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Impact of virtual vs. face-to-face learning on 21st-century skills among pre-service bilingual teachers

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ABSTRACT
The so-called 'twenty-first century skills' (Hockly et al., 2014) have been identified as essential literacies for the young generation, who must use creativity and innovation, collaboration and teamwork, critical thinking, problem-solving, autonomy, flexibility, and lifelong learning to function effectively. Bilingual pre-service teachers are entitled to develop these skills for both their own education and that of their future students (Savage & Barnett, 2015). This research analyses the opinions of 45 bilingual pre-service teachers on the development of their twenty-first century skills through either online or face-to-face teaching. Quantitative and qualitative data are scrutinized using mixed-methods research, which throws light on participants' perceptions of better development of such skills. Findings demonstrate that student teachers perceive that some of these skills are better developed with a face-to-face modality of learning (e.g., teamwork and collaboration), whereas others (e.g., autonomy and innovation) develop better through online learning. Twenty-first century literacies push the educational boundaries of bilingual teachers, who are entitled to have a repertoire of communication skills that make us, teacher educators, pursue academic rigour regarding teacher and updated training.

Keywords: Literacy, twenty-first century skills, pre-service teachers, bilingual teachers, teacher education.

Impacto del aprendizaje de las habilidades del siglo XXI entre profesorado bilingüe en formación en modalidad virtual frente a modalidad presencial

RESUMEN
Las denominadas "competencias del siglo XXI" (Hockly et al., 2014) se identifican como una alfabetización esencial para las nuevas generaciones, que deben utilizarlas (por ejemplo, creatividad, innovación, colaboración, pensamiento crítico o autonomía) para funcionar eficazmente. Los maestros bilingües en formación deben desarrollar estas competencias tanto para su propia educación como para la de sus futuros alumnos (Savage & Barnett, 2015). Esta investigación analizará las opiniones de estos sujetos sobre si el desarrollo de dichas competencias es más adecuado a través de la docencia presencial o virtual. Los datos se examinarán mediante una investigación de métodos mixtos, que arrojará luz sobre cómo los participantes consideran que se desarrollan mejor dichas competencias. Los resultados mostrarán que algunas de esas habilidades evolucionan más favorablemente a través de una modalidad presencial (por ejemplo, el trabajo en equipo y la colaboración), mientras que otras (por ejemplo, la autonomía y la innovación) lo hacen mejor online. La alfabetización del siglo XXI amplía los límites educativos de los maestros bilingües, quienes deben disponer de un amplio repertorio de competencias comunicativas que hace que los formadores de maestros persigamos el rigor académico en lo que respecta a nuestra propia enseñanza en el aula y formación actualizadas.

Palabras clave: Alfabetización, competencias del siglo XXI, profesorado en formación, profesorado bilingüe, formación del profesorado.

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1. Introduction

Twenty-first century teachers must develop a set of specific skills such as creativity and innovation, collaboration and teamwork, critical thinking, problem-solving, autonomy, flexibility, and lifelong learning to function effectively. These have been identified by Hockly et al. (2014) as 'twenty-first century skills', and they are considered particularly valuable for bilingual education teachers due to the global implementation of bilingual programmes across the world and, especially, in Europe, where "the number of identified English-taught programmes went up from 725 programmes in 2001, to 2,389 in 2007 and to 8,089 in the present study [2014]" (Wächter & Maiworm, 2014, p. 16). One of the main goals of these programmes is to help students develop their linguistic competences through the instruction of content subjects in foreign languages (Alonso-Díaz et al., 2019). But it is also among their key goals to develop other important curricular competences such as "creativity and innovation, critical thinking and problem solving, communication and collaboration" (Vitalaru, 2020, p. 303), which are among the so-called twenty-first century skills. Therefore, bilingual pre-service teachers should be aware of the need to develop such competences during their university training, so that they can instil them in their future students (i.e., 6-12 year-old bilingual Primary Education pupils).

Regarding the integration of these competences into the curriculum of pre-service teachers, *The Framework for 21st Century Skills* (P21, 2007, p. 1) identifies some key skills "that are required and help trainers integrate them into the teaching of the essential academic subjects" (e.g., critical thinking, problem-solving, communication, and collaboration). These can be found within the curriculum of a number of courses of the university Degree of bilingual pre-service teachers at the University of Córdoba (http://www.uco.es/educacion/es/primaria-planificacion-de-la-ensenanza), so the participants of this study are familiarised with them and, supposedly, having developed them through with their higher-education training along 3.25 years (when this research was carried out).

