RECOMMENDATIONS FOR DESIGNING COLLABORATIVE ACTIVITIES IN ONLINE HIGHER EDUCATION: A SYSTEMATIC REVIEW

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Abstract

Online learning, especially in higher education, has grown in recent years and the study of its didactic implications has also increased. Online experiences have been found to be as successful as face-to-face ones, but there is a concern about a lack of social interaction among students. This makes it necessary for teachers to plan collaborative activities. Therefore, the aim of the present work is to analyse the main design features of collaborative activities that have been reported as successful in higher education. A total of 46 articles published between the years 2018 and 2023 were analysed in a systematic review based on the PRISMA Statement. Their main elements were grouped into three categories: contextual factors; pedagogical strategies; and ICT tools and resources that favour the development of such activities. By way of conclusion, recommendations for the design and instruction of a collaborative higher education activity in an online environment are presented.

Keywords – Collaborative learning, ICT, Higher education, Instructional design, Computer assisted instruction.

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1. Introduction

The online learning modality is an important trend in education that has generated growing interest in the scientific community (Boom-Cárcamo, Garcia-Payares, Vergel-Castro & Boom-Cárcamo, 2022; Metchik, Boyd, Kons, Vilchez, Villano, Lazar et al., 2021), especially in higher education where it is expected that it will represent 30% of all of the educational offer (Haugland, Rosenberg & Aasekjær, 2022). Studies have shown that online experiences are as successful as face-to-face ones. However, some researchers have expressed their concern about a possible lack of social interaction, as well as disconnection and isolation in participants (Almahdi, Al-Murshidi & Al-Mahdi, 2023). For these reasons, the implementation of methodologies that foster teamwork has been studied, such as collaborative learning, as some researchers argue that activities designed to be highly social improve students' learning (Ni, 2013).

"Collaborative learning is an educational approach to teaching and learning that involves groups of learners working together to solve a problem, complete a task, or create a product" (Laal & Ghodsi, 2012: page 486). It is thus essential for group members to take greater responsibility in the acquisition of individual knowledge through common effort (Barnes, 2008) and, in turn, for teachers to develop students' interest and motivation in a more autonomous knowledge acquisition process (Amory, 2014).

Accordingly, a variant called Computer-Supported Collaborative Learning (CSLC) has been developed in recent decades, which allows positive collaboration between the members of a group, supported by information and communication technology which creates shared knowledge bases (Zapatero, Giusto-Valle & León, 2022).

According to the analysis by authors such as Van Huynh and Doan (2022), in collaborative learning, students improve their grades, increase their self-esteem, reduce anxiety and develop social assistance and a positive atmosphere for cooperation is established. Furthermore, Leong, Hassan, Isa and Ab-Jalil (2018) mention that in the framework of a social interaction students will learn to debate ideas with classmates, exchange different viewpoints and question others, improving individuals' conscience of their self-efficacy and their research capacities. Ultimately, collaborative learning involves working on higher-order thinking, such as managing and organising ideas, critical analysis, problem solving and creating new learning (Al-Ajmi, 2021). In this way, and if collaborative learning is managed correctly, learners develop greater emotional intelligence and good social skills, something that can lead to them being more successful in life as they have the capacity to deal with people (Leong et al., 2018).

The greater accessibility of the internet and the development of ICT have meant that many academics can offer collaboration experiences in online settings (Hur, Shen & Cho, 2020). This means that teachers and tutors have to reconsider their teaching methods (Erragcha, Babaym, Bchir & Saidi, 2022) and so we believe it is of interest to analyse collaborative activities that have positive results to define the general characteristics that should be considered in their design. So, the research questions of the present systematic review are:

What are the characteristics of online collaborative activities that have been implemented with positive results in higher education?

What ICT tools have been used to complement the collaborative activities designed for higher education?

What general recommendations about the design and implementation of collaborative activities can we conclude from this analysis?

2. Methodology

This review was based on the PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses, Moher, Shamseer, Clarke, Ghersi, Liberati, Petticrew et al., 2015), one of the most widely used methodologies for this type of study as it provides a checklist of important aspects to consider. As keywords for the search are used: "collaborative learning" AND (online OR virtual) AND (university OR "high education") AND design. These were selected with the aim of finding articles in which an educational intervention is designed that uses collaborative learning in online university education, thus enabling us to analyse their characteristics and make recommendations for their design.

The search used the Web of Science (WoS) and Scopus databases as these include the journals with the highest impact in the scientific field. We also decided to include the Eric database as it specialises in education. To make the search more specific, the following inclusion criteria were set:

- Publications from the years 2018-2023.
- Journal articles.
- Research carried out in the field of university education (university degree courses and programmes).

- Studies carried out in online settings.

