

Integrating the Global Competence with Telecollaboration in CLIL Teacher Training

Integración de la competencia global con telecolaboración en la formación del profesorado en contextos CLIL

Soraya Garcia-Esteban
Universidad de Alcalá, Spain
soraya.garciae@uah.es

Jozef Colpaert
University of Antwerp, Belgium
jozef.colpaert@uantwerpen.be

Abstract

Global competence will define learning for decades to come as it encompasses basic life skills. However, there is a lack of data in current academic research on the assessment and integration of this competence in teacher training with current educational technology. Thus, this project had a dual purpose: On the one hand, it aimed to examine the global competence of different groups of student teachers through the development of Sustainable Development Goals (SDG) following a content and language integrated learning (CLIL) approach. On the other, researchers aimed to determine optimal methods for the improvement and integration of this necessary competence in the curriculum. The project was developed with the collaboration of pre-service and in-service teachers enrolled in various master's programs at two European universities in Spain and Belgium. The research was carried out following a pre-test / post-test type design with various assessment instruments based on the OECD (2018) global competence framework. The quantitative analyses showed that, by integrating the SDGs when teaching contents, the participants improved in various domains of Global Competence (adaptability, openness to diversity, perspective taking), but also decreased in other areas (ability to interact in a multicultural world, respect for other cultures, ability to adopt another culture). The qualitative research showed that among the main educational technology examined, telecollaboration can optimise at least five dimensions of Global Competence. Despite the small size of the sample and the complexity of evaluating this competence, this study contributes to educational innovation by presenting didactic telecollaborative proposals and a theoretical framework for the integration and appraisal of Global Competence in (future) educators.

Keywords: Global Competence, SDG, Educational Technology, Telecollaboration, CLIL Teacher training

Resumen

La competencia global definirá el aprendizaje de las décadas venideras ya que comprende destrezas básicas para la vida y, sin embargo, se ha detectado escasa investigación sobre su valoración e integración en la formación del profesorado con tecnología educativa. Este proyecto tenía, por tanto, un doble propósito. Por una parte, explorar la competencia global de futuros docentes bilingües, tarea acometida a través del desarrollo de Objetivos de Desarrollo Sostenible (ODS) siguiendo un enfoque de aprendizaje integrado de contenidos y lenguas extranjeras (CLIL). El segundo era determinar métodos óptimos para la mejora e integración de esta necesaria competencia en el currículo. El proyecto se desarrolló con la colaboración de profesores en formación y en servicio matriculados en diversos programas de máster de dos universidades europeas en España y Bélgica. La investigación se realizó siguiendo un diseño de pruebas tipo pre-test / post-test con variados instrumentos de evaluación basados en el marco de la competencia global de la OCDE (2018). Los análisis cuantitativos mostraron que al trabajar los ODS para enseñar contenidos en

diversas disciplinas con tecnología educativa, los participantes en el estudio mejoraron en varios dominios de la Competencia Global (adaptabilidad, apertura a la diversidad, toma de perspectiva), pero también disminuyeron en otras áreas (capacidad para interactuar en un mundo multicultural, respeto por otras culturas, capacidad para adoptar otra cultura). Tras la investigación cualitativa se concluye que, entre los principales métodos de enseñanza-aprendizaje revisados, la telecolaboración contribuye al desarrollo de acciones que permiten optimizar al menos cinco dimensiones de la Competencia Global. A pesar del reducido tamaño de la muestra y la complejidad que supone evaluar la competencia global, se espera que este estudio contribuya a la innovación educativa al presentar propuestas didácticas con herramientas telecolaborativas y un marco teórico para la evaluación y mejora de la Competencia Global del (futuro) profesorado.

Palabras clave: Competencia Global, ODS, Tecnología Educativa, Telecolaboración, Formación docente CLIL

1. Introduction

There is a need to promote the Global Competence of the new generations ~~in order~~ to enhance their capacity to contribute as social citizens in multicultural backgrounds (NAFSA, OECD, UNESCO) and telecollaboration can contribute to our interconnected world (Fox, 2019). Global Competence has been acknowledged as one of the most relevant learning outcomes and school instructors are crucial in this task. However, attempts to design pedagogical interventions which integrate the Global Competence and the related SDG in higher education with digital tools following a specific approach is still limited. Despite there is literature that revises the methods and theories to teach sustainability (i.e., Mindt & Rieckman, 2017) and authors who have centred their studies on developing key competences for sustainable development in tertiary schools (i.e. Barth, Godemann, Rieckmann, & Stoltenberg, 2007), researchers have focused mostly on promoting Global Competence in teacher education on specific domains such as social justice (Schwarzer & Bridglall, 2015) or intercultural competence (Cushner & Mahon 2009).

Policies and academia note that Global Competence is one of the most relevant learning outcomes and, therefore, a recent macro study has attempted to assess this competence in several countries: PISA (OECD, 2018b). We agree with Li (2013), that there are numerous studies on multicultural and global education and that these have been mainly addressed as “intercultural competence”, “global mindset” or “global citizenship”. However, there is scarce research on the assessment of the Global Competence in teacher training and attempts for instructional proposals to promote it among student teachers is still limited. Some questions that remain unanswered relate to the measurement and effectiveness of pre-service teachers functioning in a global environment and curriculum design for the enhancement of their Global Competence (Fantini, 2009). Current accounts about teaching Global Competence come from grey literature, namely comprehensive OECD records (2018, 2019) and reports related to education for Global Competence (ie. Barker, 2000), or experimental studies on cultivating students’ Global Competence in Business studies (Li, 2013). No current empirical research has been found on the systematic development of the Global Competence with technology nor, specifically, with collaborative technology that might help teacher education in case of mobility constraints.

Thus, this study documents a pedagogical research carried out in higher education which evidences that we can improve teacher education in Global Competence by facilitating specific socio-cultural telecollaboration schemes.

2. Literature review

This theoretical framework is based on a search for relevant current literature related to the main five concepts revised in this study (“Global Competence”, “SDG”, “Educational Technology”, “Telecollaboration”, “CLIL Teacher training” in three significant databases: Scopus, Web of Science and Google Scholar.

2.1 Global Competence and SDG in teacher training

In an attempt to help understand the concept of teacher Global Competence from previous research (i.e., Deardorff, 2009), PISA has recently defined the Global Competence as a proposal within the OECD strategy "The Future of Education and Skills OECD Education 2030 Framework". In this strategy, education is oriented both to basic life skills and to different forms of knowledge, attitudes and dispositions. Global Competence is understood as "the ability to analyse global and intercultural issues, assess different perspectives from respect for human rights, to interact with people from different cultures, take action for the common good and sustainable development" (OECD, 2018a). This competence involves the development of numerous skills, including information analysis, communicative ability in intercultural contexts, perspective taking, the ability to resolve conflicts and the ability to adapt. Many of the global sub-competences are interwoven and extended with those that are necessary to exercise responsible citizenship, in which global competence is considered a model factor (Morais & Ogden, 2011). In this way, global education would become the new citizen education of the 21st century. This new area constitutes a new approach that complements the recommended key competences for lifelong learning (CE, 2018), mainly civic competence, in order to develop a global and intercultural perspective in education (Boix Mansilla & Jackson, 2011; UNESCO, 2016). The OECD (2019) explains the need for this new competence due to the current circumstances of globalization and the necessity to develop specific skills that allow us to live in harmony in multicultural communities, prosper in an unstable labour market, effectively and responsibly and, above all, support sustainable world development. At this point, the OECD relies on the sustainable development goals (SDG), considered by the UN as “main thematic priorities between different targets and Global Competence Domains to introduce global issues and understand the interconnection among its different dimensions” (2018). As stated by the UN, “the SDG present the scheme to achieve a better and more sustainable future addressing different global interconnected challenges such as those related to poverty, inequality, climate change, environmental degradation, peace and justice” and urge to meet these common targets by 2030.

