Article type

Full paper, double-blind peer review.

Publication history

Received: 21 June 2021. Revised: 21 September 2021.
Accepted: 22 September 2021. Online: 07 March 2021.

Cover image

fauxels
via Pexels.

Special issue Technology and educational ‘pivoting’ in the wake of the Covid-19 pandemic | **More at** <https://doi.org/10.21428/8c225f6e.0a9292af>

Student-centred learning in higher education in times of Covid-19: A critical analysis

Victoria I. Marín

Department of Pedagogy, University of Lleida, Lleida, Spain

Keywords

student-centred learning; higher education; Covid-19; course design; critical analysis; systematic review

Citation

Marín, V. I. (2022). Student-centred learning in higher education in times of Covid-19: A critical analysis. **Studies in Technology Enhanced Learning**, 2(2), 165-196.

<https://doi.org/10.21428/8c225f6e.be17c279>

Abstract

Student-centred learning is a pedagogical concept that has impregnated many of the discourses about teaching and learning in the last 10 years, as opposed to teacher-centred learning, and is considered core in higher education for adequately preparing lifelong learners. During the Covid-19 outbreak, teaching and learning in traditional higher education institutions shifted from face-to-face classes to online ones, and some educators tried innovative ways to deliver a student-driven education in these settings. Although there is an extensive literature on student-centred learning and online learning, the former has not been so far explored during the particular situation of emergency remote teaching due to Covid-19. Considering the relevance of student-centred learning for lifelong learning in a world in constant transformation, in this study I critically analyse the application of student-centred approaches in this context through a systematic literature review. Nine publications were selected according to their focus on and interest upon a student-centred learning design of a university course during Covid-19 pandemic. The “Own it, Learn it and Share it” framework to enhance student engagement in student-centred learning was used as the conceptual framework to guide the critical analysis. The critical analysis shows that the problem-based learning approach was the most popular during this period, and that most of the described designs include elements for supporting learning such as prompting and modelling, the provision/use of tools and resources,

and progress monitoring (Learn it), as well as for assisting sharing in terms of creating artifacts (Share it). However, fewer elements of the course designs addressed specifically some aspects to support learning ownership (Own it) such as goal setting, and to encourage sharing through Web 2.0 publications (Share it). The conclusions reflect also on aspects missing in the framework, such as the emotional aspects, emphasized due to the pandemic situation, and the specific condition of student-centred learning derived from group work, and result in recommendations for student-centred learning in higher education beyond Covid-19.

1. Introduction

The pedagogical concept of student-centred learning (SCL), as well as the paradigm shift from teacher-centred learning to SCL, has been often present in reports, speeches, studies and reflections, especially in the context of European Higher Education Area (EHEA) reforms, where SCL gained a central stage and was identified as a higher education priority area in 2015 (Dakovic & Zhang, 2020; European Students' Union, 2010; Hoidn, 2016; Sursock, 2015). SCL focuses on the development of students' competencies and on the processes of acquisition and construction of knowledge, as well as on the permanent and active attitude towards learning (Esteve & Gisbert, 2011). Within a world in constant transformation, higher education institutions' commitment should be to prepare "responsible, critical citizens who can develop personally and professionally and meet the contemporary needs of society", which includes preparing lifelong learners (Global University Network for Innovation, 2021, p. 14). Therefore, SCL should be considered as core in higher education, being innovative changes a requirement to introduce it (Salinas, 2004).

SCL has been discussed extensively in the educational technology field, considering that digital technologies are a key driver in the new roles for instructors and students, and make possible student-centred learning experiences (McLoughlin & Lee, 2010; Salinas et al., 2008). In online learning, the presence of SCL through some of its characteristics (e.g., self-regulation or scaffolding) is even more remarkable, and has also been widely covered in the literature (e.g., see reviews by Doo et al., 2020; Wong et al., 2019). Against the backdrop of the Covid-19 pandemic, different authors point towards the potential impact on the applied pedagogies due to emergency remote teaching (ERT) (Hodges et al., 2020), and suggest a greater student's agency and responsibility for their learning and innovative ways to deliver a student-driven education (Bozkurt et al., 2020; Zhao, 2020). However, this aspect has not been addressed in

detail yet (see reviews by Bond et al., 2021; Stewart, 2021). Although the literature on online learning has already addressed some of the aspects of SCL, the particular situation of ERT is of interest as a different form than online learning (Hodges et al., 2020) and deserves special attention.

In the context of the study, I align with the concept of SCL related to the notion of student-centred learning environments (SCLEs) suggested by Damşa and Lange (2019), since learning cannot be "designed", but instead teaching and pedagogical design can provide the environment and tools that offer opportunities for (student-centred) learning (Goodyear & Dimitriadis, 2013). In this context, the model "Own it, Learn it, and Share it" (OLSit) proposed by Lee and Hannafin (2016) offers a design framework based on relevant theories that fits this notion of SCLEs. Despite not being designed in the context of Covid-19, the OLSit has been considered as very applicable to the online shift in educational contexts caused by the Covid-19 pandemic, due to the simplicity of the framework (Cheng, 2020; Edyburn, 2021), when self-directed learning was required for a good online learning performance (Gu, 2021). This even considering that educators were often lacking experience in online education and / or teacher digital competence (Gewerc et al., 2020; Stewart, 2021). This aspect makes the model OLSit to be a convenient way to analyse the design of SCLEs in the context of the Covid-19 pandemic.

Therefore, in this study I explore the SCL approaches that have been carried out as part of university courses during Covid-19 against the elements of the OLSit model in a systematic literature review. The aim of this paper is to critically analyse SCL approaches in higher education developed during Covid-19, from the point of view of their design as reported by instructors-authors in the literature.

By doing this, I attempt to provide answers to the following questions:

- How have SCL approaches been designed during ERT in higher education?
- How do these SCL approaches (not) align with the pedagogical concept as understood in the literature?
- What (involved and missing) issues are especially particular from SCL approaches during this period?

2. Literature review

2.1 Emergency remote education in higher education and its impact

Hodges et al. (2020) make a clear distinction between “experiences that are planned from the beginning and designed to be online” and ERT, which “is a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances”. This is also emphasized by the survey report on the impact of Covid-19 on higher education around the world developed by Marinoni et al. (2020):

Several respondents referred to the fact that a different pedagogy is required for distance teaching and learning and that it is a challenge for faculty to seamlessly make this sudden and unprepared shift from face-to-face to distance teaching and learning. The level of readiness or preparedness of teachers to lift this challenge is very diverse (p. 25).

The same authors reported that faculty often used a “learning by doing” approach or tried to imitate a face-to-face mode using the online teaching mode, which reflects a general lack of teaching experience in online education (Gewerc et al., 2020; Stewart, 2021).

Despite these circumstances, some authors show optimism about the impact of Covid-19 on educational innovation and change in teaching and learning (Ellis et al., 2020; Marinoni et al., 2020; Zhao, 2020). Mishra et al. (2020) describe a three-step process based on Lewin’s change management theory to explain the innovative changes related to Covid-19 in higher education: 1) *unfreezing* of traditional teaching-learning, which provided motivation and readiness among stakeholders, 2) *changing* to online learning, replicating practices from other institutions, or using one’s own, and 3) *refreezing*, to integrate technology in teaching-learning processes for flexible learning. Flexible modes of delivery and of achievement of learning outcomes have been emphasized as essential and, therefore, the fact that SCL approaches are very much needed is again highlighted (McMillan, 2020). Therefore, evaluation questions such as how faculty handled the design of ERT, where they (and the students) struggled the most and what the outcomes of this process were, are relevant in the context of ERT (Marinoni et al., 2020). On the other hand, Bozkurt and Sharma (2020), in their reflection about ERT remind instructors to ask themselves if they are focusing enough on learners and learning, and not just consider ERT as an “opportunity to test online pedagogy centric approaches” (p. 3).

According to the different reviews conducted in the Covid-19 period so far (Bond et al., 2021; Stewart, 2021), students’ perceptions about online learning and the impact of the shift to online learning were major areas of interest. Course redesign - without specifying whether or not an SCL approach was adopted - was the focus of only the 11% of the empirical studies included in the systematic literature review by Bond et al. (2021). This fact suggests a deeper look into the literature in this period to explore if and how SCL approaches have been (re)designed in the context of ERT, considering both the optimism about the impact of Covid-19 on educational change in higher education and the diverse level of preparedness of instructors for ERT.

2.2 Student-centred learning (SCL)

Although there is no clear definition of SCL, there is an overall agreement on SCL being rooted in the philosophy that the student is at the heart of the learning process (European Students’ Union, 2010). In SCL approaches, students assume autonomy and responsibility for their own learning, by processing interpreting, and refining meaning and understanding that rests on individual experiences (Lee & Hannafin, 2016). These authors also argue that SCL is a complex learning process in which students are supported in the motivational, social, and cognitive aspects. On the other hand, the concept is not free from polemic. Different studies at the EU level suggest that the implementation of SCL is inadequate and a part of the reason for this is that SCL is often misconceptualized (Dakovic & Zhang, 2020).

Considering the above-mentioned understanding of SCL, the learning theory of the andragogy underpins SCL with the conception of self-directed learning, which is considered “...a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing learning strategies, and evaluating learning outcomes” (Knowles, 1975, p. 18, cited in Blaschke & Marín, 2020). In andragogic settings, learners have more control in organizing and directing learning, and therefore they have more autonomy, than in didactic settings. A further level takes self-directed learning to self-determined learning in the learning theory of heutagogy, by adding a non-linear learning structure, self-determined and transformational learning in terms of self-efficacy, competency, capability, etc. In this way, the Pedagogy-Andragogy-Heutagogy (PAH) continuum is considered a progression towards further learner autonomy (Blaschke, 2012). The PAH continuum is an instructional theory, meaning that it is situation-based

and done purposely to facilitate learning and can use different instructional methods (e.g., problem-based learning) for SCL.

According to Lee and Hannafin (2016), SCL has been covered through different names, which are considered forms or approaches to SCL – or instructional methods, as suggested in Blaschke and Marín (2020): problem-based learning, project-based learning, case-based learning and inquiry learning. In all these constructivist approaches, students construct knowledge by exploring and analysing versus processing specified content from directed instruction. Also, student and instructors' roles change against the traditional roles: students as knowledge creators and evaluators instead of receivers, and educators as facilitators and scaffolding providers, instead of knowledge transmitters (Lee & Hannafin, 2016). Considering the PAH continuum, the traditional roles will correspond with pedagogy or didactic as a teaching theory, “rather than a learning theory, [...] usually based on transmission” (McAuliffe et al., 2009, p. 14), whereas the new ones would be somewhere within andragogy and heutagogy.

