Content creation and flipped learning: a necessary pairing for education in the new millennium

Creación de contenidos y flipped learning: un binomio necesario para la educación del nuevo milenio

Abstract:

New advances in the field of education have led to the appearance of new methodological resources that make it possible to carry out teaching and learning processes in line with the educational demands of the information and knowledge society. One of the most successful approaches in the field of education is flipped learning. In order to implement this, it is vital that teachers be digitally competent, especially with certain skills in the area relating to the creation of digital resources, so that they can integrate a techno-pedagogical element in their teaching activities. The aim of this study is to ascertain the influence of teachers’ competence levels in area 3 of digital competence (creation of digital content) on the use of the innovative flipped learning methodology. To this end, a research design based on a descriptive and correlational quantitative method was used. An ad hoc questionnaire was used as a data collection instrument and was applied to a sample of 483 Spanish teachers. The results show that teachers make sporadic use of flipped learning. The results also show that...
teachers have an intermediate competence level in digital content creation, with the teachers who use flipped learning the most having better skills in programming, development, integration and re-elaboration of digital content, and knowledge of copyright and digital licenses. Therefore, we conclude that the level of digital competence in area 3 does have an influence on the use of this innovative teaching and learning methodology.

**Keywords:** information technology, educational technology, teaching method innovations, learning methods, teacher qualifications, educational resources.

**Resumen:**

Los nuevos avances producidos en el ámbito educativo han supuesto la aparición de nuevos recursos metodológicos para efectuar los procesos de enseñanza y aprendizaje según las demandas formativas de la sociedad de la información y el conocimiento. Uno de los enfoques que más ha prosperado en el terreno educativo es el flipped learning, siendo fundamental para su despliegue la competencia digital del profesorado y, en particular, determinadas destrezas en el área concerniente a la creación de recursos digitales, con la finalidad de poder llevar a cabo la acción docente bajo una dimensión tecnopedagógica. El objetivo de este estudio se centra en conocer la influencia del nivel competencial del área 3 de la competencia digital (creación de contenidos digitales) sobre la utilización de la metodología innovadora flipped learning. Para ello se ha seguido un diseño de investigación fundamentado en un método cuantitativo de tipo descriptivo y correlacional. Como instrumento de recogida de datos se ha empleado un cuestionario ad hoc que ha sido aplicado en una muestra de 483 docentes españoles. Los resultados ponen de manifiesto que los docentes hacen un uso esporádico del flipped learning. Asimismo, revelan un nivel competencial intermedio en el área de creación de contenidos digitales, siendo los docentes que mayor utilización del flipped learning han reflejado aquellos con mejores destrezas en programación, desarrollo, integración y re-elaboración de contenidos digitales, así como el conocimiento de los derechos de autor y licencias digitales. Por tanto, se concluye que el nivel de competencia digital alusivo al área 3 sí influye en el uso de tal metodología innovadora de enseñanza y aprendizaje.

**Descriptores:** tecnología de la información, tecnología educacional, innovación pedagógica, método de aprendizaje, competencias del docente, recursos educacionales.

### 1. Introduction

There is no question that much of people’s lives nowadays is occupied by technology in all areas and social sectors. This is obviously also the case in education, which has become one of the fields with the most and widest reaching innovation, directed mainly at teaching processes — by teachers — and learning — by students — as Rodríguez, Cáceres, and Alonso note (2018).
All of the technologies available to human beings, and especially ICT (Information and Communication Technology), result in constant transformation of the course of people’s everyday lives, with a positive impact on educational processes, whether in searching for information, in interactions between individuals, in content creation, or in solving everyday problems, both inside and outside the classroom (Arzola, Loya, & González, 2017).

Area (2015) considers that the inclusion of technology unavoidably results in a constant formative process for people who want to be up-to-date in the use of innovative resources to facilitate greater familiarity and coexistence with technological advances. All of this is influenced by the use of the digital tools and applications that are constantly appearing, with younger generations adapting best to these innovations and so becoming central figures in this socio-technological transformation that is shaping the contemporary society in which we live.

These technologies are causing a major revolution in educational plans, which have technology at their centre and aim to be able to adapt to the paradigms of contemporary education and to the needs of students (Viñals & Cuenca, 2016). Furthermore, as Jiménez, Sancho, and Sánchez (2019) have recently explained, teachers’ use of educational technology is regarded as one of the requirements and means for delivering and developing education nowadays.