Twenty-first century skills are also found in the curriculum of Spanish Primary Education students (6-12 year olds). These competences encompass other central skills, which are defined by different organisms (mostly the Ministry of Education and the regional government of the 17 autonomous communities). Such regional administrations can collaborate with the Ministry and decide on additional content, specific teaching methods or evaluation criteria. Regarding the key competences for Primary Education, the Order ECD/65/2015 of the *Ley Orgánica para la Mejora de la Calidad Educativa* (LOMCE, 2013) describes the relationships among competences, contents, and assessment criteria of Primary, Secondary Education, and Baccalaureate. Therefore, the competences and contents of Primary Education are ruled by the Spanish Ministry of Education, among which social and civic competences (e.g., active social participation), learning competences (e.g., self-efficacy, motivation, planning), entrepreneurship, and initiative competences (e.g., imagination, creativity, problem-solving and critical-thinking) are found.

The acknowledgement and identification of such skills by bilingual pre-service students is, therefore, a relevant achievement for teacher trainers, researchers, and institutions. Moreover, in the context of the world pandemic due to COVID-19, the training of many pre-service teachers (among whom the participants of this study are identified) abruptly turned from face-to-face sessions into online teaching, which radically changed their perspective on a number of issues, some of which are valued as mostly negative by the literature (Aliyyah et al., 2020; Hasan & Bao, 2020), whereas some other authors discuss the "recognition of the weaknesses and potentialities as an educational community" (Castaman & Rodrigues, 2020, p. 1) and identify the inequalities brought by the pandemic (Day et al., 2021).

This paper analyses the perception of 45 bilingual pre-service teachers on their best-perceived way to develop such competences, either online or through face-to-face teaching. Their university experience along the last two academic years (i.e., 2019-2020 and 2020-2021) comprises these two teaching modalities: i. The second semester of 2019-2020 (March-July 2020) was online; ii. The first semester of 2020-2021 (September-December 2020) has been delivered partly face-to-face (from September to mid-November 2020) and partly online (from mid-November to the end of December 2020). Moreover, these students are in their 4th year of their University Degree, so the first 2.5 years of their higher-education programme were completed fully face-to-face. Furthermore, these students are in the final stage of their training as bilingual teachers, which also equips them with a solid perspective on the way these skills have been developed along their university Degree. These two features make them an appropriate target group for this research, whose opinions and perceptions are positively valued by the author of this paper.

The fact that these skills can be better developed either online (that is, through digital media) or face-to-face (that is, through direct human interaction) poses interesting researching questions as, if the digital revolution brought by international pandemic for COVID-19 (Hantrais et al., 2020) is here to stay, we teacher trainers must make pre-service teachers aware of which of these two teaching modalities is the most suitable way to develop these competences in order to better instil them into their future students (Savage & Barnett, 2015).

Finally, 21st century literacy cannot be considered solely of a digital kind, although this can be understood as essential "to enable constructive social action; and to reflect upon this process" (Martin & Grudziecki, 2006, p. 155). Pre-service bilingual teachers are entitled to develop twenty-first century skills through the compulsory curriculum of their university Degree, among which competences conveying both direct human contact and distant (or online) human contact are identified. Therefore, the value of this paper is to draw a holistic picture of the acknowledgement and perception by pre-service bilingual teachers on how these competences have been developed better, including establishing the linkage between such perceptions and teacher trainers' recognition on how to continue our work after COVID-19's impact on higher education.

2. Methodology

2.1. Research Design

This study uses an on-purpose designed questionnaire validated through the Delphi technique, one of the most widely used and accepted methods for validating research instruments through the collection of opinions from a panel of experts in a particular field of study in order "to achieve a convergence of opinion on a specific real-world issue" (Hsu & Sandford, 2007, p. 1). Thus, Delphi was considered appropriate as it searches for consensus among experts who, moreover, get the opportunity to reassess and refine their initial judgments about the subject matter based on the feedback from other panellists.

The identification of an adequate panel of experts who can assess the validity of instruments is one of the most important steps in the Delphi method (Hung et al., 2007; Landeta, 2006). The members of this Delphi panel had to meet at least two of the following three features:

(a) Expertise on (at least) two of the following key areas: Bilingual Education, Second Language Acquisition, CALL (Computer-Assisted Language Learning).

(b) Strong knowledge of the Delphi method.

(c) Outstanding level of communication in at least two languages.

Thus, five experts were identified and selected from the international arena from the following Universities: University of Bremen –Germany–, University of Oldenburg –Germany–, Texas Women's University –the United States of America–, University of Córdoba –Spain–, and Lower Silesia University –Poland. Three main methodological phases were established (preliminary, exploratory, and final), and the assessment template for the panel of experts was appointed. In the preliminary phase, the two main research objectives were set, according to which the panel of experts was designed. During the exploratory phase, the questionnaire was designed as the research instrument (see Appendix). Then, it was sent through email to the panel of experts together with the template for assessment and an introductory letter where the rationale and the theoretical background of the research were explained. Detailed instructions regarding the Likert scale to be used were added, as well as the four criteria against which the questionnaire was to be validated: clarity, pertinence, adequacy (quantitative), and comments (qualitative). The instrument for validation was clearly divided into the 2 blocks by following the structure of the questionnaire, and it was arranged according to: (a) a 4-point Likert scale for the questions, where experts could assess their pertinence and/or validity; (b) a section for comments by the experts (from which qualitative data could be collected). The whole process was carried out within a two-month period.