The Global Competence and the SDG represent a new conception that complements the development of the key competences recommended by the CE (2018) for lifelong learning in order to develop an intercultural perspective. Some authors (Barrett, Byram, Lázár, Mompoin-Gaillard, & Philippou, 2014; Deardorff, (2019), suggest that these competences and goals should be integrated into the curriculum as an ongoing process to nurture a global consciousness (Mansilla & Gardner, 2007). Education plays a crucial role in the development of the Global

Competence (OECD, 2019), and instructors can contribute by providing realistic tasks and views of current issues to develop critical and cultural awareness with diverse mechanisms. As revised by Vinagre Laranjeira (2015) and O'Dowd (2020), telecollaboration can help students get involved in experiences that facilitate intercultural interactions, thus enhancing the value of diversity. We also agree with Tondeur, Siddiq, Scherer, & van Braak (2016) that technology can be incorporated in the curriculum not only to teach competences through the contents, but also to promote authenticity in teacher training (Ioannou & Ioannou, 2020) and develop teachers' pedagogical knowledge (Bueno-Alastuey & Garcia-Esteban, 2016) following Koelher & Mishra (2009). They suggested that technology should be intersect with pedagogical content knowledge as proposed in their TPACK model so that the competences that student teachers gain do not remain isolated and unexploited (Polly, Mims, Shepherd, & Inan, 2010).

This research aims to provide empirical evidence and facilitate the integration of Global Competence by developing content through SDG assisted by collaborative educational technology in multilingual higher education contexts. This implies addressing the potential of TPACK as an appropriate approach to communicative, cognitive and intercultural teaching with technology. It also aims to provide guidance on possible educational interventions and guidelines that, with the help of adequate technological support, will promote the development of Global Competence. This can be achieved following specific teaching and learning approaches such as the ones revised by Mindt & Rieckmann (2017).

2.2. Teaching the Global Competence with Educational Technology and telecollaboration

Higher education should facilitate the development of the necessary skills (Brun & Hinostroza, 2014) and many studies have focussed on the approaches needed to develop the competences of student teachers (Chien, Chang, Yeh, & Chang 2012). Teacher training organisations are responsible to educate future instructors to incorporate technology adequately in education at all levels using different strategies (Kay, 2006). For this purpose, teacher trainers are adopting different procedures to re-shape their curriculum integrating technology with supportive pedagogies across diverse subjects through reflective teaching (Lee & Lee, 2014). However, developing student teachers' competences with educational technology in formal interdisciplinary contexts is a complicated undertaking that implies the use of effective strategies such as the ones revised by Tondeur (2018). According to this author, higher education institutions should facilitate teaching with technology following common principles as "learning events, designing and developing learning experiences and assessments fit for the digital age, modelling 21st-century learning, promoting digital citizenship or engaging in ongoing professional development and leadership of technology use" (Tondeur, 2016). As suggested by Polly, Mims, Shepherd & Inan, (2010), there are many procedures to teach how to integrate technology in teacher training. This involves training in authentic teaching situations with practical workshops and case studies to develop students' skills, carry out field experiences or promote reflection on the use of technology with telecollaboration.

Optimal integration of technology in teacher training requires, therefore, the combination of different approaches (Mouza, Karchmer, Nandakumar, Ozden, & Hu, 2014) that permit the integration of contents and collaborative technology (Chien, Chang, Yeh, & Chang, 2012), thus transforming teachers into active designers (Tondeur, 2018). According to these authors, there are key premises for the appropriate integration of technology in teacher training

programmes. These relate to teacher education at an institutional level (i.e., ICT planning, institutional collaboration, further instruction, etc.) and at micro-level. At this level it should be stressed the use of teacher educators as role models for professional development (Chien, Chang, Yeh, & Chang, 2012), the role of telecollaboration for the development of skills and competences (Vinagre, 2017), reflection on learning (Garcia-Esteban, Villarreal, Bueno-Alastuey, 2019), re-designing curriculum materials (Lee & Lee, 2014); the design of technology-supported tasks and activities (Polly et al., 2010); applying educational technology in authentic settings and teacher and peer feedback (Tondeur et al., 2016). According to these authors, these strategies have been acknowledged as innovative motivators for future technology integration and have been considered key to expanding student teachers' competences with educational technology provided that contents are developed in a co-constructive way (Colpaert, 2014).

Despite the difficulties for the implementation of a unique instructional validated approach, specifically for teaching the Global Competence, research and empirical experience have confirmed the benefits of combining approaches using principled educational technology to enhance teaching (Mouza, Karchmer, Nandakumar, Ozden, & Hu, 2014). In this study, we will consider educational technology as a “wide flexible field and integrated process involving people, procedures, ideas, devices, and organizations for analysing problems, and devising, implementing, evaluating and managing the solutions involved in all aspects of human learning” (Januszewski, 2001).

This research examines data and instructional design proposals for learning and teaching the Global Competence through the SDGs in a CLIL context following an educational technology approach and online and digital exchanges or telecollaboration as described by Colpaert (2020). The revision will take into account different aspects such as: a) the methods and resources that can be used to teach, b) how to assure learning and teaching from theories, and c) the importance of aspects such as reflection and collaborative learning in teacher education.

2.3. Content and language integrated learning with technology. TPACK

Studies such as Bueno-Alastuey, Villarreal, & Garcia-Esteban, (2018) have tried to fill the gap in the literature that focuses on the integration of collaborative educational technology in content and language integrated learning (CLIL) and its impact on the development of student teachers' competences and skills. These authors suggest that the integration of technological resources such as telecollaboration in CLIL contexts contribute to the development of fundamental interpersonal, communicative and cognitive skills. These include critical thinking and analytical skills, creativity, teamwork, autonomy and problem-solving (2018, p.11). Developing these skills with telecollaboration can help increase the chances of employment and social inclusion and the transition to active citizenship (O'Dowd, 2020).

CLIL has been acknowledged to be useful to develop communication skills and content learning as well as cognitive and cultural awareness in appropriate learning environments. Since different topics including SDG can be covered following a soft or hard CLIL approach, both students and teachers need all kinds of technological resources for challenging collaborative content creation with concrete lines of action as the ones suggested by Perez Cañado (2018). We agree with de Graaff, Koopman and Westhoff (2007) that a CLIL instructor is expected to select and customize input materials so that they are instinctive, motivating and understandable

to students. In their opinion, an effective CLIL pedagogy can increase the acquisition of contents and the foreign language (FL) by facilitating the exposure and input of data and by processing meaningful information. These statements are fundamental constituents for effective content and language teaching and instructors should facilitate content processing by proposing specific tasks that involve students and that encourage the management of meaning. This can be done following a task based learning (TBL) approach with collaborative educational technology.

