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Flipped Learning for Promoting Self-regulation, Social Competence, and Decision-making in Pandemic Conditions

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Abstract

Flipped learning has emerged as a method that can facilitate practical learning supported by technology. This study analyzes the impact of the flipped approach on students' learning of prevention guidelines and socio-health regulations related to the COVID-19 pandemic. A total of 585 Spanish secondary education students participated, and three validated instruments were used to obtain information about their self-regulation, social competence, and decision-making. The results showed that the average scores achieved by all groups, both in the pre-test and the post-test measures, were similar, except those achieved by the experimental post-test group, where the average scores were higher than the rest. The study concludes that both traditional and flipped learning pedagogical applications for training students in the measures to prevent COVID-19 generate knowledge and improved skills. Theoretical and practical implications are discussed, including the insight that active teaching methods promote greater improvement in student learning than traditional, expository methods.

Keywords

flipped learning, expository-traditional method, COVID-19, pretest-postest, control group-experimental group

The historical evolution of society has led to changes in educational processes. Each historical stage has been defined by events and developments that have marked social relations, types of business, and access to information and knowledge (López & Bernal, 2019). Currently, the global pace of change is dizzying and made even more so by the COVID-19 pandemic (Attard & Holmes, 2022). These changes have had a direct impact on the educational sphere, which now favors the transition of teaching and learning processes toward more innovative practices in which students take responsibility for their own learning and teachers must adopt new roles and competences in their professional work (Guri-Rosenblit, 2018). Within these innovative processes, one methodological approach that has taken on a major role is "flipped learning" (Sánchez, 2017; Zainuddin et al., 2019). This training modality is of a mixed nature (Lee et al., 2017) and has attracted the attention of the educational community thanks to its pedagogical effectiveness and potential to move beyond more traditional academic formulae (He et al., 2016). Flipped learning is defined as a pedagogical approach in which the traditional roles of the classroom are reversed so that the student begins their learning outside the classroom and continues, reinforces, and complements it in their usual teaching schedule (Fuentes Cabrera et al., 2020; Long et al., 2017); thus, the approach comprises eminently practical learning supported by technology (Froehlich, 2018).

With flipped learning, the instructional process begins anywhere outside the school setting so that learning becomes ubiquitous. Students are given access to audiovisual content that has been chosen or created by the teacher and uploaded to a repository or web platform for viewing before the face-to-face session. This allows the content to be worked on in class from a more practical perspective since students have previously learned the theoretical aspects. Consequently, this gives the teacher more time to deepen the content and attend to classroom diversity (Moreno-Guerrero et al., 2021).

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Previous studies have demonstrated the effectiveness of flipped learning in comparison with traditional learning styles in which technology is not used. For example, Santiago and Bergmann (2018) showed the main differences between both methodologies at different times of learning are set out. In the traditional expository method of teaching, students maintain a passive attitude both before and during the class, in contrast to flipped learning, where they are active before, during, and after the class. In the flipped method, teachers take a secondary role by preparing, generating, and supervising practical activities and class dynamics that promote learning among students.

In addition to this active attitude, the inverted classroom method of flipped learning produces high levels of motivation among students (Tse et al., 2019); a better use of the time spent in the classroom (El Miedany, 2019), which allows students to construct their own knowledge through interrelation with their peer group (López Núñez et al., 2020; MacLeod et al., 2018); a high degree of commitment and positive willingness to carry out metacognitive exercises involving higher-order skills (Cabero Almenara & Llorente Cejudo, 2015; Talley & Scherer, 2013; Velegol et al., 2015); greater student participation in the ordinary classroom thanks to the high degree of flexibility provided by online materials; and the promotion of collaborative work between students both inside and outside the classroom (Gilboy et al., 2015; McLean et al., 2016; Touron & Santiago, 2015). Furthermore, Thai et al. (2017) showed that students' motivation and performance in flipped classrooms are higher than in other types of educational approaches with similar technological characteristics, such as e-learning and blended learning.

At the end of 2019, the COVID-19 pandemic emerged, spreading rapidly and resulting in a high global mortality rate (Zhou et al., 2020). This led to the closure of schools and universities, replacing face-to-face classes with entirely virtual teaching. The return to the so-called "new normality" has encouraged teachers to develop new pedagogical initiatives that allow them to be prepared for virtual or hybrid scenarios. The implementation of flipped learning in teaching brings together a series of characteristics and benefits that have allowed it to emerge as an effective method for developing certain skills in students, with the aim of preparing them for an educational scenario that differs from the norm (Tang et al., 2023). These characteristics include students' opportunity to take control of their learning (self-regulated learning), the ability to make decisions, and the acquisition of the social skills necessary to live in a community, bearing in mind the social reality in which they live.