With regards to the regulatory framework for education, current legislation recognises the importance of and need for technology in teaching-learning spaces, making promoting the inclusion of educational technology an aim of the Spanish state (Area, Hernández, & Sosa, 2016). All of this is reflected in the Spanish Organic Law 8/2013, of 9 December, to Improve Educational Quality, which is currently in force and stresses that ICT should have a central role in the different curriculum areas teachers deliver in classrooms, contributing positively to the teaching process, with teachers making effective use of them.

Some important authors such as Cabero and Barroso (2018) have noted that ICT has caused a change in teaching that involves real novel experiences, resulting in activities focussed on more in-depth and interactive learning. This is why, with technological innovations, teachers nowadays have an excellent opportunity to invigorate, improve, and update educational processes, adapting them to the demands of society (Murillo & Krichesky, 2015).

The impetus educational institutions wish to give to the inclusion of technology is because of the results achieved in studies relating to the state of the question, which have found significant benefits in comparison with traditional teaching methods, enabling better meaningful learning, attention to individual personalities (Maquilón, Mirete, & Avilés, 2017), a more invigorated and effective formative process (González, Perdomo, & Pascuas, 2017; Medellín & Gómez, 2018), better
motivation and enthusiasm for learning among students (Laskaris, Kalogiannakis, & Heretakis, 2017), and — of course — great prominence for the figure of the learner, fostering his or her constructivist role in the learning process (Mingorance, Trujillo, Cáceres, & Torres, 2017). Therefore, it is vital to integrate technology in learning settings (Kumar & Kumar, 2018).

However, the incorporation of technology in education has led to a constant preoccupation among the educational collective resulting from the requirement for them to meet the needs of students who are digital natives and have high digital skill levels that often exceed those of the teachers (Moreno, López, & Leiva, 2018). This situation requires a techno-pedagogic updating of teachers’ skills and knowledge-base in digital competences so that they can do effective educational work that is suited to a digitalised era (Aznar, Cáceres, Trujillo, & Romero, 2019).

Reviewing literature on teachers’ digital competences, we find, as Avitia and Uriarte note (2017), that this concept is constantly evolving, as is the technology itself and its integration in the educational sphere. Experts such as Castañeda, Esteve, and Adell (2018) and Lázaro, Gisbert, and Silva (2018) emphasise that digital competence is based on the capacities and skills teachers must acquire to integrate digital resources and use them satisfactorily in the educational processes they implement with students.

Spain’s National Institute of Educational Technologies and Teacher Training (INTEF) has established five areas that complement digital competence with the clear aim of regulating and standardising the skills and competences that complement digital competences at a technological level and that teachers should have in contemporary education (INTEF, 2017):

1. Information and data literacy.
2. Communication and collaboration.
3. Digital content creation.
5. Problem solving.

However, despite the influence of technology, recent studies have shown that teachers do not currently have enough training to be able to perform their role successfully using all of the technology available to them, and training imbalances have been observed in the areas noted above, with the digital content creation area being where teachers show the lowest competence levels (Fernández, Fernández, & Rodríguez, 2018; Fernández & Rodríguez, 2017; Fuentes, López, & Pozo, 2019; Romero, Castejón, López, & Fraile, 2017). This indicates that teachers do not have the necessary digital skills to use technology in teaching, with there still being a long way to go (Cela, Esteve-González, Esteve-Mon, González, & Gisbert, 2017).

According to Pérez and Rodríguez (2016), a teacher who does not have a command of technology from a pedagogical
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Perspective, will find it hard to exploit all of the potential of the digital resources and tools that have proliferated in recent years. This disparity between teachers and technology shows itself in a lack of attitude, preparation, and training in techno-pedagogic matters (Padilla, 2018; Prendes, Gutiérrez, & Martínez, 2018), as well as a resistance to the development of teaching methods, in other words, to the methodological change technology brings with it (Sorroza, Jinez, Rodríguez, Caraguay, & Sotomayor, 2018). Furthermore, there is a limited command of the different digital competence areas (Morán, Cardoso, Cerecedo, & Ortíz, 2015), which results in low competence levels in the area of ICT (Afanador, 2017; Falcó, 2017; Fernández & Fernández, 2016; Fernández, Leiva, & López, 2018).

