to high school. (Wechtersbach, n.d.).

The two initiatives mentioned above refer to specific activities that have been defined in the curriculum and are framed in an active methodology, which "allows the student to do and think about what he/she is doing" (Bonwell and Eison, 1991). Among the active methodologies available in this context are CBL, POL, and problem-based learning (PBL), which have similarities and are closely related; however, they also have their differences. POL emphasizes the final product and the skills acquired during the process, whereas PBL prioritizes the search for solutions to the problems identified (Author, 2017). POL and PBL share a problem, but do not have the same purpose. In CBL, the objective is to solve a relevant problem (Sherman et al., 2019), whereas in other cases, the objective is to analyze the problem or the decisions made by the actors in the problem case (Lee et al., 2016; Rong and Choi, 2019).

POL and CBL can be taken either individually or in groups. In the implementation of these methodologies, the need for digital competences is often presented at the beginning, alongside highlighting the contribution to their development (Cole et al., 2017). However, longer observation periods are required to demonstrate this (Carmona et al., 2018, 2014; Pérez-Mateo et al., 2014), as the specific contribution to collaborative learning (Vuopala et al., 2016) is also highlighted both in POL and in CBL (Ktoridou et al., 2018; Wengrowicz et al., 2018). In the case of teachers, the focus is on the competences related to the configuration of the problem and the preparation of a curriculum that is sufficiently flexible for the methodology, alongside assisting teams, including monitoring and managing different actors (Rees Lewis et al., 2019). Hence, there is a need to investigate how these active methodologies influence the development of digital competence, particularly online communication and collaboration, using mobile devices.

In the development of these active methodologies with technologies, the competences of interaction, communication, collaboration, and netiquette are evident. Interaction competence is the ability of the user to interact with technology, either hardware or software. The sharing competence is the ability of the user to share data, information, or content by any means, including referencing and attribution practices. Collaborative competence is the ability to use technologies for collaborative work and the co-construction and co-creation of resources and knowledge. Netiquette competence is the ability to behave appropriately when interacting in digital environments and to adapt their communication strategies to a specific audience (Vuorikari et al., 2018).

Hence the need to investigate how these active methodologies influence the development of digital competences related to communication and collaboration specifically when using mobile devices.

Research method

a) Research design

Research design begins with this research question: How are digital competences developed in active learning contexts with mobile devices? To answer this question, we applied a quantitative design with a pre-test post-test pre-experimental group.

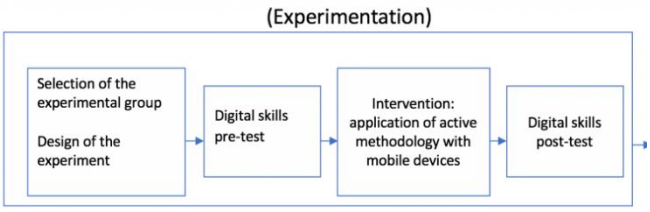

Figure 1: Research design – Quantitative stage

This research begins with the selection of two subjects whose teachers are willing to:

1. Incorporate the use of active collaborative methodologies in class planning.
2. Promote the use of mobile applications to develop learning activities.

Once the subjects were selected, the instructional design was reviewed to identify the possibility of integrating active collaborative methodology, with the support of mobile apps for different activities such as messaging, collaboration, and simulation with augmented reality, especially in the subject of forensic medicine. The characteristics of the selected subjects are presented in Table 1.

Table 1**.** Subjects' characteristics

In the Automata Theory subject, POL was implemented. In the legal medicine subject, CBL was implemented (Author, 2019). At the beginning of the academic period, a pre-test on digital

competences was applied to all students, the methodology was explained to them, and the experiment was conducted from October to February for 16 weeks.

The post-test was applied after this experiment was completed. The digital competences were evaluated again with the same test to determine if some change occurred. To evaluate the student´s perception about the development of digital competence one question was added to the post-test.

Hypothesis research is "Digital competences level of student´s Legal Medicine subject and student's Automata Theory subject register a significant positive increase in digital competencies after PBL or POL interventions".

b) Participants

The study population consisted of 680 students enrolled in the two subjects selected for the experiment:

- Automata theory taught to IT-track students featuring POL with 50 students.
- Legal medicine, taught to law-track students, featuring CBL with augmented reality, with 630 students divided into groups of 50 students

Non-probability sampling was used (Creswell and Creswell, 2017). Of the 680 students, only 178 consented to participate in the research: The pre-test involved 145 students from legal medicine subject and 33 students from automata theory subject. In the post-test, 23 students from medicine legal subject and 15 from automata theory participated. These students are from a distance learning university in Ecuador, living in different regions of the country: Pacific Coast (5 in Pol group/7 in CBL group), Andes Mountains (10 in Pol group/13 in CBL group), and Amazon Jungle (2 in CBL group). They interact with their teachers and peers through an LMS and other mobile applications. All those who took the tests provided their consent to participate in the study and received a certificate of participation. Table 2 presents the categories and variables of the study.