The Cronbach's alpha for this instrument is .767 (Table 1) which, according to Oviedo and Campo-Arias (2005), indicates a high-reliability index. This datum is confirmed by MacDonald's omega coefficient (.780 in our study) which is, again, very good, according to Campo-Arias and Oviedo (2008), as it is between 0.70 and 0.90:

Table 1. *Scale Reliability Statistics*

	Cronbach's α	McDonald's ω
scale	.767	.780

Moreover, the statistical analysis has been applied to independent elements of the questionnaire to check the reliability of the scale if one item is dropped. As Table 2 shows, none of the values is lower than .736, which, again, is classified as very good by Campo-Arias and Oviedo (2008) for both, Cronbach's α and McDonald's ω:

Table 2. *Item Reliability Statistics if One Item is Dropped*

	If item is dropped	
	Cronbach's α	McDonald's ω
Innovation	.748	.756
Collaboration	.752	.762
Teamwork	.764	.773
Critical thinking	.753	.762
Problem-solving	.747	.757
Autonomy	.748	.758
Flexibility	.759	.771
Lifelong learning	.751	.765
Innovation (2)	.761	.778
Collaboration (2)	.768	.781
Teamwork (2)	.756	.774
Critical thinking (2)	.761	.777
Problem-solving (2)	.759	.775
Autonomy (2)	.760	.775
Flexibility (2)	.766	.780
Lifelong learning (2)	.736	.756

This study was grounded in mixed methods traditions (MMR), that combines the analysis of both quantitative and qualitative data. Such a combination offers an appropriate understanding of the research problem (Creswell & Plano Clark, 2010). Qualitative analysis has been used herein to complement quantitative data (analysed through Jamovi, 2020, v. 1.2), by scrutinizing the opinions and perceptions of 45 pre-service bilingual teachers in order to make sense of and interpret the phenomena according to the meaning that participants attach to them (Denzin & Lincoln, 2018, p. 3). The integration of these two main methodological approaches enhances the research design itself, as the strengths of one approach may counterbalance the possible weaknesses of the other (Creswell et al., 2011). This study, therefore, applies both deductive and inductive logic types of inquiry to the analysis of data.

The two main objectives (M.O.) of this research are as follows:

M.O.1: To analyse the opinions of bilingual pre-service teachers on their development of twenty-first century skills.

M.O.2: To compare if pre-service teachers think that these skills are better acquired through either online or face-to-face teaching.

2.2. Participants

The sample of this research was composed of 45 bilingual pre-service teachers who were enrolled in their 4th university year of Teacher Education at the University of Córdoba (Spain). The data of this research were collected during the month of December 2020 through an online questionnaire purposefully designed (see Appendix). The distribution of the final sample of the 45 students surveyed was the following according to the sex of participants: male (22.22%) and female (77.78%).

Moreover, Table 3 shows the distribution of students surveyed according to their age:

Table 3. *Distribution of the Sample According to Participants' Age*

Age	20	21	22	25 or more
%	8.89	66.67	13.33	11.11

Regarding the languages they speak, the distribution of the sample is as follows:

Table 4. *Distribution of the Sample According to Languages Spoken*

Languages	Spanish	English	French	German	Italian	Slovak
%	100	100	24.44	8.8	6.6	2.2

77.78% of participants had learnt the languages prior to their university training, whereas 22.22% declared that they had learnt the languages during this period for the first time.

Finally, regarding technology (questions 4a and 4b of the questionnaire), 100% of students declared that they had done a course on technology, out of whom 82.22% responded that they had done it before their university degree, whereas 24.44% affirmed that they did it during their higher-education period.

3. Results

The analysis of the results of this research will be divided into two main blocks to follow the structure of the questionnaire.

3.1. Block 1: Online Teaching

Table 5 summarizes the percentages obtained by participants' answers to the first block of questions:

Table 5. *Percentages of Participants' Answers to Block 1 (Questions no. 5 to 12)*

I think online teaching has helped me develop the following skills more efficiently than face-to-face teaching:

	1 Very Little	2 Little	3 Much	4 A Lot
5. Innovation	6.98%	30.23%	51.16%	11.63%
6. Collaboration	9.30%	51.16%	32.56%	6.98%
7. Teamwork	16.28%	41.86%	27.91%	13.95%
8. Critical thinking	16.28%	41.86%	32.56%	9.30%
9. Problem-solving	6.98%	34.88%	37.21%	20.93%
10. Autonomy	2.33%	4.65%	51.16%	41.86%
11. Flexibility	9.30%	27.91%	44.19%	18.60%
12. Lifelong learning	9.30%	25.58%	62.79%	2.33%

This set of data tells us that the skill that is considered to be developed mostly online (valued as 'much' = 3) is 'lifelong learning' (62.79%), followed by 'innovation' and 'autonomy', both of which obtain a percentage of 51.16%. The highest value in the Likert scale (i.e., 'a lot' = 4) is given to 'autonomy' (41.86%).