The first of these characteristics, self-regulated learning, involves the active control of one's learning experiences (Barnard et al., 2009) and requires time management and self-discipline skills (C. S. Chen, 2002). For Zimmerman (2002), self-regulation comprises "self-generated thoughts, feelings, and behaviors that are oriented to attaining goals" (p. 65). This approach sees self-regulation as a self-directed process that transforms individuals' mental capacities to achieve learning outcomes. In this way, and given that flipped learning is a learner-centered approach, this study argues that the importance of self-regulation cannot be overemphasized: In an inverted classroom model, students are expected to display proactive attitudes to learning by completing online materials in advance and keeping track of what they do not understand about these materials themselves (Doo & Bonk, 2020). In short, one of the challenges of the flipped learning method is that students must have effective self-regulatory skills since the ultimate success of their learning will depend on them (Kenney & Newcombe, 2017; Michalsky & Schechter, 2013; Shyr & Chen, 2018).

Knowing how to face problems and make the most suitable decisions at each stage is another relevant aspect that is directly related to the flipped learning method. According to Seiffge-Krenke (2011), students have two coping styles. One is functional and comprises efforts to manage the problem, either by actively seeking support, taking concrete actions, or reflecting on possible solutions. The other is dysfunctional, where the problem is not solved in that particular moment, and is characterized by behaviors or thoughts that include denial, repression, distraction, avoidance, or emotional flattening, which leads the individual to assume an avoidant attitude to the problem (Lucio et al., 2016). In this sense, as an active learner-centered method, flipped learning promotes problem-centered coping strategies that are considered to be active and effective due to their association with better mental health and psychological well-being (Connor-Smith & Compas, 2004; Gomez & McLaren, 2006). However, a review of the literature reveals that no studies directly linked to the flipped learning method have examined its capacity to encourage students to face problems and make decisions. This opens up an essential field of inquiry regarding flipped learning's capacity to help students develop the strategies they need to face the difficulties and problems that are found in the study materials.

Finally, another of the features that characterize flipped learning is the increase in interactions among students and with the teacher through cooperative work and learning as equals. In this sense, social competence, defined as the degree to which young people engage in the prosocial behaviors that enable them to successfully create and maintain positive social interactions with others (Anderson-Butcher et al., 2016; Gresham, 2020; Masten & Coatsworth, 1998), appears as a key element for learning (Romera et al., 2017) and is associated with academic

success (X. Chen et al., 2010; Welsh et al., 2001), higher levels of self-esteem (Kostelnik et al., 2014), and lower levels of substance abuse (Griffin et al., 2001).

Therefore, flipped learning is positioned as a didactic approach with great potential in learning spaces given its prospects in diverse applications, as reflected in the impact literature (Pozo-Sánchez et al., 2020). The use of hybrid learning environments has proliferated in the field of education recently due to the COVID-19 pandemic (Dhawan, 2020; Tang et al., 2023). In this context, this study focuses on flipped learning, which was applied to teach students the hygiene and health standards and protocols they must follow both in schools and in their daily lives.

This study analyzes the impact of a flipped learning training program on the constructs of self-regulation, social competence, and responsible decision-making among secondary education students. To confirm the effectiveness of flipped learning, the study undertook a comparison with a traditional expository teaching approach applied to another group of students with the same characteristics.

Several research questions (RQ) were defined in order to guide the study:

- RQ1: Does a flipped method influence students' self-regulation when learning hygiene and health protocols?
- RQ2: Does a flipped method influence students' social competence when learning hygiene and health protocols?
- RQ3: Does a flipped method influence students' decision-making when learning hygiene and health protocols?

Method

Research Design

A quasi-experimental, pre-post type research design was employed at a descriptive and correlational level, based on a quantitative research approach. Guidelines previously established by experts were followed to ensure the appropriate development of the study (Hernández et al., 2014; Rodríguez, 2011). A training experience was developed through two different didactic approaches (Marín-Marín et al., 2020)—flipped learning and traditional learning—in order to observe the projection of each. Two groups were established (control and experimental), as well as two main variables: The typology of the didactic approach (traditional vs. flipped learning) was defined as a control variable, while the different constructs analyzed (self-regulation, social competence, and responsible decision-making) were defined as interference variables.