A total of 211 references with these criteria were initially obtained. These were imported into an information management program. After screening for repetitions, 69 references were excluded. To reject articles that did not match the study objective, we set exclusion criteria:

- Works not published in English or Spanish.
- Theoretical studies or reviews.
- Studies where collaborative learning is combined with another methodology.

A first screening was carried out, analysing the title of the article, followed by the abstract and ending with in-depth reading of the whole document (Figure 1). Accordingly, were analyzed a total of 46 articles.
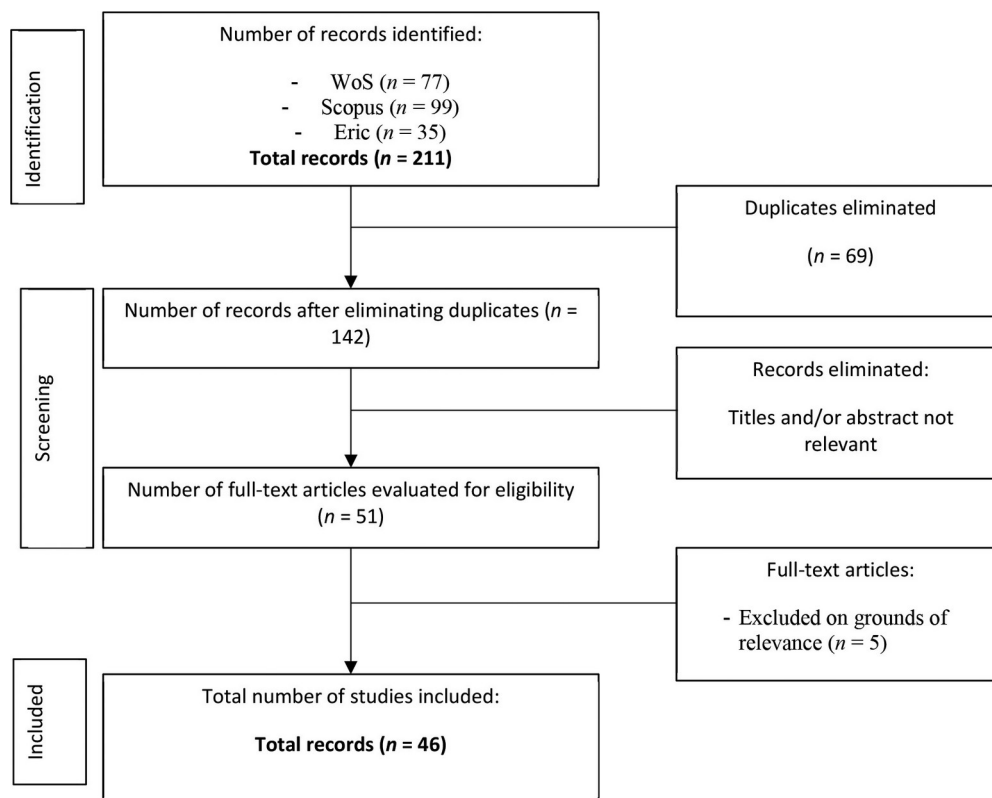

Figure 1. Flow chart of search results

3. Result

As explained above, collaborative learning has attracted significant attention in the field of online education. With the increasing number of students enrolled on online university courses, there is a growing need to design effective collaborative learning situations in online settings (Stanley & Zhang, 2020). Collaborative learning is an educational instruction design in which students work together in groups to achieve shared learning objectives, something that fosters active participation, critical thinking, problem solving and the development of communication skills among the students (Ajayi & Ajayi, 2020; Hernández-Sellés, Muñoz-Carril & González-Sanmamed, 2019; Hur et al., 2020; Kwiatkowska & Wiśniewska-Nogaj, 2021; Leong et al., 2018; Mayweg-Paus, Zimmermann & Lefke, 2021). For these reasons, collaborative learning in online university contexts is a valuable tool that facilitates the construction of knowledge among students and which teachers must know how to design and implement.

This is not without challenges that must be addressed to achieve effective results in light of the results obtained, as shown in Table 1, which displays the advantages and challenges in the three dimensions that

can be identified from a reading of the different articles: academic skills, social skills and digital competences.