Table 2. Variables

c) Measures

The questionnaire was developed based on a set of indicators. These indicators were adapted to the research context of the contribution of some authors (Ng and Cumming, 2015; Bakke, 2010; Fanbin, 2012; Ferrari, 2013). It was divided into three sections:

1. General information, this section had 3 questions: age, sex, and type of mobile device.
2. Mobile learning context, this section had 3 questions: type of internet connection, usage frequency, and learning activities using mobile devices.
3. Digital competence, this section had 6 questions with a list of items to evaluate the knowledge and skills of 4 competencies: Interaction, communication, collaboration, and Netiquette. It also had 1 question to evaluate attitudes towards the use of the mobile device in higher education.

The items for digital competencies were categorized according to the competence, the indicator being evaluated, and the level assigned (basic, medium, or advanced), according to complexity.

The items to assess the *interaction competence with mobile technology* focused on user actions with physical and logical components of their mobile device, and with different mobile applications. The items of the *competence to share with mobile technology* focused on the employment of mobile applications to share information, as well as the actions performed within them. These two competences were measured on a scale from 1 to 3. 1: I don´t know; 2: I know and 3: I use it.

The items to assess the *competence of collaboration with mobile technology*" included aspects of behavior, usage, and configuration of mobile applications related to teamwork. The items of the *Netiquette competence* focused on evaluating the norms of behavior in the virtual learning communities. For the competencies of collaboration and netiquette, a scale from1 to 5 was used to determine the intensity or level of agreement.

To make the competences equivalent and comparable, the final score was obtained of a percentage of the maximum theoretical score of each one of them, using an overall scale range from 0 to 1.

The post-test had the same questions as the post-test, plus a question on self-perception on the influence of the methodology on the development of the four competencies. The question was as follows:

From your experience of working with the methodology used, how far did it help you develop or strengthen the digital competences described below? Please answer from 1 to 5, where 1 is no help, and 5 is a great deal of help.

d) Validity and reliability of the research

Assessment of the validation and reliability of the research is required to guarantee an investigation, in every sense. The validity of an investigation lies not only in quantitative measures but also in a global assessment of the quality of a research study, its parts, its conclusions, and its possible applications (Onwuegbuzie and Johnson, 2006). Reliability is demonstrated when a particular technique is applied repeatedly to the same object and produces the same result for each iteration (Wong and Cooper, 2016).

In this study, it was possible to minimize the following threats to validity:

- *Treatment-focused* because, using a single group, there was no risk that the knowledge being tested through the experimental group could pass to the control group. Hence, there was no possibility of rivalry or demotivation.
- *Procedural threats* were covered using a single standardized instrument for both pre-test and post-test, and there was no possibility that the students could recall the questions because 5 months had elapsed between the administration of the pre-test and the post-test.
- It is not possible to control *participant threats*, namely, history, maturation, and mortality, due to the nature of open and distance modality, as studies reveal that there is an average of 50% dropout rate (Cabrera, 2015; Mora, 2014).

The threats to the external validity of this research are difficult to minimize because the experiment took place in a specific educational context, with a specific and differentiated sample.

e) Reliability and validity of the instrument:

a. To ensure the reliability of the instrument, Cronbach's alpha coefficient was established for both scales. On a scale from 1 to 3, to measure the level of knowledge and skills, a reliability coefficient of 0.93 was obtained. On a scale from 1 to 5, which is used to assess the sharing and collaboration competences and to measure attitudes, the reliability coefficient was 0.88
b. The instrument used to measure the level of digital competence had the following evidence of validity:
    - The instrument was reviewed by six digital competencies experts from Spain, Mexico, and Ecuador.
      It should be noted that the items and the scale used to measure attitudes were adapted from a scale used to measure university faculty attitudes toward ICT integration (Author, 2009). Moreover, the items and scale were adjusted toward the students' profiles and to mobile devices specifically.
    - The internal structure of the instrument follows the DIGCOMP framework, which has been widely validated and is used in different contexts. To elaborate the indicators in the specific context, research on the use of mobile devices by university students was considered (Ng and Cumming, 2015; Bakke, 2010; Fanbin, 2012; Ferrari, 2013).