Participants

A total of 585 Spanish secondary school students were selected through intentional sampling, which is employed to identify and select information-rich cases for the most effective use of a limited resource (Palinkas et al., 2015). This kind of sampling intends to maximize efficiency and validity (Morse, 2009). Of the total number of participants, 43.42% were male, and the rest were female, with an average age of 14 years ($SD = 1.06$). According to the literature, the sample size in this type of research is not a limitation or bias (Chou & Feng, 2019; Yılmaz & Soyer, 2018); thus, the number of participants selected was considered to be adequate.

The students were divided into two study groups in a probabilistic manner; that is, the groups were organized at the same level and randomly selected, applying the didactic experiment to the whole class. The control group ($n = 291$) followed a training course that adopted a traditional expository method. Meanwhile, flipped learning was employed to teach the content to the experimental group ($n = 294$). In both groups, measurements were taken before (pre-test) and after (post-test) the training. At all times, the school class group to which each student belonged was respected so as not to alter the functioning of the school or affect the results by separating the students from their natural learning environment.

Measures

The data were collected using different instruments validated for the Spanish context and the age range of the participants in the study. These instruments included Fossati et al.'s (2002) Barratt Impulsiveness Scale for Early Adolescents (BIS-11-A), adapted for the Spanish context by Martínez-Loredo et al. (2015). This tool integrates 30 items with a 4-point Likert-type response scale (1 = rarely or never; 2 = occasionally; 3 = frequently; 4 = almost always or always). The reliability of this instrument proved to be appropriate for the present study (Cronbach's $\alpha = .87$). The Perceived Social Competence Scale II (PSCS-II) by Anderson-Butcher et al. (2016), adapted for the Spanish context by Romera et al. (2017), was also included. This instrument comprises five items that are assessed on a 5-point Likert scale (1 = not true to 5 = very true). The reliability reported for this scale in the present study was adequate (Cronbach's $\alpha = .82$). Finally, the Frydenberg and Lewis (2000) Adolescent Coping Scale (ACS) was used to measure student decision-making. This instrument includes a total of 80 items, configured on a 5-point Likert scale (1 = Never; 2 = Very Rarely; 3 = Rarely; 4 = Occasionally; 5 = Very Frequently). The instrument demonstrated good reliability (Cronbach's $\alpha = .86$).

Data Analysis

Statistical Package for the Social Sciences (SPSS) v.25 (IBM Corp., Armonk, NY, USA) was used for the data analysis. This program allowed an in-depth analysis to be performed in order to achieve the study's objectives and respond to the RQs. In particular, statistics such as means (M), standard deviations (*SD*), and standard errors of the mean (SE) were produced in the analysis. Tests of skewness (Skw) and kurtosis (Kme) were also conducted to determine the trends among the sample distribution. Other tests were also employed, such as the *t*-Student test ($t_{n1+n2-2}$), which compared the means between the groups. Cohen's *d* and biserial correlation (rxy) were calculated to reveal the size of the effect achieved. In this study, statistically significant differences were set at a level of $p < .05$.

Procedure

Various Spanish educational centers and students from the first two levels of secondary education participated in the study. Contact was established and maintained with different educational centers, and access to the centers did not pose any difficulties due to the link between the researchers and the participating schools. The schools' management teams were aware of the research objectives. Informed consent was obtained from the participants, verbally and the principles of good research practice set out in the Declaration of Helsinki were respected at all times.

The experiment involved a teaching unit comprising six sessions on content related to hygiene and health guidelines of particular relevance in the context of today's pandemic. The specific contents included the basis of covid, the usefulness and life of a mask, interpersonal distance, the use of sanitizing and disinfecting products, the importance of hand hygiene, autonomous rules for the control of the pandemic, restrictions, and de-escalation phases. This content was taught through two different teaching and learning methods. The first traditional expository method was applied to the control group. In this training course, the teacher was the main source of knowledge, transmitting the different content in an oral, unidirectional way and without the support of technological resources. In this course, the students' tasks centered on attending to the teacher's explanations and completing the required activities. Conversely, the instruction process for the experimental group was carried out by means of flipped learning. In this training modality, the teacher made use of a digital content management platform, where different multimedia resources were uploaded so that the students could access the content before attending the face-to-face sessions. Through this innovative approach, the students became responsible for their own learning and acquired greater autonomy in their learning process. The teacher limited himself to guiding the process, both in the digital environment and in the classroom itself. The face-to-face class took on a different tone: Tasks were set to expand the information given, deepen the content, encourage debates, and solve the problems that arose from viewing the audiovisual resources (Figure 1). All sessions lasted 1 hr. The difference between groups was the training methodology carried out.