Due to the complexity of blending CLIL and technological knowledge to design effective lessons incorporating TPACK in subject-based courses (Bueno-Alastuey et al., 2018), this study follows these researchers call for further initiatives to use this model. As revised by them, prospective teachers can apply TPACK in their teaching with telecollaboration. This can be done following Koehler and Mishra's (2009) framework of pedagogical content knowledge (PCK) by incorporating technological knowledge (TK) within content knowledge (CK) and pedagogical knowledge (PK). Thus, this study is grounded on the adaptation of the diverse areas of the TPACK construct as an appropriate basis for the design of operative lesson plans following Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak (2013). According to these authors, some strategies and methods need to be incorporated in teacher education, and the TPACK model has proved to offer many opportunities such as the ones proposed by Bart, Lewis, O'Dowd, Rets and Rogaten (2020), which include collaborative design in teams for pre-service teacher development.

3. Methodology

This preliminary study was designed to analyse the effect that working SDG might have on the improvement of pre-service teachers' Global Competence. Two research questions were considered:

(RQ1) What areas of the Global Competence do the SDG help develop? and

(RQ2) What educational technology principles and methods facilitate the integration of the Global Competence in CLIL teaching training?.

Findings helped determine possible teaching-learning approaches and methodologies that could be used in future courses to improve the Global Competence domains where more development may be needed.

3.1. Research method and participants

The achievement of the research objectives implied following a methodological design such as the one proposed by Denzin (1970). The adoption of this methodology contributed not only to gathering different types of data but also various perspectives on similar outcomes which gave the possibility of a more complete understanding of the aspects assessed. In order to obtain the results, researchers triangulated: a) data using a variety of sources, b) several methods and c) the perceptions of pre-service teachers and in-service teachers from different areas. These included professionals working in higher education and vocational training.

Specifically, this research considered Masters' degree participants of Education and Social Sciences from two European Universities; one in Spain and the other one in Belgium. Most of them were bilingual females.

The participants from the Spanish university included 13 students from a Master's Degree in Teacher Training and 17 from a Masters' Degree in Teaching English as a Foreign Language. All these participants were pursuing an official TEFL certification and were studying a subject following the CLIL approach. The task for this group consisted of designing a CLIL lesson plan in English connecting subject contents (History, Literature, Maths, etc.) to a SDG (UN, 2018). The teaching activity was designed from experiences and academic studies on global education as described in Garcia-Esteban (2020).

The Master's Degree offered at the Belgian university was in Training and Education Sciences, which is a Master preparatory and bridging programme for employed students. In this study, researchers considered 18 participants enrolled in an ICT course who had active professional background in diverse areas and levels of education. The specific task for these in-service teachers consisted of redesigning the pre-service teachers' CLIL task with educational technology. This action involved: 1) a proposal for the integration of the SDG in a CLIL course with an optimal learning environment and 2) a justification of the methods suggested. The outcomes were analysed by the researchers of this study.

3.2. Instruments and data collection

Measuring the Global Competence resulted from a complex endeavour that required adopting diverse perspectives and approaches. To meet the objectives, this project incorporated qualitative and quantitative methods as proposed by Morse (1991). Following Tójar (2006), the qualitative study consisted of an exploratory descriptive analysis of the answers to the open-ended questions posed to the participants so that they could freely express their ideas. The investigators chose the survey because it allowed the student teachers to answer the questions easily as proposed by Rodríguez, Gil, & Garcia (1996). The quantitative method involved a test-retest process to detect possible variations.

The study was carried out in several phases along six months over the second term course. To collect data, researchers deployed a teacher questionnaire (also available online at OECD, 2018b), which was delivered through *encuestafacil.com* online survey tool. The written and oral interviews with the pre-service teachers were carried out through Blackboard institutional platform and via *JitsiMeet* open platform with the in-service teachers.

The first stage (pretest) involved dissemination of the online surveys to the pre-service teachers including face to face interviews to know their initial level of Global Competence. The second phase (post-test) involved gathering online data to know the participants' improvement after integrating the SDG assignment. In the third phase, in-service teachers presented their redesign proposal for future improvement with educational technology. Researchers analysed these data to generate an outline for the improvement of the less developed areas of student teachers' global competence.

Table 1.
Overview of data collection and analyses

Research Questions	Data Collection	Data Analyses
RQ1 What areas of the Global Competence do the SDGs help develop?	<p>Participants Pre-service teachers (n=30)</p> <p>Instruments Online survey, face to face written and oral interviews Online Teacher Questionnaire (OECD, 2018)</p> <p>Task Design of a CLIL lesson plan for the integration of SDG</p>	<p>Quantitative analyses Focused analyses to identify relationships between the SDG learning assignment and the global competence:</p> <p>Phase 1: Pre-test to know pre-service teachers' initial level of global competence</p> <p>Phase 2: Post-test to know pre-service teachers' improvement in global competence after integrating the SDG</p>
RQ2 What educational technology principles and methods facilitate the integration of the Global Competence in CLIL teaching training?	<p>Participants In-service teachers (n=18)</p> <p>Instruments Face to face, written and oral interviews consisting of a: a) Proposal for the integration of the SDG in a CLIL course with an optimal learning environment b) Justification of the method</p> <p>Task Redesign a course with educational technology</p>	<p>Phase 3: In-service teachers present their redesign proposal for future improvement with optimal learning environments</p> <p>Qualitative analyses Focused analyses of open response survey data to further explore:</p> <p>Relationships between the educational technology approaches revised and data collected from the employed student teachers</p> <p>Proposals for enhancing the Global Competence less developed areas with collaborative educational technology.</p>

4. Results and analysis

Data exploration in this study took place in two stages:

- Quantitative analyses of pre-service teachers' survey data to identify associations between the SDG learning assignment and global competence domains
- A qualitative examination of the open responses of in-service teachers to further explore relationships between the educational technology approaches revised and the data collected.

4.1. Quantitative analyses

In the first stage, researchers used a qualitative process to catalogue and classify the answers to obtain an overall perspective of the learning tasks concerning the competence domains. Participants' ideas were systematized by arranging them into substantive coding and selective coding based on Hinton (2019) and the Grounded Theory. The first method involved coding the data for meaning and summarising the pre-service teachers' ideas. Then, selective codes were formed following a deductive and inductive process. Codes were rationally combined based on academic studies and frameworks on global competence and the areas that deductively arose from the analysis of the data. The quantitative analyses identified 5 learning procedures with meaningful correlations with the global competences valued as efficient by the students. After the revision of the qualitative data, researchers carried out a focused examination to determine the association between the learning tasks and the global competence. This

exploration was used to support, refute and determine causal associations between the learning tasks and the global competences. The investigators incorporated instances from each activity.

Specifically, this analysis was carried out correlating participants' perceptions with OECD (2018) Global Competence construct and exploring which learning activities could be effective for promoting the different areas. Figure 1 presents the results before and after integrating SDG in the CLIL units. It illustrates the difference between the mean pretest scores and the mean posttest scores, thus showing the gain in global competence of the pre-service teachers. Results were standardized so that the relative scale had a meaningful interpretation.