The relations between SCL and technology have been explicitly underlined by the educational technology literature (Salinas, Pérez Garcías & de Benito, 2008). For instance, the literature review by Väättäjä and Ruokamo (2021) highlights that “constructivist and student-centered approaches seem to be largely associated with digital pedagogy” (p. 8). Furthermore, the systematic literature review on technology-enhanced learning for student agency in higher education by Marín et al. (2020) puts many learner processes connected to SCL (e.g., learner autonomy, ownership of learning, self-regulation) in relation to the use of technology in the classroom. Also, previous work has underlined the use of different technologies and digital pedagogies for supporting SCL and student agency (Blaschke & Marín, 2020; Buchem et al., 2020; Castañeda & Tur, 2020; Dabbagh & Castañeda, 2020; Dabbagh & Kitsantas, 2012; Drexler, 2010; McLoughlin & Lee, 2010; Rahimi et al., 2015).

Finally, it has already been acknowledged that SCL is a “pedagogical approach deeply rooted in historical, philosophical-religious, and thus cultural conditions of Western Europe and the United States” (Komatsu et al., 2021, p. 8). As the same authors explain, SCL emerged with teacher-centered learning (TCL) declining, becoming the construction of pedagogy dichotomous (SCL/TCL). However, the conception behind this study is not in line with the idea of students taking distance from social relations posed by Komatsu et al. (2021). In considering different forms of SCL, I recognize the importance of social relations created by methods such

as (group) project-based learning or (group) problem-based learning.

3. Theoretical framework

Considering its focus on engagement in SCL approaches and its applicability to ERT (Cheng, 2020; Edyburn, 2021), in this study I take into consideration the framework “Own it, Learn it and Share it” (OLSit) developed by Lee and Hannafin (2016). Three theories underpin this framework: the self-determination theory, constructivism, and constructionism. To these theories, I add two theories derived from education, heutagogy and andragogy. Both are considered to foster SCL according to McAuliffe et al. (2009). An overview of these theories has been already provided in section 2.2.

The *self-determination theory* points towards learner autonomy and connects to the learning theory of heutagogy. The self-determination theory relates autonomy to a high-quality motivation, which may be intrinsic or extrinsic; however, interactions between these types of motivation influence student' performance and learning in SCL (Ryan & Deci, 2006). Considering the PAH continuum, the realization of self-determined learning at the heutagogy level would require the highest level of learner maturity and autonomy, whereas the course structure and instructor control are kept low, in comparison to previous levels in the continuum (andragogy or the cultivation of self-directed learning, and pedagogy or didactic as engagement with learning) (Blaschke, 2012).

Constructivism focuses on the students' processes of discovery to obtain knowledge by themselves and then using it to transform this knowledge into something new when organizing it, rearranging it and connecting previous and new knowledge, considering the learner, the context and understanding as interdependent and connected elements (Bruner, 1961, cited in Lee & Hannafin, 2016). In this study, it is also especially important to consider elements from social constructivism, which incorporates the importance of peer interactions to reach richer levels of understanding than individually (Vygotsky, 1978, cited in Lee & Hannafin, 2016).

Constructionism involves the active production by students of external and shareable artifacts to communicate one's knowledge (Jonassen et al., 1996). The learning process is considered to take place both in the creation and sharing the products, and the student engagement with those artifacts is cognitive and emotional (Price & Marshall, 2013).

Figure 1. Subcomponents of the OLSit framework

Note. The subcomponents correspond to the design assumptions of the OLSit framework and the descriptions have been adapted in consideration with the design guidelines provided. Adapted from “A design framework for enhancing engagement in student-centered learning: own it, learn it, and share it” by E. Lee and M. J. Hannafin, 2016, Educational Technology Research and Development, 64, pp. 722-727. (<https://doi.org/10.1007/s11423-015-9422-5>).

Based on those theories, three main constructs are built upon the framework: autonomy (self-determination theory), scaffolding (constructivism) and audience (constructionism). The framework integrates motivational, cognitive, social, and affective aspects of learning. The model proposes design guidelines based on the three constructs (Lee & Hannafin, 2016) (see Figure 1):

- *Own it* targets the development of personal ownership and autonomous motivation. Students define their purpose and prepare their learning plan supported by the educator (Edyburn, 2021). Design suggestions include the facilitation of the endorsement of external goals, the provision of opportunities to set specific personal goals and the provision of

choices that matter. Many of those suggestions relate to the principles of andragogy (McAuliffe et al., 2009).

- *Learn it* is focused on scaffolding the accomplishment of goals. Students engage in learning activities that are operationalized through their learning plan (Edyburn, 2021). Design guidelines are related to providing explicit directions on starting engagement, supporting the selection and use of tools and resources, prompting to support varying needs, integrating the terminology used in the discipline, and supporting students as they monitor their progress.

- *Share it* addresses student engagement by presenting and sharing artifacts with authentic audiences. Students would identify the channel(s) for sharing their learning with an authentic audience (Edyburn, 2021). Design guidelines include the promotion of dialogue among students and audiences, and the facilitation of helpful peer review.

Each of these components has subcomponents that are shown and briefly described in Figure 1 for the purpose of the current analysis. According to the literature provided by the authors, all these subcomponents have positive direct or indirect effects on student's engagement in their learning.

4. Research design

A critical analysis of a selected sample of articles using the OLSit framework will provide an account for new introduced or redesigned SCL approaches in times of Covid-19 in different disciplines and countries. The study will identify how the constructs from OLSit were covered by those course designs through different aspects, such as: the characteristics of the designs, how these were designed and implemented, how evaluation from those designs was planned, and the results of the implementation, in case they were reported. In order to select the sample and determine these aspects, a systematic review with searches in international databases was carried out.

The systematic literature review was conducted using the EPPI-Reviewer software (Thomas et al., 2020). The international databases included Web of Science (WoS), Scopus, ERIC and Dialnet - the latter only has records in Spanish. The search was done in two rounds: one on the 8th February 2021 and another one on the 9th April 2021. All types of publications were considered in the search but had to be published in 2020 or 2021, and to describe an educational experience during Covid-19.

The search string varied slightly according to the Boolean operators in use in each of the databases, but the main one included English and Spanish terms and was as follows:

(student-centred OR "centrad* en el alumn*" OR student-centered OR learner-centred OR learner-centered OR "centrad* en el aprendiz" OR "centrad* en el estudiante" OR "problem-based learning" OR "project-based learning" OR "case-based learning" OR "inquiry learning" OR "aprendizaje basado en problemas" OR "aprendizaje basado en proyectos" OR "aprendizaje basado en casos" OR "aprendizaje por indagación") AND (learning OR aprendizaje OR edu-

cación OR education) AND (covid-19 OR covid19 OR pandemic* OR pandemia) AND ("higher education" OR "universit*" OR "educación superior" OR "universidad*")

The inclusion and exclusion criteria are described below in Table 1. Those publications that did not provide enough design information of the SCL activities of the course or were focused on specific parts of the course instead of the overall course design (e.g., focus only on assessment, on the educational resources, on the tools used, on the contents of the subject-matter, etc.) were excluded.

The process and different steps from the initial collection of references until the final selection of studies can be observed in the PRISMA diagram in Figure 2.

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Higher Education (HE) experiences	Other educational levels different from HE
Experience during Covid-19	Experience before Covid-19
Language: English and Spanish	Any other language
Focus on the design of a SCL course (any form of SCL)	No focus on design nor design of a SCL course

The final selection for critical analysis included 9 peer-reviewed publications (8 journal articles and 1 conference presentation). Content analysis of all full texts was conducted also in EPPI Reviewer. On the one hand, the studies were coded on basic information about the 1) presence/absence of the conception or understanding of SCL in the study, 2) course context: continent (and country) of implementation, higher education level (undergraduate/postgraduate), discipline, aims and prerequisites, and 3) the SCL approach (problem-based learning, project-based learning, inquiry learning, case-based learning, other). On the other hand, aspects such as the initial situation of the course, the description of the SCL (re)design and the results of the redesign were included as part of the 4) course (re)design. Finally, the coding schema included the three components of the OLSit model and their design assumptions (Lee & Hannafin, 2016, p. 723). The results of the courses' redesigns are discussed together with the critical analysis based on the OLSit model.

Figure 2. Systematic review PRISMA diagram in the study

5. Findings

5.1 Background information

Before the critical analysis, a contextualization of each of the course designs described in the studies has been done to understand better the design choices (see Appendix A). This course context covers the continent and country of implementation, higher education level, discipline, aims and prerequisites (if present).

To start with, only 4 out of the 9 studies conceptualized or described the authors' understanding of SCL or of the SCL approach used in the course. Regarding the geographical location of the courses, the sample of studies includes course designs from almost every continent (except from Oceania), with prominence of Europe and North America (3 out of 9 each). Also, the sample includes the representation of five disciplines (Health & Welfare; Natural Science; Maths & Statistics; Education; Business, Administration & Law; and ICT), being Business, Administration & Law the most frequent (3 out of 9). Most of the papers were addressing undergraduate

courses (7 out of 9) and problem-based learning approaches (6 out of 9).

Three out of 9 studies did not include information about the aims of the course (design) and only one described prerequisites for the course. In all the studies, previous experience with SCL design and developed were acknowledged; therefore, the (re)design was mostly the consideration of the online settings and the readjustment of the organization of the sessions. In other words, no educator had to actually start from scratch in this challenge and counted with previous valuable experience in addressing SCL approaches.

5.2 Critical analysis based on the OLSit framework

As explained in section 4, the three main components of the OLSit framework (own it, learn it and share it) were considered in order to critically analyse the implementation of SCL approaches in higher education courses during Covid-19 times. The detailed analysis per study can be found in Appendix B, which is linked to the results obtained in each of the cases and described as follows, including considerations regarding the initial (re)design and its outcomes (only

when specified) in terms of the OLSit framework.

5.2.1 Own it

The component *Own it* was covered by 5 of the studies in all each design elements, except from goal setting (only 3).