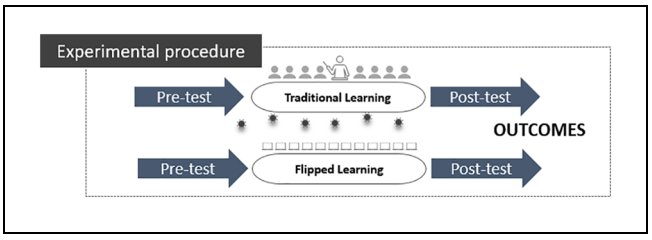

Figure 1. Training actions carried out in each group.

Data were obtained before and after the application of the didactic unit by means of a questionnaire. The data were analyzed statistically in order to draw relevant conclusions.

Results

The results in Table 1 show that the response distribution of the participants was normal. In all the dimensions, the data thrown by asymmetry and kurtosis were below ± 1.96, meaning that the sample distribution was normalized (Jöreskog, 1990). These findings justified the application of parametric tests in this study. When comparing the pre-test measures of the control and experimental groups, similar means were observed in the three study dimensions of self-regulation, social competence, and decision-making. These results varied when a comparison was made between the post-test measures of the control and experimental groups: In this case, there were slightly higher means for the experimental group in all dimensions when compared with the control group. On the other hand, comparing the average scores of both groups before and after the application of the educational unit demonstrated an increase in these scores. This increase in means was observed across all the study dimensions, both in the control group and in the experimental group. However, the increase in means was greater in the experimental group than in the control group, indicating that the flipped method applied in the experimental group generated a positive improvement in all study dimensions. The response distribution was not dispersed in either group since the standard deviation was less than 1 in all cases. With regard to kurtosis, it was observed that it was platicuric in all the dimensions of the control group, both in the pre-test and post-test measures. It was also platicuric in the pre-test measures

Table 1. Analysis Results Across the Study Dimensions.

	Parameters	Pretest				Posttest			
	Dimensions	*M*	*SD*	S_{kw}	K_{me}	*M*	*SD*	S_{kw}	K_{me}
CG	Self-regulation*	2.29	0.995	0.248	–0.992	2.39	0.960	0.380	–0.308
	Social competence**	2.36	0.999	0.389	–0.395	2.45	0.943	0.132	–0.444
	Decision-making**	2.40	0.932	0.285	–0.431	2.41	0.973	0.327	–0.222
EG	Self-regulation*	2.40	0.989	0.457	–0.170	2.66	0.998	0.537	0.024
	Social competence**	2.46	0.972	0.241	–0.290	2.60	0.996	0.468	0.002
	Decision-making**	2.37	0.999	0.515	0.002	2.64	0.997	0.557	0.076

Note. CG = control group; EG = experimental Group; *M* = media; *SD* = standard deviation; S_{kw} = symmetry; K_{me} = Kurtosis.
*Four-point Likert scale. **Five-point Likert scale.

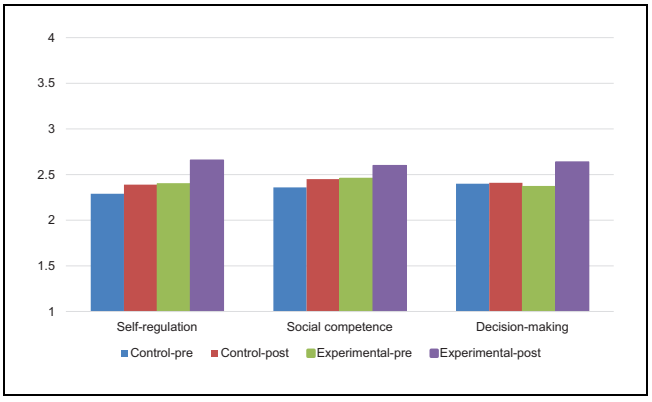

Figure 2. Pretest-posttest comparison between the control and experimental groups.

of the control group, except in the decision-making dimension, where it was mesocuric. The same trend was observed in all the dimensions for the experimental group in the post-test measures.