Accordingly, there is a significant digital divide between educational professionals and the individuals receiving the educational process, resulting from a shortcoming in training (Murillo & Román, 2016). This situation leads to a technological gulf between students and teachers, between digital natives and digital immigrants (Cabero & Ruiz, 2018). In view of this, López and Bernal (2019) note that digital competence is necessary and vital in order to meet the needs of students and — more effectively — be successful in training students. Similarly, the information and knowledge society demands education professionals who can cope with the situation now found in learning spaces in order to train new digital generations (Rodríguez, Martínez, & Raso, 2017).

This all leads to what is now known as the principle of isomorphism, in other words, a teacher whose initial training was essentially fundamentally focussed on the traditional and who, in turn, has not received the necessary additional training, will find it harder to integrate ICT into teaching and learning processes (Manso, Ezquerra, Burgos, & Mafokozi, 2019).

We should not forget that the role of teachers has developed over time, and with the appearance of educational technology this role has changed from being mere transmitters of theoretical information using classical media to become guides and facilitators for learning in virtual settings, as well as being creators and curators of digital content (Cózar, Zagalaz, & Sáez, 2015), this last role being one of the challenges for obtaining quality in education (Pérez-Berenguer & García-Molina, 2016).

Creating audiovisual resources has become a powerful tool for teachers as it allows them to spread their message by using different channels, such as verbal, textual, visual, and musical ones, thus influencing students at a rational, aesthetic, and emotive level (Fernández-Rio, 2018).

Nonetheless, to develop digital content that involves real learning experiences, teachers need a suitable level of digital skill. Despite its government’s investment in ICT areas and in teacher training, Spain still has deficient digital competence levels, holding back the development of techno-pedagogical content (Santiago, Maeztu, & Andía, 2017).
Independently of teachers’ level of digital competence, according to the studies by Sánchez (2017) and Zainuddin, Habiburrahim, Muluk, and Keumala (2019), various teaching and learning methodologies have appeared in recent years that focus on ICT, the creation or reuse of digital resources, and on the protagonism of students. Flipped learning is an especially interesting one of these and is the focus of this study (Hinojo, Aznar, Romero, & Marín, 2019).

Flipped learning is a concept that was developed by Bergmann and Sams, two experts in education, in 2012. In their teaching practice, they developed audiovisual material and posted it on the internet so that students who did not attend class regularly could keep up with the pace of learning along with their classmates (Bergmann & Sams, 2012).

This innovative pedagogical approach based on ICT is supported by a dual technique, combining the digital and the physical, on-line and face-to-face education (Lee, Lim, & Kim, 2017). This is an innovative focus based around the figure of the learner, who autonomously initiates the learning process (Salas-Rueda & Lugo-García, 2019). It is called “flipped” because instruction starts outside school (Sánchez-Rivas, Sánchez-Rodríguez, & Ruiz-Palmero, 2019). It can happen anywhere using any mobile device with an internet connection so that students can view audiovisual content that has been created by the teacher and hosted on platforms for managing digital resources, thus fostering their interaction with the materials that have been prepared using their everyday social technology — although this technology also has an educational element — and providing flexibility, as students can view the materials as often as they need (Báez & Clunie, 2019; Pereira, Fillol, & Moura, 2019).

Therefore, the teachers’ didactic explanations move out of the school setting and into digital media (Barao & Palau, 2016). However, flipping educational moments does not just involve creating and watching videos. Instead, it involves combining instructive and constructive teaching techniques, as well as a commitment by students to be active participants and agents in their learning (Tourón & Santiago, 2015).

Learning does not culminate at this point, but instead the student, having viewed and assimilated the content outside class (Ruiz-Jaramillo & Vargas-Yáñez, 2018), carries on with the educational process and subsequent reinforcement of the content at the educational centre (Long, Cummins, & Waugh, 2017), allowing the teacher to go into more depth with the curriculum content than with other pedagogical methods (El Miedany, 2019).

Previous studies have shown that flipped learning encourages student participation, interaction between teachers and students and between students, and also improves students’ attitude towards and satisfaction with learning, leading to better results (Martín & Calvillo, 2017; Sacristán, Martín, Navarro, & Tourón, 2017).
In short, using flipped learning improves students’ motivation levels (Tse, Choi, & Tang, 2019), enables learning to be flexible and adapt to the peculiarities of the students (Miño, Domingo, & Sancho, 2018), and permits collaborative work solving problems set by the teacher (Bognar, Sablić, & Škugor, 2019). All of this results in improved marks (Karabulut, Jaramillo, & Hassall, 2018), increases academic performance (Sola, Aznar, Romero, & Rodríguez, 2019), and consequently improves the general effectiveness of the learning process compared with other traditional methodologies (Sánchez, Jimeno, Pertegal, & Mora, 2019).