One of the most common design elements was providing a *personally meaningful choice* (n=5), and this was usually exemplified by offering different topics or problems to target through project-based or problem-based learning (Adinolfi & Giancotti, 2021; Arcos-Alonso & Alonso, 2021; Ehlers, 2020; Klegeris, 2020; Quintana & Quintana, 2020). For instance, in the problem-based learning approach from Ehlers (2020, p. 57), students could “choose one of five overarching topics related to artificial intelligence and the future society”, and this was a meaningful choice because the theme is relevant for students’ personal and professional lives.

For the case of *internalizing the rationale* (n=5), this involved the development of an awareness and an understanding of the course aims in all the cases (Ehlers, 2020; Klegeris, 2020; Mejía, 2020; Quintana & Quintana, 2020; Singh et al., 2021). An example is provided by Quintana and Quintana (2020), where a specifications list was provided to the students at the beginning of the course; each of the list items related to a course-learning goal, hoping to “alleviate student anxiety associated with their efforts to meet objectives at the highest levels of each rubric criterion” (p. 528). The authors explain the importance of this list for internalizing the rationale in terms of results as follows:

Anecdotally, student work was not adversely affected by the move to specifications grading. If anything, the simplified grading criteria seemed to free up students and the instructor to focus on the important work of meeting course learning goals, rather than worrying about the details of the various levels of achievement they could reach on the previously used analytic rubric (Quintana & Quintana, 2020, p. 531).

Endorsing the value (n=5) involved emphasizing real-world problems, familiar situations that affect students’ lives (Ehlers, 2020; Halaweh, 2020; Klegeris, 2020; Mejía, 2020; Singh et al., 2021). For instance, Mejía (2020, p. 139, *own translation*) describes how students were presented the question “how to build a battery with inexpensive, household materials, and that do not represent an environmental problem?”. In addition, students and instructor “discussed the importance of an emergency power source, such as batteries, in places where electricity is inaccessible” that led to generate a common battery.

Goal setting (n=3) referred to the possibility of students defining their objectives for their work. For example, Ehlers (2020, p. 58) described how students should develop a “mission statement” as the second step of the project group by focusing “on possible approaches to the problem statement” and, therefore, by reflecting on “what needs to be done to achieve a good future for its topic against the background of their “strong beliefs” and problem statements”.

5.2.2 Learn it

The component *Learn it* was included by 8 of the studies in two of the design elements, whereas progress monitoring and individual needs were covered by less studies (6 and 3, respectively).

Prompting and modelling (n=8) were exemplified by instructors facilitating challenging, reflective, or guiding questions (Adinolfi & Giancotti, 2021; Ehlers, 2020; Klegeris, 2020; Quintana & Quintana, 2020; Singh et al., 2021), showing examples of what students had to do (Arcos-Alonso & Alonso, 2021) and providing additional support (Havenga, 2020). For instance, Adinolfi and Giancotti (2021, p. 11) describe how “the first phase, which corresponds to the internalization phase of SECI model (explicit to tacit), is led by the facilitators’ leader, who consecutively poses five challenging questions to the participants that are connected in plenary through the Team platform”. One study highlighted the important role of teaming up for discussion and making possible the progress within the proximal development zones (Mejía, 2020). In reflecting on the results, Singh et al. (2021, p. 192) remark as limitation the lack of in-person interactions with preceptors and other health care professionals as role models but the author believes “these (online) interactions (small group discussions, preceptors sharing problem-solving strategies) between preceptors and small groups helped to bridge the gap between theory and practice and gave the students exposure to role models that they could emulate in future rotations”.

Most of the studies refer to *tools and resources* (n=8) too (Adinolfi & Giancotti, 2021; Arcos-Alonso & Alonso, 2021; Ehlers, 2020; Halaweh, 2020; Havenga, 2020; Klegeris, 2020; Quintana & Quintana, 2020; Singh et al., 2021). These tools and resources included in most cases, generic digital tools that were used during the course, e.g., videoconference tools such as Zoom or Teams and their various functionalities (Halaweh, 2020; Havenga, 2020), the institutional virtual learning platform or non-institutional communication tools like Whatsapp (Havenga, 2020). In one of the courses described by the studies, Perusall for social annotation was used (Quintana & Quintana, 2020).

In terms of resources, some studies refer to research articles, course readings or lecture slides; and to analytical resources such as rubrics or storyboards (Klegeris, 2020; Quintana & Quintana, 2020). In one case, subject-specific tools such as statistical ones are referred (Arcos-Alonso & Alonso, 2021). Some of the studies mentioned the provision of particular tools, learning resources and templates without being specific about them (Adinolfi & Giancotti, 2021; Ehlers, 2020; Singh et al., 2021).

This provision acted for the benefit of the quality of the projects, as Adinolfi and Giancotti (2021, p. 13) highlight that “most of the final projects were excellent: participants themselves were surprised at how capable they were to elaborate a change project when the conceptual tools were used in the perspective of action”. Havenga (2020, p. 344) explains that “participants [...] discussed the programs using WhatsApp to comment on one another’s coding. Thereafter, they used Zoom, discussed each instruction and asked questions regarding the use of the correct programming blocks and their functionality (and improved the programming code)”.

Progress monitoring (n=6) was usually made effective through (regular) personalised meetings of the groups or individuals with the instructors or coaching sessions (Arcos-Alonso & Alonso, 2021; Ehlers, 2020; Mejía, 2020; Quintana & Quintana, 2020). For instance, Arcos-Alonso and Alonso (2021, p. 285) highlight the organization of “personalised group-by-group attention through the Blackboard Collaborate virtual meetings platform, whereas the interesting doubts were shared in the virtual classroom sessions, reserving a specific space for this”. Two other actions for tracking progress monitoring that lay more on the student side are provided by Halaweh (2020), who highlights that the students had to meet certain milestones in order to demonstrate their progress, and by Havenga (2020), where students had to complete a weekly reflective sheet template.

Few studies mention some actions for addressing *individual needs* (n=3) (Ehlers, 2020; Mejía, 2020; Quintana & Quintana, 2020). For instance, Quintana and Quintana (2020, p. 529) describe that each group of students had a document where they could “list specific areas they wanted feedback on” during the second online session, when they were working “on a different specifications subset (scenario design and scaffolding design framework)” for their projects - during the first online session they focused on preparing the vision of learning context and rationale for pedagogical choices.

The teaching, coaching role within these “Learn it” design elements has been considered a key success factor in the courses, especially in terms of communication and emotional aspects. The advantages of guidance by the instructors rather than instructions were derived from students’ feedback that emphasized the concept of coaching in the course described by Ehlers (2020, p. 63): “the coaching has supported the ability for self-directed and self-organized learning” and “students have experienced the intensive coaching sessions, insightful information sessions and many suggestions for reflection as helpful for their own problem construction and solution process”. Similarly, Mejía (2020, p. 142) emphasizes the high quality of the final student works, in some cases higher than in face-to-face classes, and attributes this success to the personalized feedback group sessions on agreed, flexible schedule and to carrying out asynchronous activities that facilitate the own best timing and space distribution by the students.

5.2.3 Share it

The component *Share it* was covered by 7 of the studies in terms of artifact generation, 5 each for authentic audiences and peer review, and only 2 mentioned web 2.0 publications. One of the studies did not include any design element from this component (Arcos-Alonso & Alonso, 2021).

Most of the studies referred to very diverse, and in occasions combined, *artifact generation* (n=7) by the students, ranging from a classical written (reflective or case) paper (Ehlers, 2020; Mejía, 2020; Quintana & Quintana, 2020; Singh et al., 2021), to multimedia artifacts, such as a video (Ehlers, 2020; Havenga, 2020; Mejía, 2020) or an infographics (Mejía, 2020), and (software) prototypes and/or their concepts (Adinolfi & Giancotti, 2021; Halaweh, 2020; Quintana & Quintana, 2020). These examples are illustrated by the following excerpts: “students were working on creating prototypes for a product, website, mobile application, house, park or whatever the project domain entailed” (Halaweh, 2020, p. 6); or “the teams delivered their battery proposal in the form of a written paper that was guided by a rubric (discussed in the team feedback sessions) and a video or infographic” (Mejía, 2020, p. 141, *own translation*).

Authentic audiences (n=5) when students share their course artifacts are also varied, and seems to be dependent on the disciplines and the type of artifact developed (Adinolfi & Giancotti, 2021; Ehlers, 2020; Halaweh, 2020; Mejía, 2020; Quintana & Quintana, 2020). For example, the course design presented by Ehlers (2020) included the generation of a student conference, where students would present their artefacts to a jury and the public (academic and professional

public, and broader public via online media). The outcomes were mainly positive, as according to Ehlers (2020),

The involvement of the public as well as the publication of the artefacts has created a feeling of recognition by the teachers among the students, what has motivated them to commit themselves beyond the usual level. Due to the presentation of their work in a public event with high media impact, the students perceived their work as highly valued and important (Ehlers, 2020, p. 63).

Quintana and Quintana (2020, p. 531) also highlight the positive effect of the design element regarding authentic audiences in the course outcomes: “This added level of interaction between students and experts from outside the traditional class organization further supported the instructor’s goal of cultivating a knowledge community in ways that they had not been able to implement in previous course offerings”.

Peer review (n=5) was included in some of the course designs, as a way of providing consultancy and informal feedback, e.g., through voting (Adinolfi & Giancotti, 2021; Ehlers, 2020; Havenga, 2020; Klegeris, 2020; Quintana & Quintana, 2020), and in two cases was specified to be part of the course assessment (Ehlers, 2020; Havenga, 2020). Klegeris (2020, p. 4) explains that “students are expected to research all learning objectives independently, and their level of preparation is evaluated by their peers during the subsequent PBL session”. Havenga (2020, p. 342) describes how the instructor asked the students’ teams “to select the

“best” example and add some functionality”.

Web 2.0 publications (n=2) were represented by publication in the project website (Ehlers, 2020) and publication of a video or an infographics for the public outside the classroom, without specification of the platform (Mejía, 2020). Ehlers (2020) describes it as follows: “the working papers, video clips and presentation materials are then published on the internet” (p. 57), “on the project website next.education.org (www.next-education.org/grandchallenge2020)” (p. 63).

5.2.4 Overview of the findings

To wrap up the findings of the study, and before moving forward to the discussion of the results, I include a graphical overview of the distribution of the components and subcomponents of the OLSit model in the analysed studies. All the components were covered by the studies, but the subcomponents were unevenly addressed, as shown by Figure 3.