On the other hand, the skills that students value as less developed through online teaching (i.e., 'little') are: 'collaboration' (51.16%), 'teamwork' and 'critical thinking', both of which are valued as 41.86% of the answers to the value 'little' (= 2).

Further analysis of these data allows us to group non-positive values (i.e., 1 = 'very little' and 2 = 'little') on one column and positive values (i.e., 3 = 'much' and 4 = 'a lot') on the other to be able to understand better how students perceive the acquisition of these skills through online teaching:

Table 6 . *Grouping of Non-Positive and Positive Data*

	Non-positive data 1 = Very Little + 2 = Little	Positive data 3 = Much + 4 = A Lot
5. Innovation	37.21%	62.79%
6. Collaboration	60.46%	39.54%
7. Teamwork	58.14%	41.86%
8. Critical thinking	58.14%	41.86%
9. Problem-solving	41.86%	58.14%
10. Autonomy	6.98%	93.02%
11. Flexibility	37.21%	62.79%
12. Lifelong learning	34.88%	65.12%

Data in Table 6 clearly indicate that students think that the skill which is better developed through online teaching is 'autonomy' (93.02%), followed by 'lifelong learning' (62.79%), 'flexibility' and 'innovation' (both of which show 62.79%) and, finally, 'problem-solving' (58.14%). Then, the skill that pre-service teachers think is less developed through online teaching is 'collaboration' (60.46% for 1-2 values of the Likert scale), followed by 'teamwork' and 'critical thinking' (both showing 58.14%).

Qualitative data obtained from the answers to question number 13 of this first block, i.e., "Can you briefly explain in which ways online teaching was better than face-to-face teaching for the development of some of these skills?", were analysed through content analysis.

The word cloud of most frequent words is shown in Figure 1 below:

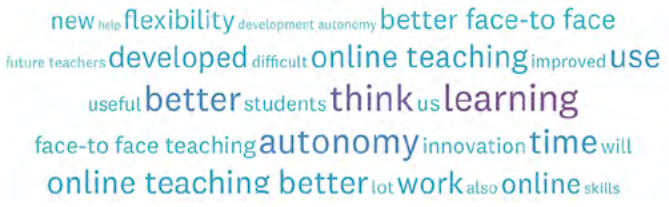

Figure 1. *Word Cloud of Most Frequent Words for Question no. 13*

The five most frequent words in this cloud are: 1. 'learning' (30.23%); 2. 'think' (27.91%); 3. 'autonomy' (20.93%); 4. 'better' (18.60%); and 5. 'time' (16.28%). Some other important words which are related to online teaching are also met in this word cloud: 'online', 'flexibility', and 'innovation'.

Some of the students' statements can be highlighted as they support the quantitative analysis above (keywords have been underlined by the author):

> [P1] For example in the skills of autonomy, in online classes we have to adapt to doing things by ourselves, we are at home and there is no one to watch us or help us, so we have to be able to organize ourselves and acquire autonomy.
>
> [P12] The development of autonomy and flexibility during online teaching was better because when learning online, we were given many individual tasks to complete. Consequently, our skills related to autonomy and flexibility were improved.
>
> [P29] Online teaching is better than face-to-face because of the creativity and innovation to do things, and to improving ICTs.
>
> [P44] Because we have to use the autonomy and to be capable of solving problems in a difficult situation.

3.2. Block 2: Face-to-face Teaching

Table 7 summarizes the percentages obtained by participants' answers to the second block:

Table 7. *Percentages of Participants' Answers to Block 2 (Questions no. 14 to 21).*

I think face-to-face teaching has helped me develop the following skills more efficiently than online teaching:

	1 Very Little	2 Little	3 Much	4 A Lot
14. Innovation	7.14%	40.48%	47.62%	4.76%
15. Collaboration	7.14%	16.67%	47.62%	28.57%
16. Teamwork	2.38%	16.67%	47.62%	33.33%
17. Critical thinking	4.76%	26.19%	45.24%	23.81%
18. Problem-solving	7.14%	33.33%	47.62%	11.90%
19. Autonomy	4.76%	40.48%	33.33%	21.43%
20. Flexibility	16.67%	38.10%	40.48%	4.76%
21. Lifelong learning	4.76%	23.81%	52.38%	19.05%

Results from answers to this second block show that students mainly think that most of these skills are better developed through face-to-face teaching, as values for 'much' (=3) are higher for all skills but for 'autonomy', which shows a percentage of 40.48% for the value 'little' (= 2), and 33.33% for the value 'much' (= 3).