2. Method
2.1. Justification and aim of the study
As a result of the great boom in technology in the field of education and the appearance of new forms of teaching and learning, there is a need to examine teachers’ levels of digital competence in area 3, which relates to the creation of digital content, in order to establish whether they have the ability and skills required to implement new methodological focuses like flipped learning.

A review of academic literature regarding the state of the question from specialist databases such as Scopus and WOS (Web of Science) did not find any studies that examine the connection between teachers’ level of competence in content creation and their use of flipped learning, with most research either focussing on the potential and benefits of flipped learning, tested in different contexts, educational stages, and specific subjects or focussing on teachers’ levels of digital competence in general. Consequently, this study is exploratory in nature and is a start in the relational approach to the two constructs.

As such, its overall aim is to establish whether the level of skills achieved in each of the dimensions that make up area 3 of digital competence shows any influence on the use of flipped learning as a teaching and learning methodology.

Based on these objectives, to guide the research, we formulated the following more specific objectives:

- To establish how often flipped learning is used.
- To establish teachers’ level of development of digital content.
- To discover the level of integration and adaptation of digital content among teachers.
- To determine the level of knowledge of copyright and licenses for use of digital resources.
- To determine the teachers’ level of competence in computer programming.

2.2. Research design
To achieve the objectives presented above, we have used a descriptive and correlational study design with a quantitative research method, following the observations of Hernández, Fernández and Baptista (2014).
2.3. Participants

The study sample comprises a total of 483 teachers from Spain. In accordance with the guidelines of McMillan and Schumacher (2005), we chose these participants using stratified probabilistic sampling, in which each group relates to a type of educational centre (public, private, and state-assisted) and to the corresponding non-university educational stages (early years, primary, secondary, baccalaureate, and professional training). We took these data from the database of the Spanish Ministry of Education and Professional Training (https://bit.ly/2TzPFiY), with the population of study centres being configured as follows (Table 1):

<table>
<thead>
<tr>
<th>Educational stage</th>
<th>Type of centre</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public</td>
<td>Private</td>
</tr>
<tr>
<td>Early years</td>
<td>14 604</td>
<td>4824</td>
</tr>
<tr>
<td>Primary</td>
<td>10 576</td>
<td>474</td>
</tr>
<tr>
<td>Secondary</td>
<td>4204</td>
<td>398</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>3127</td>
<td>366</td>
</tr>
<tr>
<td>Professional Training</td>
<td>2595</td>
<td>811</td>
</tr>
<tr>
<td>Total</td>
<td>35 106</td>
<td>6873</td>
</tr>
</tbody>
</table>

Source: Own elaboration.

Based on these data, we selected subjects following a proportionate stratification. Table 2 shows the characteristics of the sample selected for this research.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>202</td>
<td>41.82</td>
</tr>
<tr>
<td>Female</td>
<td>281</td>
<td>58.18</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>84</td>
<td>17.39</td>
</tr>
<tr>
<td>31-40</td>
<td>117</td>
<td>24.22</td>
</tr>
<tr>
<td>41-50</td>
<td>148</td>
<td>30.64</td>
</tr>
<tr>
<td>51-60</td>
<td>81</td>
<td>16.77</td>
</tr>
<tr>
<td>Over 60</td>
<td>53</td>
<td>10.97</td>
</tr>
<tr>
<td>Educational stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early years</td>
<td>98</td>
<td>20.29</td>
</tr>
<tr>
<td>Primary</td>
<td>101</td>
<td>20.91</td>
</tr>
<tr>
<td>Secondary</td>
<td>103</td>
<td>21.33</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>89</td>
<td>18.43</td>
</tr>
<tr>
<td>Professional training</td>
<td>92</td>
<td>19.05</td>
</tr>
<tr>
<td>Type of centre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>171</td>
<td>35.40</td>
</tr>
<tr>
<td>Private</td>
<td>145</td>
<td>30.02</td>
</tr>
<tr>
<td>State assisted</td>
<td>167</td>
<td>34.58</td>
</tr>
</tbody>
</table>

Source: Own elaboration.
2.4. Instrument

Data collection was carried out using an ad hoc questionnaire, drawn up based on study of other instruments found in scientific literature on the evaluation of teachers’ digital competence (Agreda, Hinojo, & Sola, 2016; Tourón, Martín, Navarro, Pradas, & Íñigo, 2018).