6. Discussion

This study has brought to light some of the challenges of SCL implementation, as described previously in section 2.2 (Dakovic & Zhang, 2020; Damşa & Lange, 2019). One example can be observed from the same review itself, and

Figure 3. Distribution of the components and subcomponents of the OLSit model in the analysed studies

Note. The distribution by colours corresponds to each of the components of the OLSit model and the size of each box depends on the number of studies represented by each subcomponent, which is indicated after the semicolon in each case.

from a terminological perspective: even though some studies that were discarded in the first or second phase used SCL as one of the keywords, these did not actually reflect SCL approaches as understood in this study. As Vääätäjä and Ruokamo (2021) describe in their literature review, TEL practices cannot be automatically considered as constructivist. However, many of those discarded studies showed that some authors label digital pedagogical practices with different pedagogical orientations from the ones supporting SCL approaches (e.g., behaviourist). The definition of SCL itself proves to be messy in this sense.

Moving away from terminology and focusing on the application of SCL approaches, findings from Nascimento et al. (2020) show that SCL can become frustrating, stressful, and conflicting for some students that have an underdeveloped autonomy skill; however, “the process of the ability to learn how to learn is gradual and [...] can evolve over time” (p. 8). The challenge of self-organization, the learner autonomy, is specifically addressed by Ehlers (2020). Students in the course described by Havenga (2020) were considered to learn a lot by having to solve the problems on their own; though initially experiencing difficulties in the coding task, they used Youtube videos to assist them. Along this line, Klegeris (2020, p. 5) observes from informal feedback of the course described that “students adapted well to this new PBL (problem-based learning) environment and were able to self-organise, problem-solve and successfully conduct online discussions unsupervised”. However, Vääätäjä and Ruokamo (2021) emphasize that instructors are required to play the role of the guide, leader, and facilitator of the learning process in SCL approaches that include the use of digital pedagogies, which reflects findings from some analysed papers (Arcos-Alonso & Alonso, 2021; Ehlers, 2020; Mejía, 2020; Quintana & Quintana, 2020). Aspects related to this role of instructors, as well as the challenges for the assumption of own responsibility for learning in the case of students, are also highlighted in the pre-pandemic literature regarding the use of digital technologies for SCL (Blaschke & Marín, 2020; Drexler, 2010; McLoughlin & Lee, 2010).

On the other hand, the emergency situation derived from the Covid-19 pandemic has surfaced the “pedagogy of care” and “human-centred design” (Karakaya, 2020). The pandemic has made noticeable that the emotional role of teaching and learning in online learning, including using SCL approaches, has been often neglected (Bozkurt & Sharma, 2020). Elements from these care approaches can be observed in many of the course (re)designs of the studies in the sample but are missing from the model used (OLSit). By fostering problem-solving approaches through empathy building, Karakaya (2020, p. 2) sustains that instructors

would “tailor teaching designs that reflect students’ needs and supportive online learning environments”. For instance, Quintana and Quintana (2020) specified that the instructor was seeking to alleviate student anxiety with regard to course assessment by using a clear and detailed specifications list, which worked better than expected in the Covid-19 pandemic context. Improvements in this sense were also made by students in the course described by Singh et al. (2021) by suggesting reducing the class time using Zoom to address student fatigue and improve focus.

On top of this, there is the social component that it is not usually made explicit neither in definitions of SCL nor the same framework used in this study but contributes to human-centred design. The authors from the different studies show this important element in SCL approaches, especially considering that most of them take place often in groups (in this case, in all the courses). For instance, Adinolfi and Giancotti (2021, p. 12) remark that “incorporating informal moments produced an emotional improvement that the authors guess that also influenced cognitive and practical abilities”. Also, Mejía (2020) emphasizes that active methodologies, including SCL approaches, should take care of creating a warm and positive class atmosphere and interactions, especially in the virtual context, which is also highlighted in the literature concerning ERT (Bozkurt & Sharma, 2020). Similarly, Havenga (2020) underscores the importance of counteracting isolation in online problem-based learning activities by providing options for online collaboration to interact with others, and remarks the positive experience of participants in their work in problem-based teams; furthermore, “they assisted each other, reassured and motivated each other to find a solution and worked well together” (p. 344).

These aspects, together with the importance of the instructor guidance and the elements of the pedagogy of care, suggest the incorporation of a possible new element to the framework regarding the emotional part of SCL approaches, which I would call “Feel it”.

Aspects directly related to the instructors’ work to redesign the courses must be also acknowledged. For instance, technical and administrative obstacles related to the course adjustments, as well as poor organizational support to the projects in some cases, were highlighted by Adinolfi and Giancotti (2021). As the authors remark, “this proved that an advanced learner-centered methodology cannot magically substitute for a lack of sponsorship or unaddressed organizational politics. Moreover, a cohesive team of prepared and committed facilitators is required” (p. 15). Mejía (2020) also remarks the intensive, extra work

that meant for the instructor to redesign the SCL approach in the online context. Arcos-Alonso and Alonso (2021) show that the online shift required an important change in the teaching role in order to facilitate pedagogical strategies in the interaction processes of the sessions. Issues regarding instructor workload in online teaching have been already discussed in the literature (Wingo et al., 2017).

Finally, although SCL approaches put a strong emphasis on owning responsibility for learning and promoting autonomy, the reflective part seems to be missing - at least in the course descriptions presented. The “Share it” component, especially the emphasis on Web 2.0 publications was neither common (see section 5.2.3), which contrasts with the possibilities of digital pedagogies that have been extensively discussed previously in the literature (Blaschke & Marín, 2020; Dabbagh & Kitsantas, 2012; Drexler, 2010). Also, many course descriptions did not address the assessment neither some did the learning goals, which are key components of course design, along with the teaching and learning activities (Fink, 2003).

On the other side, the information provided about the use of technologies does not allow to deepen on critical aspects regarding digital divide and data privacy (Williamson et al., 2020), neither are these aspects explicitly discussed in the studies. It can be guessed that most of the technological use refers to institutional tools, such as the institutional virtual learning platforms and, presumably, the videoconferencing systems and other tools with an institutional license. The only non-institutional tool mentioned by the studies is Whatsapp in the South African course (Havenga, 2020), which was used for interactions between students for a coding task. Although students are active in social media tools such as Whatsapp for informal communication, some studies suggest that they are mostly unaware of data privacy policies (Marín et al., 2021; Obar & Oeldorf-Hirsch, 2020; Steinfeld, 2016). Also, no digital divide issues were problematized, apart from the concrete mention of sporadic and minor technical difficulties with Internet connection experienced by students in the U.S. course described by Singh et al. (2021). The presence of these issues was also minor in the review by Bond et al. (2021), where only 13.5% of the studies focused on the students’ technical equipment. Furthermore, differences between design choices in the diverse countries are not clear, and could not be taken into account without also considering the diversity between disciplines.

7. Conclusion

The present study brought to light some examples of application of SCL approaches in higher education in the context of the Covid-19 pandemic. It is remarkable that all studies highlight the positive effects of the course redesigns based on students’ feedback or results, in some cases even said to be superior to the previous face-to-face course versions. Also, some of the authors (e.g., Halaweh, 2020) note the need to not limit SCL approaches to the crisis situation and adopt them also in “normal” situations. This is also in line with the hope that Covid-19 serves as a catalyst for educational change raised by Zhao (2020).

The OLSit framework has been useful to critically analyse the different course design elements present in the studies according to the pedagogical concept but has also shown some parts where it could be enhanced or extended. For instance, in relation to group work and the pedagogy of care, the latter of which emerged strongly with the pandemic situation (Bozkurt et al., 2020; Karakaya, 2020). Although this study has contributed to show practice examples of how the different course design elements could be considered during Covid-19, more research on the use of the model is needed in order to show further examples of practice for the design guidelines and elements, also designed using the model as the basis for it (Cheng, 2021).

Recommendations derived from this study include a) the consideration of the instructor workload and related challenges (e.g., administrative) for the adaptation of SCL approaches to the online settings; b) a more decisive inclusion of the “Share it” elements, especially the Web 2.0 publication, considering the digital potentialities (but without forgetting the challenges, e.g., data privacy and author’s licenses); and c) the incorporation of emotional aspects within the course design, following guidelines from the pedagogy of care.

Some considerations need to be acknowledged as limitations of this study. The selected studies are not necessarily the best examples for SCL approaches during Covid-19; instead, out of the complete sample from the systematic review done, these were the ones with more detail described in the publication in terms of SCL course design. Also, the SCL focus common in Europe and North America may be also reflecting biases present in the literature regarding geographical focus against the Global South, as has been observed in previous studies (Bond et al., 2021). On the other hand, the search string could have left out important terms to identify SCL studies during Covid-19 times or have

been too narrow. Furthermore, the different SCL formats are also dependent on the discipline, and this could bring some biased interpretation of the SCL design.

Future research could point towards different directions. One of them could put the emphasis on studying the emotional aspects of teaching and learning in SCL course design. Also, implications of course design related to digital divide, data privacy and cultural differences in different digital teaching and learning approaches, could be further explored. Last, but not least, primary research to study SCL course design in higher education can significantly contribute to complement these findings and unveil issues that may not be discussed when reporting the studies.