To follow the same procedure as above, further analysis of this second set of data allows us to group non-positive values (i.e., 1 = 'very little' and 2 = 'little') on one column, and positive values (i.e., 3 = 'much' and 4 = 'a lot') on the other to be able to understand better how students perceive the acquisition of these skills through face-to-face teaching:

Table 8. *Grouping of Non-Positive and Positive Data*

	Non positive data 1 = Very Little + 2 = Little	Positive data 3 = Much + 4 = A Lot
5. Innovation	47.62%	52.38%
6. Collaboration	23.81%	76.19%
7. Teamwork	19.05%	80.95%
8. Critical thinking	30.95%	69.05%
9. Problem-solving	40.47%	59.52%
10. Autonomy	45.24%	54.76%
11. Flexibility	54.77%	45.24%
12. Lifelong learning	28.57%	71.43%

Data from Table 8 clearly indicate that the skill that students think is better developed through face-to-face teaching is 'teamwork' (80.95%), followed by 'lifelong learning' (71.43%), 'collaboration' (76.19%), 'problem-solving' (59.52%), 'autonomy' (54.76%) and 'innovation' (52.38%). Then, the skill that pre-service teachers think that is less developed through online teaching is 'flexibility' (54.77% for values 1-2 of the Likert scale).

Qualitative data obtained from the answers to question no. 22 of this second block, i.e., "Can you briefly explain in which ways face-to-face teaching was better than online teaching for the development of some of these skills?" were analysed through content analysis.

The word cloud of most frequent words is shown in Figure 2 below:

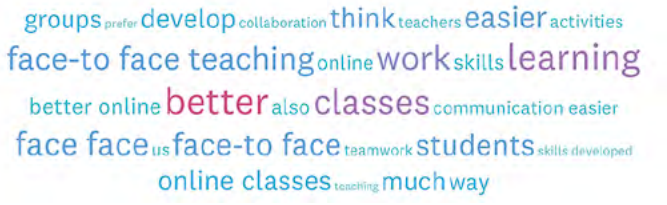

Figure 2. *Word Cloud of Most Frequent Words for Question no. 22*

The five most frequent words are: 1. 'better' (38.10%); 2. 'learning' (30.95%); 3. 'classes' (28.57%); 4. 'work' (23.81%); and 5. 'face-to-face' (21.43%). These words are all related to face-to-face teaching. Moreover, the words 'groups', 'collaboration', 'activities' and 'communication' can also be found in this word cloud, which shows that they are frequent in participants' answers.

Some of the students' statements that can be highlighted to support the quantitative analysis are as follows (keywords have been underlined by the author):

[P4] You can ask in a direct way and also, collaboration and the relationship with classmates is better.

[P7] Face-to-face learning has helped me in developing some essential skills as responsibility and teamwork, and it is a closer learning in which students and teachers can communicate better to achieve better results. Also, with face-to-face learning, students will develop a positive attitude to learn, and show interest.

[P8] Team works are better in a face-to-face working because we can see each other, and we can explain ourselves better than in a virtual way.

[P14] It was better mostly for collaboration and teamwork as we worked a lot in groups and we could share our point of view with our partners to create resources together. Moreover, it has developed also communication within the whole class when some aspects emerged and we had to collaborate together.

[P26] Although online classes have many benefits, they also have some disadvantages. In fact, lifelong learning is much higher in face-to-face classes, because I can stay attentive much longer and, furthermore, the learning environment that is created is not as possible in online classes.

[P38] In face-to-face activities I can have a relation with others more easily and we have more time to critical thinking in class because in face-to-face classes are more interaction between teachers and students.

[P41] Problem-solving could be easier in face-to-face teaching.

The comparison of data from Table 6 and Table 8 will offer a clear view of how students think that these skills are better developed:

Table 9. *Summary of Grouped Quantitative Data*

	Non positive data 1 = Very Little + 2 = Little		Positive data 3 = Much + 4 = A Lot	
Item	*Online (Table 6)*	*Face-to-face (Table 8)*	*Online (Table 6)*	*Face-to-face (Table 8)*
5. Innovation	37.21%	47.62%	62.79%	52.38%
6. Collaboration	60.46%	23.81%	39.54%	76.19%
7. Teamwork	58.14%	19.05%	41.86%	80.95%
8. Critical thinking	58.14%	30.95%	41.86%	69.05%
9. Problem-solving	41.86%	40.47%	58.14%	59.52%
10. Autonomy	6.98%	45.24%	93.02%	54.76%
11. Flexibility	37.21%	54.77%	62.79%	45.24%
12. Lifelong learning	34.88%	28.57%	65.12%	71.43%

Data shown in Table 9 clearly that pre-service bilingual teachers consider that:

a. The four skills that are mostly developed through online teaching are: 'autonomy' (93.02%), followed by 'innovation' and 'flexibility' (both 62.79%), and 'problem-solving' (58.14%).

b. On the other hand, the four skills that students think are better developed through face-to-face teaching are 'teamwork' (80.95%), 'collaboration' (76.19%), 'lifelong learning' (71.43%), and 'critical thinking' (69.05%).