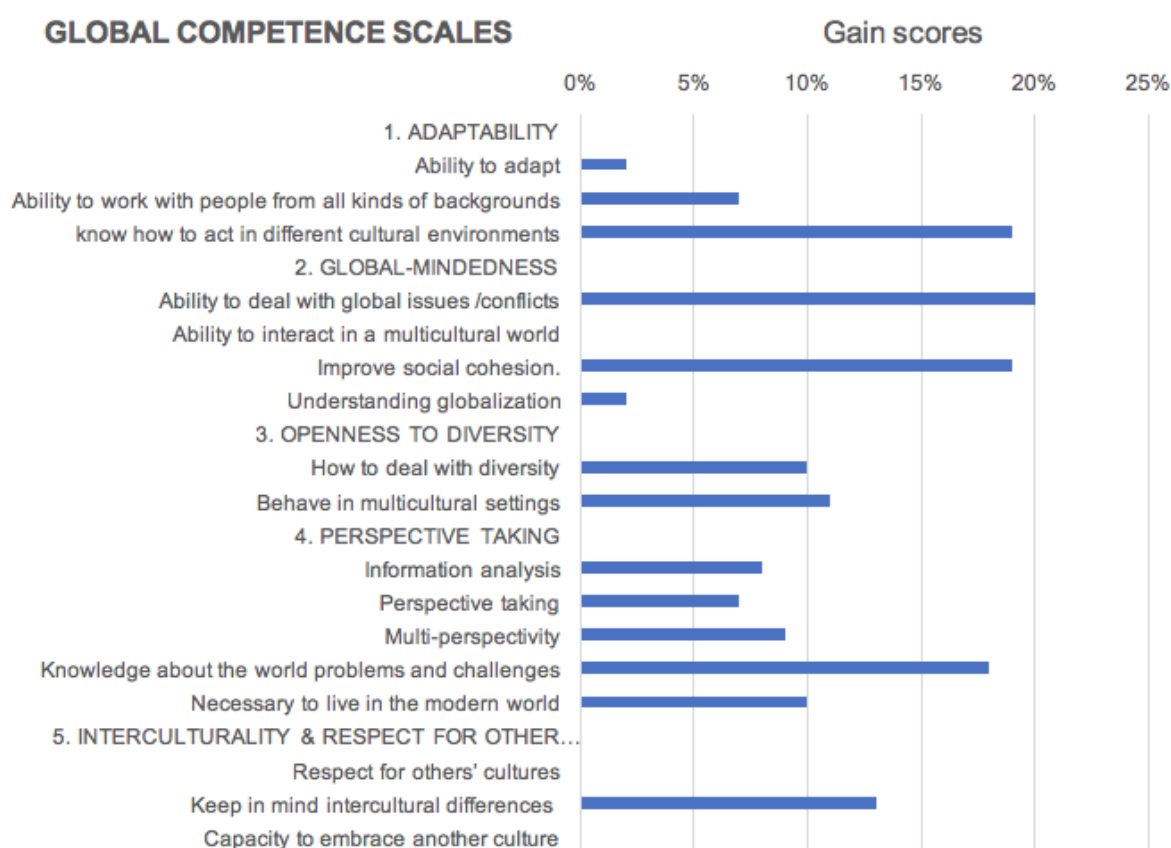


Figure 1. Pre-service teachers' perceptions of PISA global competences¹

Outcomes show that concerning the first scale, **adaptability**, the assignment proposed to develop pre-service teachers' Global Competence did not seem to increase much their ability to adapt (2%), but helped to develop their capability to work with people from all kinds of backgrounds (7%) and, to a greater extent, to know how to act in different cultural environments (19%). Designing TEFL lesson plans to raise awareness of the SDG also contributed to increasing **global mindedness**. Additionally, the ability to deal with global issues or conflicts increased (20%), as well as the recognition of a need for improvement of social cohesion (19%). However, the pre-service teachers showed a lack of interaction with the multicultural world

¹ This study is based on the depiction of 5 of the 11 PISA Global Competences following Hinton (2019:6).

(0%). Participants did not seem to enhance their understanding of globalization much (2%). Regarding **openness to diversity**, the task did not seem to teach how to deal with diversity and the score was null though it seemed significant to improve the behaviour in multicultural settings (10%). Considering perspective taking, despite pre-service teachers did not consider this domain necessary to live in the modern world and the score did not vary from the initial value (10%), the SDG task helped participants to increase (18%) their knowledge about the world problems and challenges, and, to a certain extent, to help analyse information (8%) on different issues with multiple perspectives (9%). Despite the participants' gain in awareness of intercultural differences (13%), negative scores were associated with **interculturality**, explicitly respect for others' cultures (0%) or the capacity to embrace another **culture** (0%).

4.2. Focused qualitative analysis

In the second stage of the study, researchers aimed to answer the second research question, which consisted of finding out which educational technology principles and methods might facilitate the integration of the Global Competence in multimodal teaching. This involved examining the in-service teachers' proposals.

Table 2 explains the correlation of the teaching-learning principles for global and sustainable competence development according to the participants' instructional design task and the literature review. The table below outlines the core learning environments named and justified by the participants, which the researchers examined and related to current approaches, specifically to Mindt & Rieckmann's (2017) teaching-learning principles. The participants' statements have been transcribed in italics.

Table 2.
Teaching-learning approaches to integrate the SDG

Teaching-learning principles	Proposals for the development of the Global Competence working SDG
Reflective learning	I.e., Through <i>critical thinking</i> . Teaching involves knowing the methodology, tasks and procedures and reflecting on learning to reach a deeper level of understanding. This can be accomplished with <i>peer feedback</i> (Dinkelman, 2003). Instances for the development of the SDG <i>Promote reflection on the process and proposals for improvement in a class forum</i> <i>Include rubrics with tools (i.e. Comproved app for comparative judgement) integrated into academic platforms</i> <i>Facilitate online exchange of information between students and other external institutions</i> <i>Develop extracurricular activities; i.e., telecollaboration with NGOs or charities for the development of the SDG</i>
Collaborative learning	I.e., Through <i>Virtual Collaboration or International Connectivity</i> . Teaching and learning involve not only an individual but also a collaborative process (Kaymakamoğlu, 2019) which can be enhanced with virtual collaboration (Bueno-Alastuey et al., 2016, 2018; Garcia- Esteban et al., 2019). Group