The differences in the averages is reflected visually in Figure 2, where it can be seen that in the experimental group, the post-test measures were slightly higher than the rest of the measures. This indicates that the flipped pedagogical approach experienced by the experimental group generated a slightly positive post-test impact on the students.

For independent samples, the Student's *t*-test statistic shows the degree of independence of the data collected. In this study, two aspects were analyzed. The first was the pre-test measures of the control and experimental groups. In this case, no significant relationship was observed in any of the dimensions, indicating that there were no differences in the study dimensions of self-regulation, social competence, and decision-making. The second was the post-test measures achieved by the control and experimental groups. In this case, significant differences were observed in only some of the study dimensions: Self-regulation and decision-making presented a statistically significant relationship, although social competence did not. In the dimensions of self-regulation and decision-making, the effect size was very low if we consider Cohen's d. Furthermore, the strength of the relationship between the study dimensions was also low (Table 2).

In addition, a *t*-test is undertaken for dependent samples. In this study, the differences in the mean scores between the pre-test and post-test measures of the control and experimental groups were analyzed. The findings resulting from the statistical tests showed significant relationships in almost all the study dimensions. In the

Table 2. Value of Independence Between Independent Samples With Pretest and Post-Test.

Dimensions		$\mu(X1-X2)$	$t_{n1+n2-2}$	*df*	*d*	r_{xy}
Self-regulation	Pre	–0.113 (2.29–2.40)	n.s.	–	–	–
	Post	–0.272 (2.39–2.66)	–3.353**	583	0.026	0.138
Social competence	Pre	–0.098 (2.36–2.46)	n.s.	–	–	–
	Post	–0.152 (2.45–2.60)	n.s.	–	–	–
Decision-making	Pre	0.031 (2.40–2.37)	n.s.	–	–	–
	Post	–0.234 (2.41–2.64)	–2.871**	583	0.045	0.118

Note. Student's *t* for independent samples.
**Correlation is significant at the .01 level. n.s. Correlation not significant.

control group, an improvement in the results achieved by students in all dimensions was observed, although it was only significant for self-regulation and social competence. In the experimental group, an improvement in the results achieved in all dimensions was also observed. In the experimental group, the values were higher than those achieved by the control group, indicating that the flipped learning method applied to the experimental group generated a greater effect than the traditional method applied to the control group (Table 3).

Discussion

The results showed that the distribution of the sample was normal, that is, there was no dispersion of response by students. This indicates that there was a general overlap among students who participated in the research, something that has been observed in other studies with similar characteristics (Kenney & Newcombe, 2017; Michalsky & Schechter, 2013; Shyr & Chen, 2018). This finding highlights that the application of either a traditional pedagogical approach or the flipped learning method generate similar effects among students.

In general, the measures achieved in the different dimensions studied were similar in all cases, except in the group that received the flipped learning instruction, that is, in the experimental post-test group. This result coincides with other applied educational experiences, where an increase in students' assessment scores is observed when they receive an innovative educational experience (Marín-Marín et al., 2020; Moreno-Guerrero et al., 2020).

These insights required a more concrete and specific reading. To do this, two clearly different but related levels were considered. First, the group that received the traditional teaching was compared with the group that received the flipped learning teaching, both before and after the instruction was applied. Second, we conducted a comparison of each group before and after the educational experience was applied.

Starting with the comparison of both groups before and after the application of the educational experiences, several factors were observed. The first is that before applying the educational experience, both the group that received the traditional teaching and the group that received the flipped learning instruction presented similar averages in the three study dimensions of self-regulation, social competence, and decision-making. This finding coincides with other analyses of educational experiences, which have shown that before an educational experience, students' assessments usually present similar results if the sampling has been conducted properly (Cabero Almenara & Llorente Cejudo, 2015; Tse et al., 2019). However, what happens when different educational experiences are applied to two groups? The present study observed that in the post-test measures, there were significant differences between the group that received traditional teaching and the group that received flipped learning instruction. This finding supports those of other studies, which have shown that the application of different teaching methods changes students' perceptions (Gilboy et al., 2015; McLean et al., 2016; Touron & Santiago, 2015).

In our study, significant improvements were not generated across all the three dimensions of self-regulation, social competence, and decision-making: Improvements were only seen in self-regulation and decision-making. In other words, applying the flipped learning method to teach issues related to COVID-19 health and safety protocols improve students' self-regulation and decision-making but not their social competence. This finding may be associated with what can be observed in daily life, given that the younger generation has been the most criticized for not complying with the COVID-19 rules at a social level (López & Bernal, 2019) since the information provided by the media suggests they are the social group with the least risk of serious illness (Attard & Holmes, 2022).