4. Discussion and Conclusions

The development of the twenty-first century competencies, as discussed in the introduction to this article, is key to understanding the training of bilingual teachers in this era as well as the education of Primary Education school pupils (which, at least in Spain, is defined by being bilingual for almost the whole of the national territory). Therefore, the analysis of the perceptions of this group of pupils in training (pre-service bilingual teachers) is of the greatest importance for researchers, teacher trainers and institutions, because their opinion will help us to understand whether, on the one hand, these skills are being developed throughout their university training and, on the other, whether the acquisition of these skills is best carried out through online or face-to-face teaching.

The group of participants in this study was assessed positively by the author of this paper, given their university background, in which they have had both online and face-to-face training. On the other hand, the characteristics of their training profile in languages and technology only endorse the author's positive assessment. 100% of them speak 2 languages, and 17.6% of them speak 3 languages (including Italian, French, German, and Slovak). Another interesting (and appropriate for this study) feature of their profile is that 100% of the subjects have specific training in technology, having acquired it prior to their higher-education period in 82.22% of cases.

Therefore, the group of subjects is considered suitable for this study, and their responses are assessed as highly reliable for this analysis. On the other hand, the general values of Cronbach's alpha (.767) and McDonald's omega (.780) indicate that the validity of the instrument used is also very good and, therefore, the results extracted from this analysis are relevant for our research.

Data from the first block of the questionnaire (that is, whether online teaching is better than face-to-face teaching for the development of twenty-first century competences) indicate that participants believe that the skill that is best developed online is 'autonomy', with a value of 93.02% for grades 3 (much) and 4 (a lot) on the Likert scale, followed by 'flexibility' and 'innovation' (both of which yield a percentage of 62.79%). Regarding the importance of autonomy in online learning, Nayernia (2020, p. 117) states: "Studies have shown that learner autonomy plays a decisive role in online learning", which corroborates the perceptions of the participants in this study and endorses the high percentage that these students attribute to this competence. Likewise, 'flexibility' and 'innovation' are two competencies that Lee (2020, p. 1) believes are related in an interesting way: "being pedagogically innovative by increasing interactivity among students while maintaining the same level of flexibility […] seems very challenging". It is striking that the participants in this study have attributed the same percentage of importance to their online development because, as Lee (2020) explains, they seem to be decisive in the interaction of students in distance learning settings.

On the other hand, the competences which are best developed through face-to-face teaching are (in order of the importance attributed by students): 'teamwork' (80.95%), 'collaboration' (76.19%), 'lifelong learning' (71.43%), 'critical thinking' (69.05%) and 'problem-solving' (59.52%).

'Teamwork' is the competence that this group of participants thinks is best developed through face-to-face teaching, followed

by 'collaboration'. Higher education systems have placed particular emphasis on incorporating cooperative and collaborative learning techniques in recent years (OECD, 2013), especially in teacher training studies (Takala et al., 2019), and students are therefore used to developing this competence face-to-face. However, there are many researches today (especially, published after the pandemic by COVID-19) that describe successful experiments with implementations of these cooperative and collaborative techniques through online teaching (e.g., Kauppi et al., 2020).

On the other hand, lifelong learning is one of the two competences that Kumari et al. (2020) identify as essential to the teaching profession. Moreover, 'critical thinking' is a skill whose development Álvarez and Domenech Rodríguez (2020) associate with increasing student diversity in higher education internationally. The fact that 69.05% of the subjects in this study believe that 'critical thinking' is best developed through face-to-face rather than online teaching may be related to this fact because, in addition, the indications of *The Framework for 21st Century Skills* (P21, 2007) advise that it should be taught in the context of teaching key content.

The percentage that students give to 'problem-solving' (59.52%) for its face-to-face acquisition concords with the data from the literature, since this competence is generally associated with face-to-face teaching and, fundamentally, cooperative teaching, and learning modalities (e.g., Sun et al., 2020). In fact, the qualitative analysis of the data corroborates this result (e.g., participant no. 41 indicates that "Problem-solving could be easier in face-to-face teaching").