	<p>virtual collaboration is considered an appropriate resource since: a) foreign language improves naturally with the international connection, b) it provides a real learning environment that favours change for sustainable behaviour, c) it can promote cultural exchange and awareness of the Global Competence.</p> <p>Learning environment instances for the development of the SDG</p> <p><i>In virtual collaboration with other institutions in order to carry out joint tasks related to the SDG to discuss teaching strategies and methods through the development of case studies on local problems, etc.</i></p>
<p>Transformative learning</p>	<p>I.e., Through Mezirow's (2009) <i>Transformative Learning (TL)</i> teachers can challenge the thinking process of the students. TL focuses on three dimensions: psychological (changes in own understanding), conviction (revision of one's own beliefs) and behaviour (changes in lifestyle).</p> <p>Instances for the development of the SDG</p> <p><i>Using disorienting dilemmas related to the SDG which involve students think critically about their underlying assumptions and beliefs.</i></p> <p><i>An example to reach TL is to collaborate online in the FL with reception centres for asylum seekers to confront students with the daily reality</i></p>
<p>Experiential learning</p>	<p>I.e., Through Microteaching. This approach offers the possibility to experiment and can be implemented through class presentations following Kolb's (1984) <i>experimental learning theory</i>.</p> <p>Instances for the development of the SDG</p> <p><i>Giving students the opportunity to experience with their classmates: 1) teaching the SDGs, 2) learning about their own teaching strategy and 3) practicing teaching subject contents in a foreign language</i></p>
<p>Task based learning</p>	<p>I.e., In Multilingual / Intercultural contexts. <i>Task based learning (TBL)</i> may contribute to the integration of the SDG in Foreign language teaching in an implicit way by working together with students from other cultures.</p> <p>Instances for the development of the SDG</p> <p><i>Making short videos related to sustainability in collaboration with other institutions</i></p>
<p>Learner-centred learning</p>	<p>I.e., Through student-centred teaching methods including the creation of <i>Personal Learning Environments and Collaborative Learning</i> (Weimer, 2002). Assessment is part of this learning process.</p> <p>Instances for the development of the SDG</p> <p><i>Using rubrics, the e-portfolio and other ICT tools (i.e., Comproved, FINAO, Enducurious, etc.) in the form of:</i></p>

	<p>a) <i>Summative evaluation by the teacher, in pairs or groups. An example could be a collaborative final presentation that would ensure the dissemination of SDG.</i></p> <p>b) <i>Peer evaluation with digital tools that allow projects to be digitally evaluated in distance learning environments. An example would be publishing the final projects online (ex. in a padlet or blob, etc.) for external appraisal.</i></p>
Active learning	<p>I.e., <i>Motivation through Personalization</i>. Active learning stimulates learning, thus enhancing students' motivation. This can be promoted by following the approach of self-determination or personalization by fostering self-interest and the identification of preferences, etc. Intrinsic motivation is born in the individual himself (<i>McGregor, 2000</i>).</p> <p>Instances for the development of the SDG</p> <p><i>Enhancing active learning through motivation and allowing students to choose the objectives of their interest following a specific taxonomy. Facilitating and using applications chosen by the students themselves (i.e Xerte, Kahoot, etc.)</i></p>
Problem-based learning	<p>I.e., <i>Through PBL in which the teacher poses a series of questions, dilemmas or challenges</i> following a methodological design and programmed strategies that involve the completion of a set of tasks. This involves research, a creative process and a higher level of involvement and cooperation among students culminating in a final product presented to others for dissemination.</p> <p>Instances for the development of the SDG</p> <p><i>Carrying out "real" case studies about online news related to sustainability.</i></p>
Transdisciplinary learning	<p>I.e., <i>Through the examination of an issue from different perspectives and areas in order to acquire knowledge and a deeper understanding with real-life experiences (Jantsch, 1972)</i>. This approach offers a vision linked to the socio-cultural reality of people.</p> <p>Instances for the development of the SDG</p> <p><i>SDG can be worked from various disciplines (eg History and Literature) dealing with a common theme (i.e., Gender Equality), carrying out extramural activities and working with other educational institutions or associated universities through telecollaboration.</i></p>
Interdisciplinary learning	<p>I.e., <i>Through the construction of new knowledge and the integration of various perspectives, disciplines, theories and methods</i>. The knowledge gained through the explanation and solution of common problems can be reflected in a specific discipline. <i>Interdisciplinarity</i>, thus, becomes a means for <i>self-reflection</i> in the corresponding discipline (<i>Barth et al., 2007</i>).</p> <p>Instances for the development of the SDG</p>

<i>The SDGs could be developed with collaborative didactic projects such as the creation of didactic multimedia i.e., short videos or films to explain contents.</i>
--

5. Discussion

The following lines try to rationalize and answer the research questions of the study:

5.1 Educational technology that facilitates the integration of the Global Competence

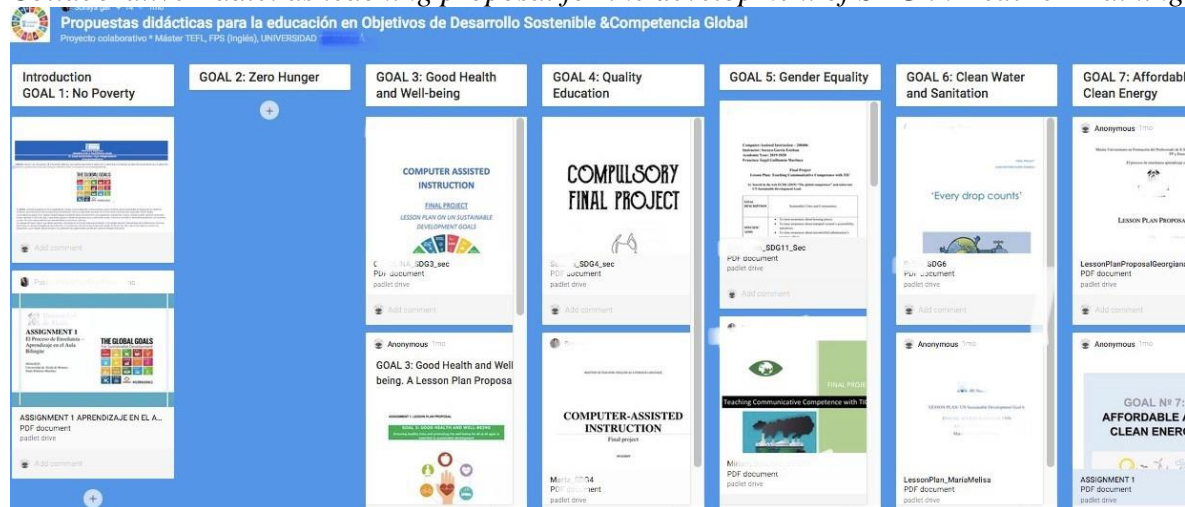
Table 2 describes how learning should be facilitated so as to develop the SDG with diverse teaching and learning strategies following Mindt & Rieckmann's (2017) principles. These educational methods can be adapted to different course programs or teaching approaches with telecollaboration. Namely, the proposals for the integration of the SDG with educational technology suggested by the participants of this research seem to corroborate that the combination of different approaches allow teacher educators to integrate collaborative educational technology for Global Competence development as previously revised by Chien et al., (2012), thus helping transform educators into active designers (Tondeur, 2018).

Founded on the bibliography consulted (Mouza et al., 2014) and the data gathered in the surveys, TPACK model can be considered as a useful model for educators who intend to use support digital tools and strategies to formal CLIL teaching and learning. This model was designed around the idea that content (what is taught: i.e., Global Competence) and pedagogy (how it is taught; use of the most appropriate approaches) should be the foundation for the integration of any educational technology that helps improve language learning and communication. These views are presented in Figures 2, 3 and 4, which illustrate how to teach content integrating the SDG following Koehler & Mishra's (2009) TPACK construct (TCK, PCK and TPK) taking into account the learning environments and approaches reviewed in table 2.