The questionnaire features 28 questions arranged in 5 categories. The first category contains sociodemographic questions, as well as a specific question about frequency of use of the flipped learning focus in day-to-day teaching practice. The other four dimensions match those established in the 2017 version of the common framework for teachers’ digital competence established by INTEF (Spain’s National Institute of Educational Technologies and Teacher Training): a) sociodemographic; b) developing digital content; c) integration and adaptation of digital content; d) copyright and licences; and e) programming.

The answer format for the different questions in the instrument varies. Some of them use a 5-point Likert type scale (1-very low, 2-low, 3-medium, 4-high, and 5-very high) to evaluate respondents’ competence in each of the items that comprise the dimensions. The questions relating to frequency of use employ a 4-point Likert scale (1-never, 2-occasionally, 3-frequently, and 4-always). Furthermore, the instrument contains other questions with dichotomous answers.

The instrument was subjected to a process of qualitative evaluation using the Delphi method with a panel of 7 experts in educational technology from different Spanish universities (Universidad de Granada, Universidad Pablo de Olavide, Universidad de Educación a Distancia, and Universidad de Córdoba). The purpose of this technique is to obtain objective and anonymous feedback from the assessors in order to optimise the instrument (Cabero & Infante, 2014). We statistically analysed the feedback to obtain levels of association, concordance, and pertinence using the Fleiss’ Kappa and Kendall’s W statistics and found good results (K = .83; W = .86).

In addition, we performed exploratory factor analysis using the principal component method with a varimax rotation. We used the Bartlett test of sphericity, which showed a dependency among variables (Bartlett test = 2847.22, p < .001), and the Kaiser-Meyer-Olkin test, which gave a result of .93, reflecting adequate values.

Finally, to establish the reliability of the questionnaire, we used the statistical procedures listed in Table 3, which, in line with Bisquerra’s observations (2004), showed high evidence of reliability.

<table>
<thead>
<tr>
<th>Table 3. Reliability tests applied to the instrument.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimension</strong></td>
</tr>
<tr>
<td>Developing digital content</td>
</tr>
<tr>
<td>Integrating and adapting digital content</td>
</tr>
<tr>
<td>Copyright and licenses</td>
</tr>
<tr>
<td>Programming</td>
</tr>
</tbody>
</table>

Note: α (Cronbach’s alpha); CR (Composite Reliability); AVE (Average Variance Extracted). Source: Own elaboration.
2.5. Procedure

We began the study presented here in November 2018 by consulting the database of different educational centres in Spain provided by the Spanish Ministry of Education and Professional Training (https://bit.ly/2TzPFiY) with the aim of identifying the educational institutions and their corresponding professionals that would be included in the research, after the sampling process.

Once we had chosen the sample, we contacted the management teams by email to explain the objectives of the study and obtain their agreement to participate and the email addresses of the different members of the teaching staff so that we could send them the instrument and they could complete it, respecting the ethical principles of all research.

The data collection process lasted for three weeks. In this period, participants could complete the questionnaire and could contact the researchers for answers to any questions.

When the period for completing the questionnaire had ended, all of the data were collected, prepared, organised, and exported to a statistical program to perform in-depth analysis.

2.6. Variables used

This section contains the different variables used in this research, which, as stated above, we took from the common framework for teachers’ digital competence proposed by INTEF (Spain’s National Institute of Educational Techn-ologies and Teacher Training). Similarly, to facilitate reading and comprehension of the information subsequently presented in the results, we have created the following terms:

- FUFL: Frequency of use of the flipped learning teaching and learning methodology.
- DEDC: Development of digital content by the teachers.
- IADC: Integrating and adapting digital content.
- CRLC: Knowledge of copyright policies and handling licences for using digital resources and content.
- PROG: Skills relating to computer programming.