References

- Adinolfi, P., & Giancotti, F. (2021). Pedagogical triage and emergent strategies: A management educational program in pandemic times. *Sustainability*, 13(6). <https://doi.org/10.3390/su13063519>
- Arcos-Alonso, A., & Alonso, A. A. (2021). Problem-based learning and other active methodologies as support for distance teaching during the COVID-19 pandemic. *Cypriot Journal of Educational Sciences*, 16(1), 277–287. <https://doi.org/10.18844/cjes.v16i1.5525>
- Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. *The International Review of Research in Open and Distributed Learning*, 13(1), 56. <https://doi.org/10.19173/irrodl.v13i1.1076>
- Blaschke, L. M., & Marín, V. I. (2020). Applications of Heutagogy in the Educational Use of E-Portfolios. *RED. Revista de Educación a Distancia*, 20(64). <https://doi.org/10.6018/red.407831>
- Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, 18. <https://doi.org/10.1186/s41239-021-00282-x>
- Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., Lambert, S. R., Al-Freih, M., Pete, J., Olcott, D., Rodes, V., Aranciaga, I., Alvarez, A. V., Roberts, J., Pazurek, A., Raffaghelli, J. E., de Coëtlogon, P., Shahadu, S., Brown, M., ... Mano, M. (2020). A global outlook to the interruption of education due to COVID-19 Pandemic: Navigating in a time of uncertainty and crisis. *Asian Journal of Distance Education*, 15(1), 126. <http://www.asianjde.com/ojs/index.php/AsianJDE/article/view/462>
- Bozkurt, A., & Sharma, R. C. (2020). Emergency remote teaching in a time of global crisis due to CoronaVirus pandemic. *Asian Journal of Distance Education*, 15(1), 6. <https://doi.org/10.5281/zenodo.3778083>
- Buchem, I., Tur, G., & Hoelterhof, T. (2020). The role of learner control and psychological ownership for self-regulated learning in technology-enhanced learning designs. Differences in e-portfolio use in higher education study programs in Germany and Spain. *Interaction Design and Architecture(s) Journal - IxD&A*, 45, 112–132. http://ixdea.uniroma2.it/inevent/events/idea2010/index.php?s=10&a=10&link=ToC_45_P&link=45_5_abstract
- Castañeda, L., & Tur, G. (2020). Resources and Opportunities for Agency in PLE-Related Pedagogical Designs: A Literature Exploration. *Interaction Design and Architecture(s) Journal - IxD&A*, 45, 50–68. http://ixdea.uniroma2.it/inevent/events/idea2010/index.php?s=10&a=10&link=ToC_45_P&link=45_2_abstract
- Cheng, Z. (2021). Leveraging theories in instructional design: A reflective response to OLSit framework. *Educational Technology Research and Development*, 69(1), 109–112. <https://doi.org/10.1007/s11423-020-09932-9>
- Dabbagh, N., & Castañeda, L. (2020). The PLE as a framework for developing agency in lifelong learning. *Educational Technology Research and Development*, 68(6), 3041–3055. <https://doi.org/10.1007/s11423-020-09831-z>
- Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education*, 15(1), 3–8. <https://doi.org/10.1016/j.iheduc.2011.06.002>
- Dakovic, G., & Zhang, T. (2020). Student-Centered Learning from a European Policy and Practice Perspective. In S. Hoidn & M. Klemenčič (Eds.), *The Routledge International Handbook of Student-Centered Learning and Teaching in Higher Education* (1st ed., pp. 562–580). Routledge. <https://doi.org/10.4324/9780429259371-42>
- Damşa, C., & Lange, T. de. (2019). Student-centred learning environments in higher education: From conceptualization to design. *Uniped*, 42(01), 9–26. <https://doi.org/10.18261/issn.1893-8981-2019-01-02>

- Doo, M. Y., Bonk, C., & Heo, H. (2020). A Meta-Analysis of Scaffolding Effects in Online Learning in Higher Education. *International Review of Research in Open and Distributed Learning*, 21(3), 60–80. <https://doi.org/10.19173/irrodl.v21i3.4638>
- Drexler, W. (2010). The networked student model for construction of personal learning environments: Balancing teacher control and student autonomy. *Australasian Journal of Educational Technology*, 26(3). <https://doi.org/10.14742/ajet.1081>
- Edyburn, D. (2021). Transforming student engagement in COVID-19 remote instruction: A research perspective. *Educational Technology Research and Development*, 69(1), 113–116. <https://doi.org/10.1007/s11423-020-09919-6>
- Ehlers, U.-D. (2020). Making open educational practices real. The case of “the grand challenge 2020”. *Journal of E-Learning and Knowledge Society*, 16(4), 56–66. <https://doi.org/10.20368/1971-8829/1135374>
- Ellis, V., Steadman, S., & Mao, Q. (2020). ‘Come to a screeching halt’: Can change in teacher education during the COVID-19 pandemic be seen as innovation? *European Journal of Teacher Education*, 43(4), 559–572. <https://doi.org/10.1080/02619768.2020.1821186>
- Esteve, F. M., & Gisbert, M. (2011). El nuevo paradigma de aprendizaje y las nuevas tecnologías. *REDU Revista de docencia universitaria*, 9(3), 55–73. <https://riunet.upv.es/bitstream/handle/10251/141675/Esteve?sequence=1>
- European Students’ Union. (2010). *Student Centered Learning. An Insight Into Theory And Practice*. European Students’ Union. http://www.ehea.info/media.ehea.info/file/T4SCL_forum_Leuven_October_2010/34/2/2010_T4SCL_Stakeholders_Forum_Leuven_-_An_Insight_Into_Theory_And_Practice_600342.pdf
- Fink, L. D. (2003). *A Self-Directed Guide to Designing Courses for Significant Learning*. Jossey-Bass.
- Gewerc, A., Persico, D., & Rodes-Paragarino, V. (2020). Guest Editorial: Challenges to the Educational Field: Digital Competence the Emperor has no Clothes: The COVID-19 Emergency and the Need for Digital Competence. *IEEE Revista Iberoamericana de Tecnologías Del Aprendizaje*, 15(4), 372–380. <https://doi.org/10.1109/RITA.2020.3033208>
- Global University Network for Innovation. (2021). *New Visions for Higher Education towards 2030* [GUNi World Report Special Issue]. Global University Network for Innovation. www.guninetwork.org/files/concept_note_guni_2021_new_visions_for_he_2030_def.pdf
- Goodyear, P., & Dimitriadis, Y. (2013). In medias res: Reframing design for learning. *Research in Learning Technology*, 21. <https://doi.org/10.3402/rlt.v21i0.19909>
- Gu, X. (2021). Response to “A design framework for enhancing engagement in student-centered learning: Own it, learn it, and share it”: a design perspective. *Educational Technology Research and Development*, 69(1), 101–104. <https://doi.org/10.1007/s11423-020-09896-w>
- Halaweh, M. (2020). Are universities using the right assessment tools during the pandemic and crisis times? *Higher Learning Research Communications*, 11, 1–9. <https://doi.org/10.18870/hlrc.v11i0.1184>
- Havenga, M. (2020). COVID-19: Transition to online problem-based learning in robotics—Challenges, opportunities and insights. *International Symposium on Project Approaches in Engineering Education*, 10, 339–346. <https://doi.org/10.5281/zenodo.4815077>
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The Difference Between Emergency Remote Teaching and Online Learning. *EDUCAUSE Review*, 27. <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning>
- Hoidn, S. (2016). The Pedagogical Concept of Student-Centred Learning in the Context of European Higher Education Reforms. *European Scientific Journal, ESJ*, 12(28), 439. <https://doi.org/10.19044/esj.2016.v12n28p439>
- Jonassen, D. H., Myers, J. M., & McKillop, A. M. (1996). From constructivism to constructionism: Learning with hypermedia/multimedia rather than from it. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Educational Technology Publications.
- Karakaya, K. (2020). Design considerations in emergency remote teaching during the COVID-19 pandemic: A human-centered approach. *Educational Technology Research and Development*, 69(1), 295–299. <https://doi.org/10.1007/s11423-020-09884-0>

- Klegeris, A. (2020). Mixed-mode instruction using active learning in small teams improves generic problem-solving skills of university students. *Journal of Further and Higher Education*. <https://doi.org/10.1080/0309877X.2020.1826036>
- Komatsu, H., Rappleye, J., & Silova, I. (2021). Student-Centered Learning and Sustainability: Solution or Problem? *Comparative Education Review*, 65(1), 6–33. <https://doi.org/10.1086/711829>
- Lee, E., & Hannafin, M. J. (2016). A design framework for enhancing engagement in student-centered learning: Own it, learn it, and share it. *Educational Technology Research and Development*, 64(4), 707–734. <https://doi.org/10.1007/s11423-015-9422-5>
- Marín, V. I., Carpenter, J. P., & Tur, G. (2021). Pre-service teachers' perceptions of social media data privacy policies. *British Journal of Educational Technology*, 52(2), 519–535. <https://doi.org/10.1111/bjet.13035>
- Marín, V. I., de Benito, B., & Darder, A. (2020). Technology-Enhanced Learning for Student Agency in Higher Education: A Systematic Literature Review. *Interaction Design and Architecture(s) Journal - IxD&A*, 45, 15–49. http://ixdea.uniroma2.it/inevent/events/idea2010/index.php?s=10&a=11&link=ToC_45_P&link=45_1_abstract
- Marinoni, G., van't Land, H., & Jensen, T. (2020). *The Impact of Covid-19 on Higher Education around the World. IAU Global Survey Report*. International Association of Universities. https://www.iau-aiu.net/IMG/pdf/iau_covid19_and_he_survey_report_final_may_2020.pdf
- McAuliffe, M., Hargreaves, D., Winter, A., & Chadwick, G. (2009). Does Pedagogy Still Rule? *Australasian Journal of Engineering Education*, 15(1), 13–18. <https://doi.org/10.1080/22054952.2009.11464018>
- McLoughlin, C., & Lee, M. J. (2010). Personalised and self regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, 26(1). <https://doi.org/10.14742/ajet.1100>
- McMillan, M. (2020). COVID19 - The Catalyst for Educational Change: Applying/Using E-PBL for Accelerated Change. *Journal of Problem-Based Learning*, 7(2), 51–52. <https://doi.org/10.24313/jpbl.2020.00297>
- Mejía, A. R. (2020). A course in Electrochemistry in pandemic times: The educational ecosystem in action. *Educacion Quimica*, 31(5), 136–143. <https://doi.org/10.22201/fq.18708404e.2021.5.77094>
- Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, 1, 100012. <https://doi.org/10.1016/j.ijedro.2020.100012>
- Nascimento, J. R. S., Galvão Júnior, L. D. C., Carniello, M. F., & Nogueira, S. H. (2020). The formative process by active methodologies in the medicine course at the federal university of maranhão and its implications in regional development. *Revista Brasileira de Gestao e Desenvolvimento Regional*, 16(3), 312–322. <https://rbgdr.net/revista/index.php/rbgdr/article/view/5886>
- Obar, J. A., & Oeldorf-Hirsch, A. (2020). The biggest lie on the Internet: Ignoring the privacy policies and terms of service policies of social networking services. *Information, Communication & Society*, 23(1), 128–147. <https://doi.org/10.1080/1369118X.2018.1486870>
- Price, S., & Marshall, P. (2013). Designing for learning with tangible technologies. In R. Luckin, S. Puntambekar, P. Goodyear, B. Grabovski, J. Underwood, & N. Winters (Eds.), *Handbook of Design in Educational Technology* (pp. 288–300). Routledge.
- Quintana, R., & Quintana, C. (2020). When classroom interactions have to go online: The move to specifications grading in a project-based design course. *Information and Learning Science*, 121(7), 525–532. <https://doi.org/10.1108/ILS-04-2020-0119>
- Rahimi, E., van den Berg, J., & Veen, W. (2015). A learning model for enhancing the student's control in educational process using Web 2.0 personal learning environments: Enhancing student's control using Web 2.0 PLEs. *British Journal of Educational Technology*, 46(4), 780–792. <https://doi.org/10.1111/bjet.12170>
- Ryan, R. M., & Deci, E. L. (2006). Self-Regulation and the Problem of Human Autonomy: Does Psychology Need Choice, Self-Determination, and Will? *Journal of Personality*, 74(6), 1557–1586. <https://doi.org/10.1111/j.1467-6494.2006.00420.x>