The quantitative analysis of these data (for both blocks) is supported by the qualitative results to which, as already mentioned, content analysis has been applied. We found a great coincidence in the terms that students use most frequently in their explanations of why some skills are developed better than others for both modalities. Such qualitative analysis of results, moreover, concord with the quantitative data previously analysed. For example, participant no. 10 indicates that, despite the fact that for them face-to-face learning is, in general, better than online learning, the abrupt change to an online modality caused by this pandemic has helped them to find many resources on the web that s/he can now use with their classmates. And s/he continues: "Moreover, I became more autonomous. I liked that not all the work was group work as it is difficult to do it if you cannot see your partners face-to-face, so in this way, you can gain autonomy." Participant no. 18 states: "Online learning requires you to be more autonomous and responsible, as you are at home and this makes working harder, it is an extra effort to wake up each morning. So, this difficulty pushes you harder to improve your skills if you want to succeed". Likewise, participant no. 4 affirms: "From my view of point, I prefer face-to-face teaching because my idea of education is not conceptualised without a physical presence inside of the classroom. It provides more proximity to our future students, and because of that, more capacity to solve their questions and problems. Also, the collaboration and the team-working feeling is reflected better in this way". We see, therefore, that the students establish a logical link between the personal acquisition of these skills and their professional future by indicating that they cannot understand teaching without an important face-to-face component because they believe that, as teachers, it will be easier to resolve doubts and problems to their future Primary Education pupils through direct human contact.

Finally, we would like to make a final reflection on the importance of this research insofar as, on the one hand, we believe that it has helped participants themselves to become aware of and to make explicit the relevance of the acquisition of these twenty-first century competences for their professional future, as the results of our study indicate. On the other hand, we believe that this work is important in that it also represents a point of reflection for teacher trainers in this century, having lived under a pandemic and being, at this time, receiving the impact that the COVID-19 is leaving on multiple aspects of life (education among them). The perception of which skills are best developed through each modality should make us, teacher trainers, pursue a more than desirable academic rigour and the obligatory updating to which university teaching staff must submit. Only in this way will it be possible to fulfil the expectations of teacher students who are clearly capable of analysing what and how their skills are being developed and what impact this may have on their professional future.

References

Aliyyah, R. R., Rachmadtullah, R., Samsudin, A., Syaodih, E., Nurtanto, M., & Tambunan, A. R. S. (2020). The perceptions of primary school teachers of online learning during the COVID-19 pandemic period: A case study in Indonesia. *Journal of Ethnic and Cultural Studies*, *7*(2), 90–109. https://doi.org/10.29333/ejecs/388

Alonso-Díaz, L., Delicado, G., & Ramos, F. (2019). A comparative study of bilingual teacher preparation programs in California and Spain. In B. Johannessen (Ed.), *Bilingualism and bilingual education: Politics, policies and practices in a globalized society* (pp. 81–101). Springer. https://doi.org/10.1007/978-3-030-05496-0_5

Álvarez, M. D. L. C., & Domenech Rodríguez, M. M. (2020). Cultural competence shifts in multicultural psychology: Online versus face-to-face. *Translational Issues in Psychological Science*, *6*(2), 160-174. https://doi.org/10.1037/tps0000229

Campo-Arias, A., & Oviedo, H. C. (2008). Psychometric properties of a scale: Internal consistency. *Revista de salud pública*, *10*(5), 831–839. https://doi.org/10.1590/s0124-00642008000500015

Castaman, A. S., & Rodrigues, R. A. (2020). Educação a Distância na crise COVID-19: um relato de experiência. *Research, Society and Development*, *9*(6), e180963699–e180963699. https://doi.org/10.33448/rsd-v9i6.3699

Creswell, J. W., & Plano Clark, V. L. (2010). *Designing and conducting mixed methods research* (2nd ed.). SAGE. https://doi.org/10.1177/1094428108318066

Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2011). *Best practices for mixed methods research in the health sciences.* National Institutes of Health. https://doi.org/10.1037/e566732013-001

Day, T., Chang, I. C. C., Chung, C. K. L., Doolittle, W. E., Housel, J., & McDaniel, P. N. (2021). The immediate impact of COVID-19 on postsecondary teaching and learning. *The Professional Geographer*, *73*(1), 1–13. https://doi.org/10.1080/00330124.2020.1823864

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2018). *The SAGE handbook of qualitative research* (5th ed.). SAGE.

Hantrais, L., Allin, P., Kritikos, M., Sogomonjan, M., Anand, P. B., Livingstone, S., Williams, M., & Innes, M. (2020). Covid-19 and the digital revolution. *Contemporary Social Science*, *16*(2), 256-270. https://doi.org/10.1080/21582041.2020.1833234

Hasan, N., & Bao, Y. (2020). Impact of "e-Learning crack-up" perception on psychological distress among college students during COVID-19 pandemic: A mediating role of "fear of academic year loss". *Children and Youth Services Review*, *118*, 105355. https://doi.org/10.1016/j.childyouth.2020.105355

Hockly, N., Dudeney, G., & Pegrum, M. (2014). *Digital Literacies*. https://doi.org/10.4324/9781315832913

Hung H-L., Altschuld, J. W., & Lee, Y. (2008). Methodological and conceptual issues confronting a cross-country Delphi

study of educational program evaluation. *Evaluation and Program Planning, 31,* 191–198. https://doi.org/10.1016/j.evalprogplan.2008.02.005

Hsu, C. C., & Sandford, B. A. (2007). The Delphi technique: Making sense of consensus. *Practical assessment, research & evaluation, 12*(10), 1–8. https://doi.org/10.7275/pdz9-th90