When pre and post comparisons were made for the same group, it was revealed that both the application of the traditional and flipped learning instruction generated improvements in students' scores for all the study dimensions, except for decision making in the group that received traditional teaching. This implies that the application of

Table 3. Value of Independence Between Dependent Samples Between the Control and Experimental Groups.

Dimensions		μ (X1−X2)	$t_{n1+n2-2}$	*df*	*SD*	SEA
Self-regulation	CG	–0.103 (2.29–2.39)	–5.221**	290	0.337	0.020
	EG	–0.262 (2.40–2.66)	–10.196**	293	0.440	0.026
Social competence	CG	–0.086 (2.39–2.45)	–4.227**	290	0.347	0.020
	CE	–0.139 (2.46–2.60)	–6.891**	293	0.347	0.020
Decision-making	CG	–0.010 (2.40–2.41)	n.s.	–	–	–
	CE	–0.276 (2.37–2.64)	–10.556**	293	0.448	0.026

Note. Student's *t*-test for related samples.
**Correlation is significant at the .01 level. n.s. Correlation not significant.

both traditional and innovative methods generates new knowledge in students. Thus, what is the difference between the two? This difference lies in the strength of the knowledge acquired, given that in the group where the innovative, flipped learning method was applied demonstrated a much greater improvement than the group where the same content was explained using a traditional teaching method. This finding has already been observed in previous studies, which obtained similar results (Marín-Marín et al., 2020; Moreno-Guerrero et al., 2020).

The results of the present study are aligned with previous research by Santiago and Bergmann (2018), Cabero Almenara and Llorente Cejudo (2015), Talley and Scherer (2013), and Velegol et al. (2015). These studies have verified that flipped learning not only promotes high levels of motivation in students (Tse et al., 2019) but also develops high engagement and positive attitudes toward performing metacognitive exercises involving higher-order skills such as self-regulation and decision-making.

Conclusion

This study revealed that educational methods of any nature can facilitate effective learning about health measures that can help prevent the spread of COVID-19, although those who receive instruction through an innovative educational method acquire better skills than those who receive a traditional educational experience. The study established that the students who received the flipped learning pedagogical experience presented better competences than those who received traditional instruction. However, it should be noted that the application of an innovative teaching method did not improve social competence in aspects related to COVID-19, although it did improve students' self-regulation and decision-making.

A limitation of this study lies in the type of sampling used, which was of a non-probabilistic nature and was intentional due to the complexities posed by the COVID-19 pandemic when conducting this type of research. Future studies should employ the random sampling technique to examine different segments of the population and obtain a representative sample of the society under analysis.

Theoretical and Practical Implications

This study has several theoretical and practical implications. On a theoretical level, this study contributes to increasing the body of knowledge and scientific literature on the application of active and emerging teaching methods such as flipped learning, in contrast to more conservative didactic approaches such as the traditional exhibition method. Likewise, the study verified how the use of flipped learning can result in competency improvements in the analyzed constructs. As such, our findings expand the literature in this field to form a solid base of knowledge on a topic that is currently very relevant, that is, educational training processes influenced by the COVID-19 pandemic. Therefore, this work can serve as a guide for readers, researchers, and teachers interested in this state-of-the-art approach. Moreover, the study demonstrates that in periods of health restrictions, the use of a pedagogical method such as flipped learning generates improved competences among students.

On a practical level, this research revealed the improvements that can be obtained according to the type of training method used. In particular, the learning process experienced by the students who followed a flipped learning course effectively benefited them in two of the three analyzed dimensions (self-regulation and decision-making). This suggests the value of promoting innovative methods in today's educational field and reinforces the potential that technology offers for teaching. In this sense, this study can facilitate increases in teachers' confidence in the use of an inverted approach and provides insights for professionals interested in the dissemination and learning of the protocols and standards related to government-implemented measures to counter the COVID-19 pandemic. However, to contribute to the development of social competence, as envisaged in this study, flipped learning should be complemented by other approaches to help improve student interaction and teamwork. Finally, the study's results show that when a situation similar to the current pandemic occurs, resulting in restrictions on access to educational centers, innovative pedagogical practices should be encouraged that make use of the technological resources available at that time.

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Improvements obtained according to the type of training methodology used Potential that technology offers to the educational. Flipped learning has supposed competent improvements in diverse analyzed constructs

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