- Salinas, J. (2004). Innovación docente y uso de las TIC en la enseñanza universitaria. *RUSC Revista Universidad y Sociedad del Conocimiento*, 1(1). <http://dx.doi.org/10.7238/rusc.v1i1.228>
- Salinas, J., Pérez Garcías, A., & de Benito, B. (2008). *Metodologías centradas en el alumno para el aprendizaje en red*. Editorial Síntesis.
- Singh, H., Olberding, L., Al Jammali, Z., Steinkopf, M., Bookman, N., Ostrogorsky, T. L., Eckrich, M., McCracken, C., & Olstad, S. (2021). Zooming forward: An advanced pharmacy practice experience utilizing virtual case-based learning in response to COVID-19. *JACCP Journal of the American College of Clinical Pharmacy*, 4(2), 184–194. <https://doi.org/10.1002/jac5.1384>
- Steinfeld, N. (2016). “I agree to the terms and conditions”: (How) do users read privacy policies online? An eye-tracking experiment. *Computers in Human Behavior*, 55(Part B), 992–1000. <https://doi.org/10.1016/j.chb.2015.09.038>
- Stewart, W. H. (2021). A global crash-course in teaching and learning online: A thematic review of empirical Emergency Remote Teaching (ERT) studies in higher education during Year 1 of COVID-19. *Open Praxis*, 13(1), 89. <https://doi.org/10.5944/openpraxis.13.1.1177>
- Sursock, A. (2015). *Trends 2015: Learning and Teaching in European Universities*. European University Association. <https://eua.eu/component/attachments/attachments.html?id=437>
- Thomas, J., Graziosi, S., Brunton, J., Ghouze, Z., O'Driscoll, P., & Bond, M. (2020). *EPPI-Reviewer: Advanced software for systematic reviews, maps and evidence synthesis*. EPPI-Centre Software. UCL Social Research Institute. <https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=2914>
- Väätäjä, J. O., & Ruokamo, H. (2021). Conceptualizing dimensions and a model for digital pedagogy. *Journal of Pacific Rim Psychology*, 15, 183449092199539. <https://doi.org/10.1177/1834490921995395>
- Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: Digital technologies and distance education during the coronavirus emergency. *Learning, Media and Technology*, 45(2), 107–114. <https://doi.org/10.1080/17439884.2020.1761641>
- Wingo, N. P., Ivankova, N. V., & Moss, J. A. (2017). Faculty Perceptions about Teaching Online: Exploring the Literature Using the Technology Acceptance Model as an Organizing Framework. *Online Learning*, 21(1). <https://doi.org/10.24059/olj.v21i1.761>
- Wong, J., Baars, M., Davis, D., Van Der Zee, T., Houben, G.-J., & Paas, F. (2019). Supporting Self-Regulated Learning in Online Learning Environments and MOOCs: A Systematic Review. *International Journal of Human-Computer Interaction*, 35(4–5), 356–373. <https://doi.org/10.1080/10447318.2018.1543084>
- Zhao, Y. (2020). COVID-19 as a catalyst for educational change. *PROSPECTS*, 49(1–2), 29–33. <https://doi.org/10.1007/s11125-020-09477-y>Appendix A. Background of the course designs of the sample

Acknowledgements

This research study has been funded by the Spanish State Research Agency of the Ministry of Science, Innovation and Universities and the European Social Fund through a Ramón y Cajal Research Fellowship (RYC2019-028398-I funded by MCIN/AEI/10.13039/501100011033 and FSE “El FSE invierte en tu futuro”).

About the author

Victoria I. Marín is a Senior Research Fellow (Ramón y Cajal) in Educational Sciences at the University of Lleida (Spain) and member of the research group Competences, Education, Technology and Society (COMPETECS) at the same university. She holds a PhD in Educational Technology from the University of the Balearic Islands (UIB, Spain). Research collaborator of the Institute for Research and Innovation in Education with the Educational Technology Group of the UIB and member of the Centre for Open Education Research (COER, Oldenburg). Among her research interests are: self-regulated learning, digital competence and (personal) data literacy, personal learning environments (PLE), personal learning networks (PLN), and the use of digital technologies for student-centred teaching and learning, especially in the context of higher education.

✉ Email: victoria.marin@udl.cat

ORCID: [0000-0002-4673-6190](https://orcid.org/0000-0002-4673-6190)

🐦 Twitter: [@vmarinj](https://twitter.com/vmarinj)

Open Access (CC BY 4.0)

© 2020 The Authors. This article is distributed under Creative Commons Attribution 4.0 International licence.

You are free to

- Share — copy and redistribute the material in any medium or format
- Adapt — remix, transform, and build upon the material for any purpose, even commercially.

Under the following terms:

- Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

The full licence conditions are available at: <https://creativecommons.org/licenses/by/4.0/>

Appendix A. Background of the course designs of the sample

Paper	Continent (country)	HE level	Discipline (programme/course)	SCL approach	Course design
(Adinolfi & Gancotti, 2021)	Europe (Italy)	Master	Business, Administration & Law (Programme “Leadership and Change Management”)	Project-based learning	<p>Aims: “to provide leadership skills for small groups, large organizations, and the strategic level, with a particular focus on managing change in the digital dimension.” (p. 4)</p> <p>Initial situation: Before redesigning the course, but after the shift to online learning, a reduction of participation and a higher density of verbal interaction involving a lower number of participants in the different types of sessions was noticeable. Also, attempts to unblock participants’ inhibition was unsuccessful. According to the authors, “the recorded online sessions hindered knowledge transfer, reducing “knowledge entropy” as well as the quality of the interactions, with the loss of tacit and emotional knowledge transfer. In addition, the opportunities of casual interactions diminished drastically, and participants tended to restrict their interactions with those most similar to them.” (p. 10)</p> <p>Description of the (re)design: The redesign of the course included adjustments in the structure of teamwork sessions to facilitate knowledge exchanges and communication, the incorporation of informal meetings without recording and outside the formal schedule and the reduction of the duration of sessions. Participants were also asked to show their face for non-verbal communication. Regarding the programme structure, the third module on critical evaluation was postponed to the fourth module on communication and, within this, an Exhibition Day in presence was organized. Also, some talks to recall and strengthen the teambuilding experiences of the first modules were offered. (p. 11).</p>

Paper	Continent (country)	HE level	Discipline (programme/course)	SCL approach	Course design
(Arcos-Alonso & Alonso, 2021)	Europe (Spain)	Undergraduate	Business, Administration & Law (Course “Statistics Applied to Business”)	Problem-based learning	<p>Aims: Teach students the fundamental aspects of statistical inference and its application to business analysis.</p> <p>Prerequisites: Competencies acquired in the subject taught in the first term of the second year of the BSc.</p> <p>Initial situation and description of the (re)design: The course is in its second phase of the innovation process that began in the academic year 2019/2020, focused on training for transversal competency social and ethical responsibility. In the academic year 2019/2020, it was decided to further delve into social and ethical values and grant greater relative weight to this competency, going from 10% to 50% in the evaluation of the subject. As a result of the digital shift, the eGela and Blackboard Collaborate platforms were used as interaction channels, as well as Skype and email. (pp. 281, 285)</p>
(Ehlers, 2020)	Europe (Germany)	Undergraduate	Business, Administration & Law (Course “New concepts”)	Problem-based learning	<p>Aims: “The course focuses on a red-hot topic: the consequences of digitalisation, artificial intelligence and big data on our society. The key task [...] is to develop a future scenario in the light of artificial intelligence and Big Data of the year 2040” (p. 57).</p> <p>Initial situation and description of the (re)design: The course design was applied and improved for some years, but it was “regularly carried out on campus in blended learning format” (p.572). In this case, the course was exclusively carried out online during the whole semester. It is based on competence learning and built upon the concept of student-centered teaching in a socio-constructivist teaching/learning setting.</p>
(Halaweh, 2020)	Middle East (United Arab Emirates)	Undergraduate	Business, Administration & Law (Course “Innovation and Entrepreneurship”)	Problem-based learning	<p>Description of the (re)design: “The author has adopted PBL as an assessment method in a course, [...] with the project being worth 80% of the total course grade. [...] The course was taught online using Microsoft Teams. The instructor used Teams to create small groups of five to six students who met online to discuss their project separately from the other groups during class time” (p. 5).</p>

Paper	Continent (country)	HE level	Discipline (programme/course)	SCL approach	Course design
(Havenga, 2020)	Africa (South Africa)	Undergraduate	ICT (Course “Computer Science”)	Problem-based learning	Description of the (re)design: “The lecturer restructured the course to enable students to achieve the outcomes using online PBL. The students were required to manage and upload their assignments (PBL robotics tasks) on the eFundi university learning management platform (developed by Sakai). In addition, students used WhatsApp to share information and the lecturer provided additional support regarding some challenges that students experienced with the simulation programs. Particular robotic scenarios were ‘drivers’ for active learning and group work that required problem solving, critical thinking and innovation while employing the PBL approach. Further, opportunities were provided for cooperative problem solving and the development of SDL. Students participated in an online learning community using Zoom” (p. 342).
(Klegeris, 2020)	North America (Canada)	Undergraduate	Natural Science, Maths & Statistics (Course “Biochemistry”)	Problem-based learning	<p>Aims: Students will be able to: (1) Gain knowledge on several human disease-related topics through independent study and mastery of lecture material (2) Apply their knowledge to solve clinically-relevant problems (3) Develop their group-work skills (4) Enhance their ability to read and critically analyse primary research articles (5) Advance their problem-solving skills (6) Improve their critical thinking skills (7) Independently research reliable sources of biomedical information (8) Exercise professional behaviour (9) Reflect on their metacognitive skills (10) Practise effective note-taking techniques during lectures (11) Develop competitive job application packages” (p. 4).</p> <p>Initial situation: In the past, this course consisted of didactic lectures only. It was transformed to mixed-mode instruction over a seven-year period in two stages.</p> <p>During the second stage of three years and concluding in 2018, most in-class lectures were pre-recorded and offered to students as screencasts, in order to dispose of class periods for alternative learning opportunities.</p>