Results.

a) Descriptive Results

The students who **worked with CBL** were between 18 -51 years old (*M*=32; *SD*=8.6). The female group is 68% of the sample. 92.41% who worked with CBL have a smartphone and 89% of them use it daily. 37.93% of those who worked with CBL have a Tablet, only 34% of them use it daily. These students group connects mainly through a home network to develop academic activities; 72.4% do it through a Smartphone and 63.5% do it through a Tablet. Only 46.9% of students in the group perform academic activities using a data plan.

The highest percentage of students who worked with CBL use the Smartphone for academic activities. The Smartphone is used mostly for Content Sharing activities (71.3%) and a few for Collaborative Work activities (46.9%).

The students who **worked with POL** were between 21 -51 years old (*M*=34; *SD*=7.6). The male group is 65% of the sample. 96.97% who worked with POL have a smartphone and 94% of them use it daily. 33.33% of those who worked with POL have a Tablet, but only 12% of them use it daily. These students group connects mainly through a home network to develop academic activities; 78.8% do it through a Smartphone and 63.6% do it through a Tablet. 69,7% of students in the group do their academic activities using a data plan.

The highest percentage of students who worked with POL use the Smartphone for academic activities. The Smartphone is used mostly for Content Sharing activities (71.7%) and a few for Collaborative Work activities (51.5%).

In both the CBL and POL groups, the Tablet was used mainly for activities related to interacting with the device (information searching, documents reading, websites navigation). A lesser extent used it in activities related to information sharing. The "quantity of mobile devices that a person has" and "quantity of academic activities that a person develops with mobile devices" were weakly correlated (rp 1(178) = 0.201; p<0,01). Mann-Whitney test indicated that there did not differ significantly between participants of CBL and POL groups in "**academic activities that a person develops with mobile devices"** (*p* >0,05).

b) POL and CBL influence on post-test results.

After CBL and POL interventions were completed, the digital competences test was administered again. 38 completed responses were obtained: 15 POL group and 23 CBL group.

As mentioned in the Measures Section, the final measurement scale for the four competencies was unified from 0 to 1. Table 3 and Table 4 show the results of the pre-test and post-test and the difference between them. In both groups, an increase of 0,02 to 0,08 is observed between the pre-test and post-test, except for the competence to share with mobile technology in the POL group, although it should be recalled that a remarkably high score (0.92) was assessed before the intervention.

The sample of this research in each subject is smaller than 30 students, therefore the Shapiro-Wilk test for normality was applied. Shapiro-Wilk test for normality results indicate that mean differences between pre-test and post-test of the interaction, collaboration, and netiquette competences of CBL group, as well as the sharing competence of CBL and POL group, do not have a normal distribution (p<0.05), so the Wilcoxon statistic is applied.

Mean differences between pre-test and post-test of interaction, collaboration, netiquette competences and attitudes of POL group, as well as attitudes of CBL group, have a normal distribution (p>0.05), so T-student is applied.

POL results analysis

Although the level of all competencies increased in the post-test, only the mean difference (0.07) of the interaction competency (SD=0.063), is statistically significant t (14) =-4.486, p=0.001, i.e. POL positively influenced the development of the digital interaction competency.

Table 3. Results pre-test and post-test - POL

No significant differences were found between the pre-test and post-test results in the following competencies: collaboration with mobile technology, sharing with mobile technology, netiquette, and attitudes. However as shown in Table 5, according to the students' perception, the two methodologies: have promoted the development of the 4 competencies.
In POL methodology, the mean value is 3,27, 50% of data are over medium value and more frequent data is 4. These results show student's perception that POL methodology is helping for their digital competences development

CBL results analysis

For Legal Medicine students subject, where CBL was used, positive difference in four competencies (interaction +8%, sharing +6%, collaboration +5%, and netiquette +4%), are significant; so the research hypothesis is accepted with these competences. A Wilcoxon Signed-ranks test indicated that:

- Post-test interaction digital competence result (Mdn=0,91) was statistically significantly higher than pre-test result, Mdn=0,85, Z=-3-336, p<.05
- Post-test sharing digital competence result (Mdn=0,95) was statistically significantly higher than pre-test result, Mdn=0,92, Z=-2,511, p<0.05
- Post-test collaboration digital competence result (Mdn=0,78) was statistically significantly higher than pre-test result, Mdn=0,71, Z=-2,640, p<0.05.
- Post-test Netiquette competence result (Mdn=0,76) was statistically significantly higher than pre-test result, Mdn=0,74, Z=-2,246, p<0.05.