TCK conveys the knowledge of using technology for teaching content. CLIL instruction can be taught incorporating social media, multimedia and audio-visuales about themes related to the SDG for the development of topics with **TBL** or **transdisciplinary learning**. Integrating technological tools such as videos or digital animation would enhance **interdisciplinary learning** by proposing learners from different disciplines not only select and discuss subjects from different perspectives, but also to improve their FL use when editing the movies or images to be presented. Further technological resources that allow teaching contents and evaluate them collaboratively following an **active learning and learner-centred approach** can be, for instance, Prezi, Storymaker or Padlet. Figure 2 illustrates a sample for TCK: Technological Content Knowledge.

Figure 2.

Collaborative Padlet as teaching proposal for the development of SDG in Teacher Training

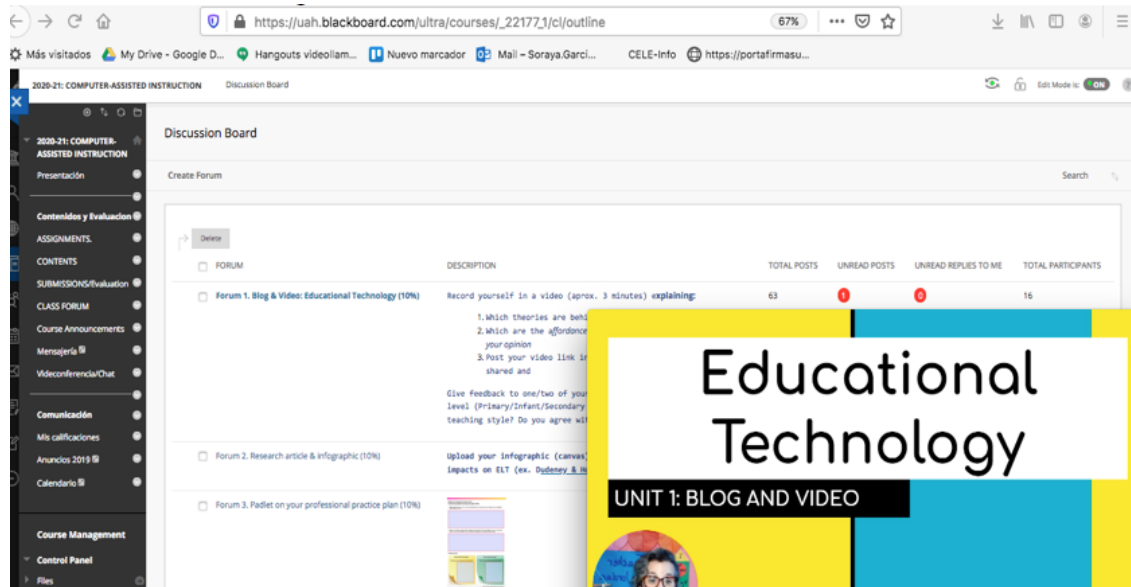


Source: <https://padlet.com>

PCK denotes the specialized knowledge transferred from educators in the classroom. Following this idea, the SDG can be transmitted integrating them into subject contents with effective teaching approaches such as **Transformative Learning** to ensure reflective, constructive, and significant learning. Proposing disorientation dilemmas and discussions related to the SDG through **PBL** to convey students' **experiential learning** with telecollaborative tools (ie. Forums or Chats) in various learning platforms (Blackboard, Teams, etc.). Figure 3 illustrates a sample for PCK: Pedagogical content knowledge.

Figure 3.

Forum and video to share contents on Blackboard.



Source: Blackboard institutional platform

TPK refers to a transformation in education with the particular use of technology. Educational Technology should be used to integrate the Global Competence with different pedagogical

strategies which enhance **reflective learning**. Following this approach, the SDG can be worked online, thus promoting **collaborative learning through different** oral or writing tasks, using writing assistants or online dictionaries, sharing texts, evaluating collaboratively with tools such as *Comproved*, or conducting online tutorials and discussions to mention a few. All these functionalities could be available in a single virtual platform such as the one projected in figure 4, which illustrates a sample of TPK: Technological Pedagogical Knowledge.

Figure 4.
Virtual platform design proposal



Source: A. Fontana and J. Verboven

The proposed teaching-learning strategies seem to support students' development in Global Competence. All of them could be carried out with telecollaboration following CLIL and TPACK framework as sharing, adapting and reusing content helps increase the didactic quality and self-efficacy (Author 2, 2012, 2019).

5.2 Global Competence domains developed with SDG in teacher training

Findings have revealed that proposing CLIL pre-service teachers to incorporate the SDG with educational technology when creating lesson plans to teach the specific contents of a particular subject (Literature, PE, Science, etc.) can enhance their Global Competence as “the OECD relies on the 17 sustainable development goals, which can be recognized as main thematic priorities between different targets and Global Competence Domains. Through deductive experiential learning, it is possible to introduce global issues and understand the interconnection among its different dimensions” (CE, 2019). From the 5 scales evaluated, the average did not score over 10% in Global Competence development and there were 3 sub-areas that did not seem to improve. The lines below describe how these domains can be further developed with telecollaboration following the instructional pre-service teachers' reflective proposals.

Concerning adaptability, student scores did not vary significantly except for the knowledge on how to act in different cultural environments. A possible explanation for this is that working SDG requires the revision of different contexts worldwide. Notwithstanding, subdomains which imply the “ability to adapt one’s thinking and behaviors to the prevailing cultural environment, or to novel situations and contexts that might present new demands or challenges” (OECD 2018:15) could be further developed through transformative learning with disorienting dilemmas which involve “critical self-reflection and the reformulation of a meaning perspective to allow a more inclusive, discriminating, and integrative understanding of one’s experience” (Mezirow, 2009). This scale could also be enhanced through student-centred teaching methods including the creation of Personal Learning Environments in collaborative virtual presentations following Weimer (2002).

As defined by the OECD, “Globally-minded individuals exercise critical awareness and are open to reflecting on and changing their vision as they learn about different perspectives” (2018:17). This pre-service teacher competence could be enhanced following Jantsch’s (1972) transdisciplinary learning approach with extramural multimedia tasks that facilitate the exchange of viewpoints in the foreign language and promote reflection on the process with proposals for improvement following Dinkelman’s (2003) reflective learning.

Openness to Diversity is understood as an “active willingness to seek out and embrace opportunities to engage with people from other cultural backgrounds, to discover and learn about their cultural perspectives and to learn about their linguistic and behavioral conventions” (OECD, 2018a:17). Exploring global concerns taking into account different perspectives in a cooperative forum, not only permits to inform about other values and cultures’ viewpoints, but also promotes the ability to solve problems (Hinton et al., 2019:42) following collaborative learning and Godemann’s (2007) interdisciplinary learning approach.

Perspective Taking denotes “the cognitive and social skills individuals need in order to understand how other people think and feel” (OECD, 2018a:15). Following Kolbs’ (1984) experiential learning, pre-service teachers could carry out online microteaching, presentations or simulations followed by reflective discussions. This sort of TBL and PBL activities increase the opportunity to discuss pedagogical, cultural and social issues for diversity speaking - and thus, improving- the foreign language.