Paper	Continent (country)	HE level	Discipline (programme/course)	SCL approach	Course design
					<p>Description of the (re)design: “Students work in randomly selected groups of seven or eight throughout the first block. Students are not told in advance what diseases will be covered in each block, and they are not expected to study or prepare for the first PBL session. [...] The main challenge was transitioning PBL to an online environment, but it was accomplished with the help of students over a single session”:</p> <p>1) discussion and chat areas were created for each PBL group on the online institutional course platform but during the first remote PBL session all groups independently transitioned to Facebook Messenger, 2) Google Docs was used by the PBL groups to collaborate on online discussions to provide answers to case guiding questions (with previous preparation of each individual student), and 3) before the start of each PBL session, the course instructor emailed a schedule of the 80-minute period to all students. “Each group was required to email the course instructor a single document summarising their online discussion, answers to guiding questions and a list of students participating within 24 hours after the conclusion of the PBL session. The course instructor, or the teaching assistant, combined all PBL-related notes received from individual groups and made this information available to the class on the online course platform” (p. 5).</p>
(Mejía, 2020)	South and Central America (Mexico)	Undergraduate	Natural Science, Maths & Statistics (Course “Electrochemistry”)	Problem-based learning	<p>Initial situation: The author (instructor) had already applied PBL in another experimental course of Electrochemistry for over a decade before this new course. In addition, the author had also started designing this new course based on a PBL approach three years before.</p> <p>Description of the (re)design: The course adopted a group PBL and a flipped classroom approaches combined with a frequent formative assessment through weekly Google questionnaire forms. The activities were designed to be carried out asynchronously and weekly deliverables were to be uploaded to tasks in Edmodo. In synchronous Zoom sessions, doubts and activities were mainly discussed, and general information for the next activities were provided.</p>

Paper	Continent (country)	HE level	Discipline (programme/course)	SCL approach	Course design
(Quintana & Quintana, 2020)	North America (USA)	Master	Education (Course “Principles of Software Design for Learning)	Project-based learning	<p>Aims: “to gain practical experience in designing learning technologies that address key issues in learning sciences, learning theory and human–computer interaction” (p. 526).</p> <p>Initial situation: “The original course design integrates ideas from approaches for teaching design in higher education settings and other work about project-based pedagogies in different fields. The core course activity involves a semester-long group project (3–5 students) to design a learning technology, moving from project proposal to final conceptual prototype” (p. 526).</p> <p>Description of the (re)design: “The instructor approached the shift to online instruction through the lens of care theory, which framed course modifications that aimed to alleviate student anxiety. These changes were also guided by the instructor’s replacement of analytic grading rubrics with a simplified specifications grading approach. [...] The instructor eliminated the final paper requirement and asked students to incorporate the theoretical rationale originally slated for the paper into their project presentation. [...] “After moving online, the instructor continued to hold class at the regularly scheduled time through videoconferencing software. This decision allowed the instructor to use class time for design critiques as before, with some modifications. The instructor introduced whole-group critiques, with each group sharing progress and presenting their design outlines in one session and design sketches in a subsequent session. [...] “Following both of these presentation sessions, the instructor created “breakout rooms” that allowed students to resume their group work” and to get feedback and assistance from the instructor (pp. 528–530).</p>

Paper	Continent (country)	HE level	Discipline (programme/course)	SCL approach	Course design
(Singh et al., 2021)	North America (USA)	Undergraduate	Health & Welfare (Course “Effective Advanced Pharmacy Practice Experience”, APPE)	Case-based learning	<p>Aims: “to develop and refine the students’ knowledge, critical thinking skills, evaluation and assimilation of scientific evidence, attitude, and behavior necessary to provide patient-focused disease management” (p. 185).</p> <p>Initial situation: This online elective APPE rotation was developed to ensure students could continue progressing towards degree completion, following the guidance from the accreditation council for pharmacy education in light of the pandemic.</p> <p>Description of the (re)design: The course was based on asynchronous independent work and synchronous video conferencing using Zoom and the university-supported learning management system, CANVAS. The coordination and implementation of the course was carried out by a diverse team of preceptors comprised of faculty and residents, and 24 other pharmacy professionals served as preceptors or expert presenters. Staff and administrators assisted students with scheduling, information technology support, and other logistical processes and tasks such as daily maintenance and update of CANVAS. The sessions included “time dedicated to individual case work-up followed by case discussion, knowledge assessments, and specialist presentations delivered live via video conferencing, [...] (and) each section rotated every two weeks in each of the following areas: acute care, ambulatory care, and drug information/journal club. Three faculty members, each with expertise in their assigned area, served as section coordinators” (p. 185).</p>

Appendix B. SCL design elements in the sample based on the OLSit framework with examples of quotes for each element and paper

Paper	Own it	Learn it	Share it
(Adinolfi & Giancotti, 2021)	<p>Personally meaningful choice:</p> <p>“Upon the selection interview, the participants are required to <i>specify which issue or challenge they would like to face.</i>” (p. 6)</p>	<p>Prompting, modelling:</p> <p>“The team facilitator has a <i>list of challenging, appreciative questions</i> to promote discussion and brainstorming.” (p. 12)</p> <p>Tools and resources: “Each participant re-examines the path that was suggested by the five questions, by [...] producing, through <i>specific tools and templates</i>, an explicit and reasoned illustration of what has emerged from the individual and collective intuition.” (p. 12)</p>	<p>Artifact generation:</p> <p>“a participant who started with the idea of developing a <i>safety app for train passengers</i>, ended up by developing a new <i>co-creative concept</i> of the relationship between the transportation company and its clients, in a society 5.0 framework.”(p. 13)</p> <p>Authentic audiences:</p> <p>“the groups could present their work in-progress not only to the other participants and to the military staff, but also to an <i>authoritative audience of top managers</i>, who could challenge their ideas constructively” (p. 11)</p> <p>Peer review: “sharing and integrating explicit knowledge [...] is a collective reflection process, organized through <i>peer consultancy groups</i> or group relations conferences.” (p. 12)</p>

Paper	Own it	Learn it	Share it
(Arcos-Alonso & Alonso, 2021)	<p>Personally meaningful choice:</p> <p>“the students were asked to carry out a small investigation about a <i>social topic of choice</i> among four options: fair trade, social and solidary economy, environmental sustainability and NGOs for development” (p. 284)</p>	<p>Prompting, modelling:</p> <p>“considering that the participants were second-year students who were not familiar with the different forms of research dissemination, the teacher <i>showed them academic posters and explained the criteria that they had to meet.</i>” (p. 284)</p> <p>Progress monitoring: “<i>personalised group-by-group attention</i> through the Blackboard Collaborate virtual meetings platform, whereas the interesting doubts were shared in the virtual classroom sessions, reserving a specific space for this.” (p. 285)</p> <p>Tools and resources: “The students had to identify, with the help of the teacher, the <i>adequate statistical tools</i> for the contrast.” (p. 285)</p>	
(Ehlers, 2020)	<p>Internalize the rationale:</p> <p>“Students <i>develop awareness to the existence of different positions</i> on the topic of technology assessment in relation to artificial intelligence, as well as to the <i>need of developing basic ethical attitudes</i> towards the topic.” (p. 62)</p> <p>Endorse the value:</p> <p>“The students are thus dealing with a <i>topic that affects them personally and will also shape their future</i> (professional) everyday life.” (p. 57)</p>	<p>Individual needs:</p> <p>“The consulting and coaching processes explicitly includes both themes, a) the content dimension of learning with feedback and advice <i>on the student’s development of the respective group topics and artefacts</i>, as well as b) the process dimension of learning including feedback on the group collaboration process. In addition to these coaching appointments, students always have the possibility to organise <i>further spontaneous, self-initiated advisory and coaching processes</i> with the teaching team.” (p. 58)</p> <p>Prompting, modelling:</p> <p>“On the basis of assumptions as well as <i>open questions</i>, available literature and foresight studies”. (p. 58)</p>	<p>Artifact generation:</p> <p>“the student groups produce a <i>portfolio consisting of three artefacts: 3-5 pages long essay</i> “Future with AI in 2040” (on the respective group topic), <i>Challenge 2020 video on the respective topic</i> (max. 5 minutes), <i>seven-minute TED-Talk presentation</i> that is presented along with the video to an expert jury during the public final conference.” (p. 58)</p>

Paper	Own it	Learn it	Share it
	<p>Personally meaningful choice:</p> <p>“Students were invited to design their own projects and to <i>choose one of five overarching topics</i> related to artificial intelligence and the future society: Work, education, the life of the individual in society, art and culture, and politics.” (p. 57)</p> <p>Goal setting:</p> <p>“A second step is the <i>development of a “mission statement”</i> of the project group, which focuses on possible approaches to the problem statement.” (p. 58)</p>	<p>Progress monitoring:</p> <p>“Between the individual Challenge Conferences, students have the opportunity to discuss and consult with the teaching team about their questions and topics, work progress, and the learning materials used in <i>approximately one-hour group coaching sessions</i>.” (p. 58)</p> <p>Tools and resources:</p> <p>“The <i>teacher</i> only acts as a learning guide or supervisor; he/she only <i>provides learning resources</i> and takes over the teaching of content only in exceptional cases or to a very limited extent”. (p. 62)</p>	<p>Authentic audiences: “From the beginning, students are informed that the course will end with a <i>student conference</i>, in which all artefacts will be presented to a <i>jury and the public</i> (including both the academic and professional public, as well as the broader public via online media).” (p. 62)</p> <p>Peer review: “Through a peer-assessment process, <i>students also act as feedback providers and jurors</i>, as they evaluate the essays (artefact a) vote to award the best essays. [...] Elements of peer feedback and peer assessment are integrated into the assessment.” (pp. 58-61)</p> <p>Web 2.0 publications: “This online conference was streamed live and the <i>resulting student works</i> [...] were published on the project website.” (p. 57)</p>