2.7. Data analysis

In this study we have used basic statistics such as the mean ($M$) and standard deviation ($SD$), as well as tests such as Pearson’s coefficient of skewness ($CS_p$) and Fisher’s coefficient of skewness ($CS_f$). In addition, specific tests were used such as Pearson’s chi-squared ($\chi^2$) for comparing variables, Cramer’s test ($V$), and the contingency coefficient (Cont.) to obtain the strength of association.

All of the statistical processing was done with the Statistical Package for the Social Sciences v.22 program (SPSS), taking $p$ values < .05 as a statistically significant difference.
3. Results

This section shows the main findings discovered during the research process, displayed in the form of tables and figures shown below.

In an initial approach to studying the use of flipped learning in the sample analysed (Graph 1), the results show higher frequencies of the central values of the Likert scale, reflecting intermediate level of use of this methodological focus. Despite this, analysis of frequency of use shows a higher peak for frequency at the upper end of the Likert scale (“always”) compared with the sample group that reported that it never uses flipped learning while teaching. These results — combined with the competence analyses reported by the teachers — will act as the basis for establishing a possible statistically significant relationship between how often teachers use the flipped learning focus and their level of digital competence in area 3.

**Graph 1. Frequency of use of a flipped learning focus (FUFL).**

![Graph showing frequency of use of flipped learning focus](image)

Source: Own elaboration.

Moreover, Table 4 shows the competence level reported by the sample in area 3 of digital competence: creation of digital content. Intermediate values are dominant for all four items from the area in question, with a right-skewed distribution in the areas relating to the development, integration, and adaptation of digital content, and a left-skewed distribution for skills relating to programming and copyright and digital licences. The summary results show competence levels in this area, with a very slight left skew, denoting a high concentration in the central values.
Based on the results above, there was an irregular distribution in the analysis of the means for the different competence levels in area 3 of digital competence (Graph 2). Accordingly, results above the aggregate mean (M_aggregate = 2.9) were obtained in the items relating to the development and integration and adaptation of digital content. Nonetheless, the items in the programming and copyright and digital licences areas display a general competence level lower than the aggregate mean.
Finally, Table 5 shows the results obtained for the associational study of the frequency of use of flipped learning compared with the competence level of the sample in the different items relating to area 3 of digital competence. We found statistically significant differences for all of the items analysed, displaying a strong relationship based on the statistics used to measure the strength of association (contingency coefficient and Cramer’s V). Accordingly, we observed a significant trend in which teachers who have low or very low competence levels prefer not to use flipped learning as a methodological focus, and if they do use it, they only use it sporadically. In contrast, individuals with higher skills in programming, in the development, integration, and adaptation of digital content, and in knowledge of copyright and digital licences tend to use the flipped learning focus more frequently, and in a notable number of cases they make it their preferred methodological approach.

### Table 5. Association between FUFL and competence levels in DEDC, IADC, CRLC, and PROG.

<table>
<thead>
<tr>
<th>Likert</th>
<th>FUFL n (%)</th>
<th>Parameters</th>
<th>(\chi^2(\text{gl}))</th>
<th>(p)-value</th>
<th>Cont</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Occasionally</td>
<td>Often</td>
<td>Always</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low</td>
<td>31 (6.42)</td>
<td>11 (2.27)</td>
<td>3 (.62)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>30 (6.21)</td>
<td>58 (12.01)</td>
<td>4 (.83)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>3 (.62)</td>
<td>29 (6.01)</td>
<td>57 (11.8)</td>
<td>33 (6.83)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>5 (1.03)</td>
<td>37 (7.66)</td>
<td>53 (10.97)</td>
<td>41 (8.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very high</td>
<td>2 (.41)</td>
<td>21 (4.34)</td>
<td>36 (7.45)</td>
<td>29 (6.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IADC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low</td>
<td>24 (4.96)</td>
<td>10 (2.07)</td>
<td>3 (.62)</td>
<td>1 (.21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>26 (5.38)</td>
<td>62 (12.83)</td>
<td>1 (.21)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>10 (2.07)</td>
<td>31 (6.41)</td>
<td>51 (10.55)</td>
<td>35 (7.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>6 (1.24)</td>
<td>31 (6.41)</td>
<td>67 (13.87)</td>
<td>39 (8.07)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very high</td>
<td>5 (1.03)</td>
<td>22 (4.55)</td>
<td>31 (6.41)</td>
<td>28 (5.79)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRLC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low</td>
<td>15 (3.1)</td>
<td>116 (24.01)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low</td>
<td>24 (4.96)</td>
<td>10 (2.07)</td>
<td>3 (.62)</td>
<td>1 (.21)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Discussion and conclusions

Educational technology has become a major feature of teaching and learning processes. It brings with it a set of focuses, resources, and methodological tools that aim to drive a change in formative settings in contemporary education, with various experts in this field of knowledge agreeing on this (Cabero et al., 2018; Rodríguez et al., 2018).