Table 4. Results pre-test and post-test - CBL

These results coincide with the students' self-perception. In CBL methodology, the mean value is 3,83, 50% of data are over medium value and more frequent data is 4. Only in sharing competence mode value is 5. These results show student's perception that the CBL methodology is helping for their four digital competences development, as presented in Table 5.

As in the POL group, according to the t-test for attitudes, the positive differences were not significant. **t(22)= -1.073, p=0.295.**

Table 5. Self-perception of competence development

Kruskal-Wallis test was conducted to examine the differences in digital competence according to country region. No significant differences were found among the four regions, as shown in Table 6.

Table 6. Kruskal Wallis test

Discussions and conclusion

This study provided quantitative results on the influence of Pol and CBL with the use of mobile devices in the area of communication and collaboration of the DIGCOMP 2.1 framework with the development of four digital competencies (Carretero et al., 2017). The choice of the communication and collaboration area responds to the findings and proposals for future studies found in other research publications. Highlighting the need to determine alternative means for the development of digital competencies and, in particular, to introduce elements of digital literacy in

the teaching methodologies used in the teaching of any academic discipline (Guzmán-Simón et al., 2017), as well as in the impact of mobile devices on the development of digital competencies (Molina and Chirino, 2010).

The results obtained with POL and CBL in this research confirm their effectiveness in the development of some digital competencies of students, in agreement with Pérez-Mateo et al. (2014) and (Cole et al., 2017), although the percentage of development is small in most of the competencies. Although the statistically significant differences show that with CBL more competencies are developed in the context of a subject of Legal Medicine, this does not imply that POL is not an effective teaching strategy that allows developing digital competencies, since a large number of students involved in POL perceived that they had increased their competencies in this field; besides, taking into account that the students who worked with POL are from the IT career and before the intervention showed a higher percentage of use of mobile devices for learning activities, the expected increase was lower due to a greater mastery of this type of competencies. The experimentation period with these methodologies was only 5 months, and as evidenced in other similar studies, in short periods a null development of digital competencies is usually found (Carmona et al., 2018). Therefore, it would be necessary to expand the samples with students from other areas and initial proficiency levels and generate future longitudinal research to adequately assess the development of digital competence in a wider range of time. These results lead to further qualitative research to complement the results and perform a better validation of the contribution of active methodologies to the development of digital competencies.

From the four competencies, the digital media collaboration competency is the one that is most analyzed in other research and its development is found in another CBL research (Wengrowicz et al., 2018). Although, in this study, this competence obtained the lowest score in the pre-test (0.70), in the post-test its increase of (0.75) was evidenced after the intervention with CBL. According to Ktoridou et al. (2018), this competence must be developed before starting a collaborative work in CBL; thus, it will be possible to build trust, establish objectives and negotiate the roles of the participants (Lee et al., 2016).

Another important aspect to discuss is attitudes towards the inclusion of mobile devices in the learning process. In this research, although the change found in the post-test is not statistically significant, the students assure that there was a positive change in attitudes when they answered the question of the general perception of change in attitude; This is probably reflected in improvements in competencies, following Bakke (2010) and Fanbin (2012), who have concluded that high scores in motivational constructs (attitude) can lead to the acquisition of new knowledge and skills.

This is a very important aspect since the integration of mobile devices as a learning tool of an active methodology can generate greater motivation in students and, therefore, better learning results and an implicit development of digital competence, favoring the process of digital literacy in the general public. Likewise, the acceptance of students to this kind of methodology using mobile devices can promote innovation in current pedagogical models of educational institutions and inspire teachers to develop their digital competence and innovate their educational practices with emerging technologies and pedagogies.

Different researches highlight the need for the empowerment of educational institutions to promote the development of digital competences of students (Soler-Costa et al., 2021; Torres-Gastelú et al., 2019). This is a great challenge for universities and their teacher training areas, who must design and implement new training and guidance programs for teachers in the implementation of this type of active methodologies supported by technologies so that they develop their technological-pedagogical competencies (Cejas-León & Navío Gómez, 2018; Contador & Esteban, 2016). Educational institutions can have the DigcompEdu model as a reference since it contemplates the professional and pedagogical competencies of educators, as well as the development of students' digital competencies (Ghomi and Redecker, 2019). The results have shown that this type of didactic methodologies allows active learning through the use of mobile devices and also the acquisition of digital competencies.

In this sense, teachers should overcome the digital divide and play the role of guide in the learning construction process, taking advantage of mobile digital resources to promote the development of career-specific competencies and generic and transversal competencies, such as digital competence, which is becoming increasingly relevant in all professional fields.