Concerning the less developed competences, one of the negative perceptions detected was the lack of **interaction in a multicultural world**, which is considered a fundamental dimension of the Global Competence as it allows to “engage effective and open exchanges” (OECD, 2018a:26). This area could be improved by redesigning assignments to introduce some tasks which would involve working with real external institutions following a collaborative TFL approach for transformative and transdisciplinary learning (Mezirow, 2009; Jantsch, 1972). The Global Competence area concerning respect for others’ cultures did not seem to improve either. This framework in which “respect assumes the dignity of all human beings and their inalienable right to choose their own affiliations, beliefs, opinions or practices” (OECD, 2018a: 16) could be enhanced by redesigning the course in order to introduce cooperative tasks which involve reflective learning. Extracurricular tasks with international organizations such as collaborating with NGOs or charities would enable the exchange of experiential information to enhance “the principle of human dignity” (OCDE, 2018a). Active learning activities based on “self-determination by fostering self-interest and the identification of preferences”, as described by McGregor (2000), would also help develop this domain. In this line, the capacity to embrace another culture could be enhanced carrying out telecollaboration tasks with other institutions,

following Kaymakamoğlu (2019), and considering that “respect consists of positive regard for someone or something based on the judgment that they have intrinsic worth” (OECD, 2018a:16).

6. Conclusions

The lines below describe some conclusions derived from the initial research objectives.

Concerning the development of the Global Competence with optimal educational technology, this paper has revised current methods and proposed approaches for the effective incorporation of the SDG. Based on our study, three key outcomes can be advocated. The first one suggests that collaborative educational technology can be considered as an appropriate strategy to develop Global Competence following principled teaching. The second finding supports CLIL as an interdisciplinary approach for the appropriate integration of the SDG following the TPACK construct, which contributes to the introduction of this model for Global Competence development. The last outcome highlights the use of telecollaboration with external multicultural organizations to increase transdisciplinary and reflective content and language integrated learning.

Regarding the improvement of the less developed domains of Global Competence, researchers projected ten principles to teach specific contents which can help improve the less developed areas of this competence with educational technology. Findings suggest that integrating the SDG with collaborative methods can improve certain global competences. Specifically, it can enhance personalized teaching, foreign language learning and critical and high-level thinking. This contributes to the development of students’ 21st-century skills, thus leading to a greater insight into one’s own cultural and global issues, norms and values. These teaching models can be taught and adapted to various learning environments following the TPACK construct.

To foster the less developed global competences and avoid possible conflicts such as mobility constraints, telecollaboration seem an optimal approach to develop TBL and PBL active learning to upgrade citizenship, which has been considered a supra-factor of the global competence. This can be carried out in cooperation with external organizations and facilitating reflective evaluation with motivational educational technology. Furthermore, working on the proposal of a final CLIL task with collaborative educational technology for the integration of the SDG following the TPACK construct seems beneficial to foster knowledge on the fundamental aspects of Global Competence. Data suggest that these types of telecollaborative models not only involve gathering data, learning contents, and investigating underlying approaches; they also imply reflection on the optimal integration of pedagogy with technology.

This paper intended to explore the global competences of a reduced sample of European student teachers in order to identify where improvement is needed and revised methods for continuous development. However, measuring the Global Competence is a complex task and further experiential cohesive tests at a macro level and with other groups or samples are needed to be able to assess in detail each of the sub-competences in relation to the curricular contents. Notwithstanding, throughout this project, (future) instructors have learnt not only the significance and applicability of the SDG, but also about five domains of their own Global Competence, which we expect will help to qualify citizens for a more sustainable world. Following Colpaert (2020), further work will concentrate on the need for collaborative Open

Data for the elaboration of educational materials, thus contributing to the integration and development of the Global Competence in the curriculum.

Received: September 6, 2021

Accepted: December 20, 2021

Published: January 30, 2022

Garcia-Esteban, S., & Colpaert, J. (2021). Integrating the Global Competence with Telecollaboration in CLIL Teacher Training. *RED. Revista Educación a Distancia*, 21(68). <http://dx.doi.org/10.6018/red.491281>

Funding

This project was funded by the Spanish Ministry of Science, Innovation and Universities (Ref. CAS19/00017).

References

- Barker, C. M. (2000). *Education for International Understanding and Global Competence*, NY: Carnegie Corporation.
- Barrett, M., Byram, I., Lázár, P., Mompoin, G. & Philippou S. (2014), *Developing Intercultural Competence through Education*, Strassbourg: Council of Europe Publishing
- Bart R., Lewis T., O'Dowd, R., Rets I., & Rogaten, J. (2020). The impact of virtual exchange on TPACK and foreign language competence: reviewing a large-scale implementation across 23 virtual exchanges, *Computer Assisted Language Learning*. <https://doi.org/10.1080/09588221.2020.1737546>.
- Barth, M., Godemann, J.; Rieckmann, M., & Stoltenberg, U. (2007) Developing key competences for sustainable development in higher education. *International Journal of Sustainability in Higher Education*, 8 (4), 416-430. <https://doi.org/10.1108/14676370710823582>.
- Brun, M., & Hinostroza, J.E. (2014). Learning to become a teacher in the 21st century: ICT integration in Initial Teacher Education in Chile. *Educational Technology and Society*, 17, 222–238.
- Bueno-Alastuey, C. & Garcia-Esteban, S. (2016). Telecollaboration to improve CLIL and TPACK Knowledge: aid or hindrance?, *Estudios Sobre Educación Journal (ESE)*. Vol.31., págs.117-138. DOI: <https://doi.org/10.15581/004.31.117-138>.
- Bueno-Alastuey, C, Villarreal, I. & Garcia-Esteban, S. (2018). Can telecollaboration contribute to the TPACK development of pre-service teachers?, *Technology, Pedagogy and Education*, 27 (3), 367-380. DOI: 10.1080/1475939X.2018.1471000.

- Chien, Y., Chang, C., Yeh, T., & Chang, K. (2012). Engaging pre-service science teachers to act as active designers of technology integration: AMAGDAIRE framework. *Teaching and Teacher Education*, 28, 578–588.
- Colpaert, J. (2014). "10 Conclusion. Reflections on Present and Future: towards an Ontological Approach to LMOOCs". *Language MOOCs*, ed. Elena Martín Monje and Elena Bárcena Madera, Warsaw, Poland: De Gruyter Open Poland, 2014, pp. 161-172. <https://doi.org/10.2478/9783110420067.10>
- Colpaert, J. (2020). Editorial position paper: how virtual is your research?, *Computer Assisted Language Learning*, 33:7, 653-664, DOI: 10.1080/09588221.2020.1824059
- Cushner, K., & Mahon, J. (2009). Developing the intercultural competence of educators and their students: Creating the blueprints. In D. Deardorff (Ed.), *The SAGE handbook of intercultural competence* (pp. 304–320). Thousand Oaks, CA: SAGE.
- De Graaff, R., Koopman, J.G., & Westhoff, G. (2007). Identifying Effective L2 Pedagogy in Content and Language Integrated Learning (CLIL). *Vienna English Working Papers*, 16(3), 12-19
- Deardorff, D. K. (2019), *UNESCO Manual on Developing Intercultural Competence Based on Human Rights*. Paris: UNESCO.
- Denzin, N.K. (1970). *Sociological Methods: a Source Book*. Aldine Publishing Company: Chicago.
- Dinkelman, T. (2003). Self-study in teacher education: A means and ends tool for promoting reflective teaching, *Journal of teacher education*, 54(1), 6-18.
- Fantini A.E. (1997). *New ways in Teaching Culture*. Alexandria, VA: TESOL.
- Fox, E. (2019). Mobile Technology: A Tool to Increase Global Competency among Higher Education Students. *International Review of Research in Open and Distributed Learning*, 20(2), 242–259. <https://eric.ed.gov/?id=EJ1214368#>.
- García-Esteban, S. (2020). Telecollaboration for Civic Competence and SDG Development in FL Teacher Education. *European Journal of Education* 3 (3), 51-61. ISSN 2601-8624.
- García Esteban, S., Villarreal, I. Bueno-Alastuey, M.C. (2019). The effect of telecollaboration in the development of the learning to learn competence in CLIL teacher training. *Interactive Learning Environments*, 27 (5-6). DOI: 10.1080/10494820.2019.1614960
- Hinton, C. coord. (2019). Developing Students' Global Competence – An International Research Study. *Round Square*. <https://www.roundsquare.org/wp-content/uploads/2019/11/RS-RSI-Global-Competence-Report-13,11-19>.
- Ioannou, M., & Ioannou, A. (2020). Technology-enhanced Embodied Learning: Designing and Evaluating a New Classroom Experience. *Educational Technology & Society*, 23 (3), 81–94