Kauppi, S., Muukkonen, H., Suorsa, T., & Takala, M. (2020). I still miss human contact, but this is more flexible–Paradoxes in virtual learning interaction and multidisciplinary collaboration. *British Journal of Educational Technology, 51*(4), 1101-1116. https://doi.org/10.1111/bjet.12929

Kumari, V., Hameed, D., Mazumder, D., & Sathyan, A. (2020). The role of education leadership in managing teaching competencies of selected secondary teachers in the United Arab Emirates (UAE) (an exploratory study). *International Journal of Management (IJM), 11*(9), 688-698. https://doi.org/10.34218/IJM.11.9.2020.065

Landeta, J. (2006). Current validity of the Delphi method in social sciences. *Technological forecasting and social change, 73*(5), 467–482. https://doi.org/10.1016/j.techfore.2005.09.002

Lee, K. (2020). Openness and innovation in online higher education: A historical review of the two discourses. *Open Learning: The Journal of Open, Distance and e-Learning*. https://doi.org/10.1080/02680513.2020.1713737

LOMCE.Ley Orgánica 8/2013, de 9 de diciembre, para la mejora de la calidad educativa.. Boletín Oficial del Estado, 295, de 10 de diciembre de 2013, 97858-97921. https://cutt.ly/bjWuf7G.

Martin, A., & Grudziecki, J. (2006). DigEuLit: Concepts and Tools for Digital Literacy Development. *Innovation in Teaching and Learning in Information and Computer Sciences, 5*(4), 249–267. https://doi.org/10.11120/ital.2006.05040249

Nayernia, A. (2020). Development and validation of an e-teachers' autonomy-support scale: A SEM approach. *Development*, *14*(2), 117–134.

OECD. (Organisation for Economic Cooperation and Development). (2013). Assessment of higher education learning outcomes. *AHELO Feasibility Study Report Vol. 3–Further Insights*. https://cutt.ly/LjWnJIn.

Oviedo, H. C., & Campo-Arias, A. (2005). Aproximación al uso del coeficiente alfa de Cronbach. *Revista colombiana de psiquiatría, 34*(4), 572–580.

P21. (Partnership for 21st Century Skills). (2007). *Framework definitions*. https://www.battelleforkids.org/networks/p21

Savage, M., & Barnett, A. (2015). *Digital literacy for primary teachers: Critical teaching*. Critical Publishing.

Sun, C., Shute, V. J., Stewart, A., Yonehiro, J., Duran, N., & D'Mello, S. (2020). Towards a generalized competency model of collaborative problem solving. *Computers & Education*, *143*, 103672. https://doi.org/10.1016/j.compedu.2019.103672

Takala, M., Nordmark, M., & Allard, K. (2019). University curriculum in special teacher education in Finland and Sweden. *Nordic Journal of Comparative and International Education*, *3*(2), 20–36. https://doi. org/10.7577/njcie.2659

The Jamovi Project (2020). *Jamovi*. (Version 1.2) [Computer Software].

Vitalaru, B. (2020). Competences in US and Spain: Skills and strategies in LAs' Spanish academic papers. In M. E. Gómez-Parra & C. A. Huertas-Abril (Eds.), *Handbook of bilingual and intercultural education* (pp. 302–337). IGI Global. https://doi.org/10.4018/978-1-7998-2588-3

Wächter, B., & Maiworn, F. (Eds.). (2014). *English-taught programmes in European Higher Education*. Lemmens.

Appendix

Questionnaire

Demographic and Educational Background Data

1. Gender: _____ Male _____ Female _____ Other
2. Age: _____
3. Languages you speak (please, write them down):

_____

4a. Have you done a course on technology yet? _____ Yes _____ No
4b. If you answered 'Yes' to the question before, please, say if it was before or during your Undergraduate course at the University: _____ Before ____ During

BLOCK 1: ONLINE TEACHING

I think online teaching has helped me develop the following skills more efficiently than face-to-face teaching:

	1 (Very Little)	2 (Little)	3 (Much)	4 (A Lot)
5. Innovation				
6. Collaboration				
7. Teamwork				
8. Critical thinking				
9. Problem-solving				
10. Autonomy				
11. Flexibility				
12. Lifelong learning				
13. Can you briefly explain in which ways online teaching was better than face-to-face teaching for the development of some of these skills?				

BLOCK 2: FACE-TO-FACE TEACHING

I think face-to-face teaching has helped me develop the following skills more efficiently than online teaching:

	1 (Very Little)	2 (Little)	3 (Much)	4 (A Lot)
14. Innovation				
15. Collaboration				
16. Teamwork				
17. Critical thinking				
18. Problem-solving				
19. Autonomy				
20. Flexibility				
21. Lifelong learning				
22. Can you briefly explain in which ways face-to-face teaching was better than online teaching for the development of some of these skills?				