Finally, it is important to highlight that although the instrument used in this research leads to measuring the student's self-perception and can generate subjectivity in the responses, it is also a widely used technique in educational research due to the very nature of the research context and the complexity of the assessment in real situations or simulators. As Mateus et al. (2019) pointed out the self-perception character of the instruments, allows to positively demonstrate the direct correlation between the student's self-perception and the ability to achieve an expected result, based on the theory of self-efficacy Bandura (1982)

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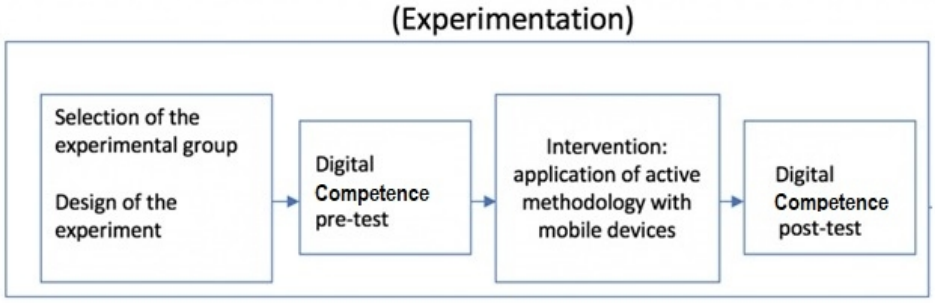

Research Design

56x21mm (300 x 300 DPI)

Table 1. Subjects' characteristics

Variable	Group 1	Group 2
Subject	Automata theory	Legal medicine
Career	Computer systems	Law
Treatment	POL	CBL
Mobile application	WhatsApp Socrative Canvas Student	WhatsApp Augmented reality: Virtopsy and anatomical regions Canvas Student

Note: Only in legal medicine subject were augmented reality applications used because of the nature of the subject

Table 2. Variables

Variable	Type	Categories
Digital competence	Dependent	Interaction with mobile technologies (MT) Sharing information and content using MT Collaboration through MT Netiquette Attitudes
Active learning methodology with mobile devices	Independent	Type of methodology: –CBL –POL
Context	Contextual	Possession of mobile devices Frequency of Internet use Connection type Use of mobile phones in learning activities

NOTE: The digital competence variable is assessed in 4 specific competences such as interaction, sharing, collaboration, and netiquette

Table 3. Results pre-test and pos-ttest - POL

Methodology	Competence	Medium Pre	Medium Post	Dif.	t	Z	Sig
POL	Interaction	0.87	0.94	0.073	-4.486		**0.001**
	Share	0.92	0.92	0.005		.451	0.652
	Collaboration	0.68	0.73	0.054	-1.744		0.103
	Netiquette	0.66	0.69	0.034	-2.086		0.056
	Attitudes	0.69	0.71	0.018	-0.957		0.355

NOTE: t: T-test / Z: Wilcoxon

Table 4. Results pre-test and post-test - CBL

Methodology	Competence	Medium Pre	Medium Post	Dif.	t	Z	Sig
CBL	Interaction	0.81	0.90	0.0839		-3.336	0.001
	Share	0.85	0.91	0.0630		-2.511	0.012
	Collaboration	0.70	0.75	0.0526		-2.640	0.008
	Netiquette	0.72	0.76	0.0330		-2.246	0.025
	Attitudes	0.75	0.78	0.0287	1,073		0.295

NOTE: t: T-test / Z: Wilcoxon

Table 5. Self-perception of competence development

Methodology		Interaction	Sharing	Collaboration	Netiquette
POL	Media	3.27	3.27	3.27	3.13
	Medium	4.00	4.00	4.00	3.00
	Mode	4	4	4	4
	Standard deviation	1.438	1.486	1.335	1.457
CBL	Media	3.83	4.00	4.00	4.04
	Medium	4.00	4.00	4.00	4.00
	Mode	4	5	4	4
	Standard deviation	1.072	1.044	0.905	0.878

Table 6. Kruskal Wallis test [a,b]

Methodology		Interaction Difference	Share Difference	Collaboration Difference	Netiquette Difference
POL	Chi-square	.636	.099	.736	.752
	df	1	1	1	1
	Asymp. Sig.	.425	.753	.391	.386
CBL	Chi-square	2.990	4.099	3.568	.064
	df	2	2	2	2
	Asymp. Sig.	.224	.129	.168	.969

a. Kruskal Wallis Test

b. Grouping variable: REGION