This innovation has brought about modification and renewal of the methodological principles of teaching as they adapt to the actual situation found nowadays, not just in the classroom but in any space of learning. The ubiquity and flexibility of education is one of the characteristics that has flourished in the educational paradigms of the information and knowledge society, as Báez et al. (2019) and Pereira et al. (2019) have already established.

For all of this to make sense and be put into practice, it is vital that teachers' professional competences are up to date, and so teachers' digital skills and abilities take on a very important position. Teachers must take the reins of staying up to date so that techno-pedagogy can be a current reality and can be put into practice, not just at a theoretical level promoted by experts (Aznar et al., 2019; Jiménez et al., 2019), as has been glimpsed in this work.

Nonetheless, educational professionals who are currently active report that they still do not have a sufficient level of digital competence to meet the needs of a teaching process focussed on technology from a pedagogical perspective. This fact has been confirmed by various studies reported in high quality scientific literature impact (Afanador, 2017; Falcó, 2017; Fernández et al., 2016; Fernández et al., 2018; Morán et
It has been shown that teaching staff struggle to provide an effective education that satisfies the needs and expectations of a student body that has been born into and grown up hand in hand with technology, as Cela et al. note (2017).

But, as Pérez et al. (2016) note, this does not mean that teachers do not use the technological resources that are available to them, but rather that they do not make optimal use of them and so do not make the most of the didactic potential educational technology can offer when used in teaching by professionals with high digital skills.

This whole situation has an impact on the use of the new methodological focuses, like the one analysed in this study, motivated — according to earlier research — not only by the level of digital competence but also by negative attitudes and resistance to change by some sectors of the teaching community (Padilla, 2018; Sorroza et al., 2018).

The arguments and findings presented by previous researchers explain the limited use of flipped learning observed in this study, with intermediate application of this techno-pedagogical focus by teachers, with sporadic use (32.3%) standing out, followed very closely by frequent use (31.7%).

Regarding teachers’ level of digital competence, specifically in the area examined relating to creation of content (vital in this innovative methodology), the teachers — in line with studies presented in the past (Fernández et al., 2018; Fernández et al., 2017; Fuentes et al., 2019; Romero et al., 2017) — reported intermediate competence levels in the different dimensions relating to the creation of digital content, and so, as Santiago et al. noted (2017), the creation of digital content as a fundamental pillar of flipped learning is affected as a result of shortfalls in competences in technological matters.

These results are statistically significant in relation to the use of flipped learning, reflecting the fact that teachers with competence shortfalls in the use of technology generally do not use this focus or only use it sporadically. In contrast, teachers who have shown high skill levels in programming, development, integration and adaptation of digital content, and in knowledge of copyright and digital licences reported greater use of flipped learning.

In consequence, these findings allow us to respond to the objectives of this research, showing that the level of digital competence of teachers in area 3 — relating to the creation of content — does influence their use of the flipped learning focus as an innovative methodology, as shown in the associational study based on the statistics used to measure the strength of association (contingency coefficient and Cramer’s V), in which statistically significant differences were found for all of the items analysed, showing a strong relationship and confirming a statistical trend where the higher the teachers’ level of digital competence in area 3, the more frequently they use this focus.
This study suggests that in future teachers as a group should increase their awareness of and make an effort to update the techniques, resources, and methodological focuses used to educate their students with the aim of offering a quality service that is appropriate for a digital era. This can only be achieved through constant, ongoing training that enables them to improve their digital competence levels and be at the forefront of the latest techno-pedagogical focuses and resources of the digital era.

As a future line of research, we intend to establish whether the use of flipped learning is influenced by teachers’ levels in the other areas that make up digital competence, and so obtain an overview of teachers’ training in the field of technology and its impact on the pedagogical decisions they might take on the frequency of use of methodological focuses of this type.

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Content creation and flipped learning: a necessary pairing for education in the new millennium


Content creation and flipped learning: a necessary pairing for education in the new millennium


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