Paper	Own it	Learn it	Share it
(Halaweh, 2020)	<p>Endorse the value:</p> <p>“through a <i>project that tackles a real-world problem</i>” (p. 6)</p>	<p>Progress monitoring:</p> <p>“Students worked on their group project in phases and had to <i>meet certain milestones</i> during the semester to demonstrate their progress.” (p. 5)</p> <p>Tools and resources:</p> <p>“The students found it is easier to <i>work remotely via Teams</i> on their ideas as they were recording their notes immediately on their computer, using the <i>Internet to find relevant information, using the drawing function</i> on their computer, and using screen sharing among themselves and with the instructor to get feedback.” (p. 5)</p>	<p>Artifact generation:</p> <p>“students were working on <i>creating prototypes for a product, website, mobile application, house, park</i> or whatever the project domain entailed.” (p. 6)</p> <p>Authentic audiences:</p> <p>“present their project outcome to the public (public product) through <i>participation in a national innovation competition</i>”. (p. 5)</p>

Paper	Own it	Learn it	Share it
(Havenga, 2020)	<p>Goal setting:</p> <p>“Each student needs to program and move his or her own robot using the simulator. This is an <i>open-ended problem</i>.” (p. 342)</p>	<p>Prompting, modelling:</p> <p>“the lecturer <i>provided additional support</i> regarding some challenges that students experienced with the simulation programs (teacher presence).” (pp. 341-342)</p> <p>Progress monitoring:</p> <p>“After finalising these tasks, each student must complete the <i>weekly reflective sheet template</i> (comprising questions on responsibilities, cooperation, commitment, addressing of challenges and peer assessment).” (p. 342)</p> <p>Tools and resources:</p> <p>“The students were required to manage and upload their assignments (PBL robotics tasks) on the <i>eFundi university learning management platform</i> (developed by Sakai). In addition, students used <i>WhatsApp</i> to share information (social and cognitive presence). [...] Students participated in an online learning community using <i>Zoom</i> (online discussion through a cloud-based platform) [...]” (pp. 341-342)</p>	<p>Artifact generation:</p> <p>“Make <i>video recordings</i> of your programming efforts using your mobile phone.” (p. 342)</p> <p>Peer review:</p> <p>“your team needs to <i>select the ‘best’ example and add some functionality</i>.” (p. 342)</p>

Paper	Own it	Learn it	Share it
(Klegeris, 2020)	<p>Internalize the rationale:</p> <p>“The first in-class period of each term is spent <i>detailed the procedures of the course in general, and PBL activities in particular, as well as the expected learning outcomes</i>”. (p. 4)</p> <p>Endorse the value: “<i>students were expected to independently research learning objectives directly relevant to the PBL case discussed in class before returning to the next session.</i>” (p. 8)</p> <p>Personally meaningful choice:</p> <p>“At the end of each session, <i>students, with the help of the instructor, identify seven to twelve questions addressing topics that are deemed challenging or could help solve the case (learning objectives).</i>” (p. 4)</p>	<p>Prompting, modelling:</p> <p>“On the first day of PBL activities, students are presented with the initial information about the clinical case displayed as several slides on the large screens in the classroom. On each slide, up to <i>four guiding questions</i> accompany the case information consisting of text and images.” (p. 4)</p> <p>Tools and resources:</p> <p>“As the PBL case progresses, <i>three to four relevant original research articles per block</i> are selected by students or assigned by the instructor as examinable material.” (p. 4)</p>	<p>Peer review:</p> <p>“Students are expected to research all learning objectives independently, and their <i>level of preparation is evaluated by their peers</i> during the subsequent PBL session.” (p. 4)</p>

Paper	Own it	Learn it	Share it
(Mejía, 2020)	<p>Internalize the rationale:</p> <p>“El problema sirvió entonces como una <i>actividad integradora, que ponía en uso los saberes construidos y las habilidades conseguidas hasta ese momento</i>, esto es, los estudiantes tuvieron la oportunidad de desarrollar competencias científicas en una comunidad de aprendizaje”. (p. 139)</p> <p>Endorse the value:</p> <p>“El problema propuesto en el ambiente de ABP lo presenté a los estudiantes desde el inicio del curso con esta pregunta: <i>¿Cómo construir una pila con materiales baratos, de uso doméstico, y que no representen un problema ambiental? Además, discutimos la importancia de una fuente de energía de emergencia, como las pilas</i>, en lugares donde la electricidad es inaccesible. El curso ya estaba planeado para usar esta experiencia como un <i>pretexto para enganchar la atención de los estudiantes, y para enculturarlos con una práctica epistémica de la electroquímica</i>.” (p. 139)</p>	<p>Individual needs:</p> <p>“manejar actividades asíncronas permite que los <i>estudiantes distribuyan sus tiempos y espacios de mejor manera</i>, entrenándolos para mejorar sus funciones ejecutivas y su autorregulación”. (p. 142)</p> <p>Prompting, modelling:</p> <p>“Formar equipos, en ambientes de ABP, es fundamental también porque, para entender la complejidad del conocimiento hay que negociarlo y adquirirlo desde la complejidad de la interacción con los compañeros de clase. Esta premisa posibilita la <i>discusión desde diferentes niveles de entendimiento y hace posible el avance en las zonas de desarrollo próximo</i>, hasta alcanzar un entendimiento mejor y más homogéneo.” (p. 139)</p> <p>Progress monitoring:</p> <p>“Programé dos reuniones por equipo, espaciadas en el tiempo, para dar realimentación específica acerca del avance de la resolución del problema. Estas <i>reuniones grupales de treinta minutos de realimentación</i> fueron fundamentales para que los estudiantes despejaran dudas y consiguieran éxito en el entendimiento de su problema por equipo. [...] Los <i>cuestionarios semanales</i> en los formularios de Google sirvieron como evaluación formativa, porque había realimentación inmediata en las sesiones presenciales.” (pp. 139-140)</p>	<p>Artifact generation:</p> <p>“los equipos entregaron la propuesta de su pila en forma de un <i>trabajo escrito</i> que estaba dirigido por una rúbrica (discutida en las sesiones de realimentación por equipo), y un <i>video o una infografía</i>”. (p. 141)</p> <p>Authentic audiences:</p> <p>“un video o una infografía, que mostraba al <i>público fuera del aula</i> sus resultados” (p. 141)</p> <p>Web 2.0 publications:</p> <p>“<i>un video o una infografía</i>” (p. 141)</p>

Paper	Own it	Learn it	Share it
(Quintana & Quintana, 2020)	<p>Internalize the rationale:</p> <p>“The instructor presented students with a <i>specifications</i> list during the first synchronous online session and explained how <i>each item is related to a course-learning goal</i>.” (p. 529)</p> <p>Personally meaningful choice:</p> <p>“<i>individual students select and critique a learning technology</i>” (p. 527)</p> <p>Goal setting:</p> <p>“(in the specification list) Clear vision of learning goals: <i>Articulates clearly specified learning goals</i> that allow learners to show evidence of their learning, including what learners should be able to know, do and feel; Learning goals are specific, observable and measurable”. (p. 530)</p>	<p>Individual needs:</p> <p>“In this session, a second document was used for each group to <i>list specific areas they wanted feedback on</i>.” (p. 529)</p> <p>Prompting, modelling:</p> <p>“Student–teacher and student–student interactions are key to scaffolding learning as students learn content and complete their design project. <i>Weekly design reviews</i> are pivotal and act as scaffolding mechanisms, as the instructor meets with groups to discuss progress, pose and answer questions and provide feedback. [...] The instructor provided the class with a <i>collaborative word processing document to ask questions of each group</i>.” (pp. 526-529)</p> <p>Progress monitoring:</p> <p>“<i>the instructor meets with groups to discuss progress, pose and answer questions and provide feedback</i>” (p. 526)</p> <p>Tools and resources:</p> <p>“<i>Course readings, using Perusall for social annotation to highlight, comment and respond to comments; Review of lecture slides for reference; Course assignments guided by rubrics</i>. [...] Design activity is complex as students use different tools, artifacts, research and storyboards.” (p. 527)</p>	<p>Artifact generation:</p> <p>“Semester-long group <i>design project to design software that supports learning</i>. [...] <i>Final reflection paper</i> where individual students reflect on their role on the group project and provide other feedback about their work”. (p. 527)</p> <p>Authentic audiences:</p> <p>“Additionally, the online format inspired the instructor to ask students to invite <i>respected professors and industry experts to join their final presentations</i>.” (p. 531)</p> <p>Peer review:</p> <p>“Additionally, <i>the instructor occasionally pairs up groups for informal interim design reviews</i> on the progress of each group’s design project, allowing for peer feedback.” (p. 526)</p>

Paper	Own it	Learn it	Share it
(Singh et al., 2021)	<p>Internalize the rationale:</p> <p>“The goal was to <i>expose students to difficult situations they may encounter in practice settings</i> and provide specific practice in addressing unengaged patients.” (p. 186)</p> <p>Endorse the value:</p> <p>“Once a week there was a brief discussion on the concept of “trust but verify” in terms of the data that are presented on rounds by medical interns and residents. This activity helped the students to <i>understand that it is important to independently verify any information discussed on rounds prior to implementing a plan.</i>” (p. 187)</p>	<p>Prompting, modelling:</p> <p>“Some cases included <i>question prompts</i> to focus on developing student clinical reasoning skills. [...] During this time, two preceptors were available to answer clarifying questions and provide additional information related to the case, as requested. [...] During (the) role-play activity, one preceptor assumed the role of a patient while another preceptor played the role of a pharmacist. Based on the <i>scenario presented</i>, all students were directed to design a plan.” (p. 186)</p> <p>Tools and resources:</p> <p>“the preceptor shared <i>past direct messages received from a medical team</i> to illustrate other forms of interaction with providers. The students were given a few minutes to use <i>resources</i> and respond to the question in a timely manner.” (p. 187)</p>	<p>Artifact generation:</p> <p>“Students spent ~4 hours preparing a case plan following a SOAP note format to pre- sent later in the day.” (p. 186)</p>