- Jantsch, E. (1972). Interdisciplinary and transdisciplinary university. Systems approach to education and innovation. *Higher Education*, 1(1), 7-37.
- Januszewski, (2001). *Educational technology: The development of a concept*. Englewood, CO: Libraries Unlimited.
- Kay, R.H. (2006). Evaluating strategies used to incorporate technology into preservice education: A review of the literature. *Journal of Research on Technology in Education*, 38, 383-408.
- Kaymakamoğlu, E. S. (2019). In search of developing practical knowledge in pre-service EFL teachers: A proposed model. *Journal of Language and Linguistic Studies*, 15(3), 1000-1010. <https://doi.org/10.17263/jlls.631543>.
- Koehler, M.J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9 (1), 60- 70.
- Lee, Y., & Lee, J. (2014). Enhancing pre-serviceteachers' self-efficacy beliefs for technology integration through lesson planning practice. *Computers and Education*, 73,121-128.
- Li, Y. (2013). Cultivating student global competence: A pilot experimental study. *Decision Sciences Journal of Innovative Education*, 11(1), 125-143.
- MacGregor, J.T. (1990). Collaborative learning: Shared inquiry as a process of reform. In Svinicki, M.D. (Ed.), *The changing face of college teaching*, New Directions for Teaching and Learning No. 42. San Francisco; USA, Jossey-Bass Publishing.
- Mansilla, V. B., & Gardner, H. (2007). From teaching globalisation to nurturing global consciousness. In M. M. Suárez-Orozco, and C. Sattin (Ed.), *Learning in the global era: International perspectives on globalisation and education*. CA: University of California Press.
- Mansilla, V. B., & Jackson, A., (2011). *Educating for global competence: Preparing our youth to engage the world*. New York.
- Mezirow, J. (2009). Transformative learning theory. In J. Mezirow, and E. W. Taylor (Eds), *Transformative Learning in Practise: Insights from Community Workplace, and Higher Education (pp. 18-32)*. San Francisco, CA: Jossey Bass.
- Mindt, L., & Rieckman, M. (2017). Desarrollo de las competencias para el emprendimiento orientado a la sostenibilidad en la educación superior: una revisión bibliográfica de los métodos de enseñanza y aprendizaje. *Teoría De La Educación. Revista Interuniversitaria*, 29, 129-159. <https://doi.org/10.14201/teri.16702>.
- Morais, D.B., & Ogden A.C., (2011). Initial Development and Validation of the Global Citizenship Scale, *Journal of Studies in International Education* 15(5), 445-466. <https://doi.org/10.1177/1028315310375308>.

- Morse, J.M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing research*, 40(2), 120-123.
- Mouza, C., Karchmer Klein, R., Nandakumar, R., Ozden, S.Y., & Hu, L. (2014). Investigating the impact of an integrated approach to the development of preservice teachers' technological pedagogical content knowledge (TPACK). *Computers and Education*, 71, 206-221.
- O'Dowd, R. (2020). A transnational model of virtual exchange for global citizenship education. *Language Teaching*, 53(4), 477-490. <https://doi.org/10.1017/S0261444819000077>.
- OECD (2019). Assessment and Analytical Framework, *PISA*, *OECD Publishing*, <https://doi.org/10.1787/b25efab8>.
- OECD (2018a). Teaching for Global Competence in a Rapidly Changing World. *OECD / Asia Society Publishing*. <https://asiasociety.org/sites/default/files/inline-files/teaching-for-global-competence-in-a-rapidly-changing-world-edu.pdf>.
- OECD (2018b). Questions related to global competence. *PISA*, *OECD Publishing*, <https://www.oecd.org/pisa/PISA-2018-Global-Competence-Questionnaire.pdf>
- Perez Cañado, (2018). CLIL research in Europe: past, present, and future, *International Journal of Bilingual Education and Bilingualism*, 15(3), 315-341, <https://doi.org/10.1080/13670050.2011.630064>.
- Pérez Cañado, M.L., (2018). Innovations and Challenges in CLIL Teacher Training, *Theory Into Practice*, 57(3), 1-10. <https://doi.org/10.1080/00405841.2018.1492238>.
- Polly, D., Mims, C., Shepherd, C., & Inan, F. (2010). Evidence of impact: transforming teacher education with preparing tomorrow's teachers to teach with technology (PT3) grants. *Teaching and Teacher Education*, 26, 863-870.
- Rodríguez, G., Gil, J., y García, E. (1996). *Metodología de la investigación cualitativa*. Málaga: Aljibe.
- Schwarzer B. & Bridglal, L. (2015), *Promoting Global Competence and Social Justice in Teacher Education: Successes and Challenges Within Local and International Contexts*. NY: Lesington Books.
- Tójar, J.C. (2006). *Investigación cualitativa: comprender y actuar*. Madrid, España: La Muralla.
- Tondeur, J. (2018). Enhancing future teachers' competences for technology integration in education: Turning theory into practice. *Seminar.net*, 14(2), 216-224. <https://journals.hioa.no/index.php/seminar/article/view/2981>.
- Tondeur, J., Siddiq, F., Scherer, R., & van Braak, J. (2016). Time for a new approach to prepare future teachers for educational technology use: its meaning and measurement. *Computers and Education*, 94, 134-150.

UN (2018). Sustainable Development Goals. *Sustainable Development Knowledge Platform*, Division for Sustainable Development, Geneva: United Nations. <https://sustainabledevelopment.un.org/>

UNESCO (2016). *Global Education Monitoring Report*, Paris: UNESCO.

Vinagre Laranjeira, M. (2015). El desarrollo de la competencia intercultural en los intercambios telecolaborativos. *Revista de Educación a Distancia (RED)*, (41). Recuperado a partir de <https://revistas.um.es/red/article/view/236391>

Vinagre Laranjeira, M. (2017). Developing teachers' telecollaborative competences in online experiential learning. Special Issue: Innovation in Language Learning and Teaching. *System*, 64, 34-45. <https://doi.org/10.1016/j.system.2016.12.002>.

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge—a review of the literature. *Journal of Computer Assisted Learning*, 29(2), 109-121.