Dimensions		Evaluation of learning experiences	Review articles
Academic skills	Advantages	Improves learning outcomes	(Ajayi & Ajayi, 2020; Anduvare & Holmner, 2020; Cuetos, 2021; Haugland et al., 2022; Hill, 2021; Mohd-Kassim, Darus, Lee, Bala-Subramaniam & Januin, 2022)
		Favours meaningful learning	(Yilmaz & Karaoglan-Yılmaz, 2020)
		Improves debating and reasoning skills	(Haugland et al., 2022; Leong et al., 2018; Ngai, Wing-Man, Pak & Dongying, 2019; Ouyang, Chen, Cheng, Tang & Su, 2021)
	Challenges	Presents difficulties for people who are not accustomed to self-reflection	(Hu, Yu, Tzen & Zhong, 2023; Marden & Herrington, 2021)
		Need for prior training for teachers	(Burch & Bunnag, 2023)
Interaction and socio-affective skills	Advantages	Improves the development of social communication skills in virtual settings	(Al-Ajmi, 2021; Almahdi et al., 2023: Erragcha et al., 2022; Hill, 2021)
	Challenges	Unequal participation by group members	(Jamridafrizal & Ibrahim, 2019; Kalmar, Aarts, Bosman, Ford, de Kluijver, Beets et al., 2022; Kilis & Yıldırım, 2018; Muñoz, Hernández, Fuentes-Abeledo & Gonzalez-Sanmamed, 2021; Stanley & Zhang, 2020; Tezer, Yildiz, Bozkurt & Tangul, 2019)
		Difficulty establishing clear and effective communication	(Hovlid, Husabo, Valestrand & Hartveit, 2022; Hur et al., 2020; Inada, 2022; Wen, 2022)
Digital competences	Advantages	Fosters education regarding ethical questions in digital collaboration	(Hu et al., 2023)
		Stimulates use of digital tools for sharing knowledge	(Jamridafrizal & Ibrahim, 2019; Kalmar, Aarts, Bosman, Ford, de Kluijver, Beets et al., 2022; Lee, Chern & Azmir, 2023; Metchik et al., 2021; Reyna, 2023)
	Challenges	Possibility of digital barriers or divides in the adoption of innovative technologies in learning	(Lizcano-Dallos, Barbosa-Chacón & Villamizar-Escobar, 2019; Ngai et al., 2019; Vitalaru, 2019; Voigt, Stadelmann, Meuth, Funk, Ramisch, Niemeier et al., 2021)
		Possible appearance of dependence on digital platforms	(Lee et al., 2023; Rakha, 2023; Tiruwa, Yadav & Suri, 2018)

Table 1. Advantages and Challenges of Online Collaborative Learning

These elements have been grouped into three sections to favour understanding of the main elements relating to the design of collaborative learning proposals that must be taken into account according to the articles consulted. First, we present the contextual factors, then pedagogical strategies and finally the tools and resources that favour the development of these instructional designs.

Effective online collaborative learning design depends on a holistic approach. Contextual factors set the stage by recognizing the unique characteristics of each learning environment. Pedagogical strategies provide the framework for meaningful collaboration through careful planning of group formation, task design, and instructor facilitation. ICT integration provides the necessary tool set, but it is the inclusion of social factors that fosters a sense of community, addresses group dynamics, and ultimately transforms a transactional experience into a learning community.

3.1. Contextual Factors

These factors include teachers' prior experience of designing collaborative learning, students' reluctance to participate in collaborative activities and institutional emphasis on individual evaluation. Regarding teachers' prior experience, it has been found that a lack of prior experience of designing collaborative learning activities can hinder the creation of meaningful and effective learning experiences for students (Al-Ajmi, 2021; Hur et al., 2020; Inada, 2022; Kalmar et al., 2022; Wang, Lin, Wu & Huang, 2020; Wen, 2022). In addition, it is also noted that students can be hesitant to participate in collaborative activities owing to the lack of familiarity or comfort with the concept (Ergulec & Zydney, 2019; Kumi-Yeboah, 2018; Metchik et al., 2021; Muñoz et al., 2021; Ouyang et al., 2021). Furthermore, institutional systems that prioritise individual evaluation can deter students from participating actively in collaborative learning, as they can see it as a deviation from the norm (Hovlid et al., 2022; Kalmar et al., 2022; Kumi-Yeboah, 2018; Tezer et al., 2019).

Based on the articles selected, we can conclude that overcoming these challenges requires teachers to be provided with training and support to improve their comprehension and skills in the design of collaborative-learning experiences (Al-Ajmi, 2021; Ergulec & Zydney, 2019; Hovlid et al., 2022; Inada, 2022; Kumi-Yeboah, 2018; Ouyang et al., 2021; Tezer et al., 2019; Wen, 2022). The studies consulted recommend, in relation to teacher training, the promotion of professional development programmes and workshops that focus on collaborative learning pedagogies and the integration of technological tools to facilitate online collaboration (Hovlid et al., 2022; Kumi-Yeboah, 2018; Tezer et al., 2019; Wen, 2022).

With regards to students, the fact that they must receive guidance and support to develop their collaborative skills and their technological competence is underlined (Ergulec & Zydney, 2019; Hovlid et al., 2022; Wen, 2022). This can be achieved through workshops, tutorials and resources that provide step-by-step instructions for using online collaboration tools and strategies for effective teamwork (Tiruwa et al., 2018; Zapatero et al., 2022).

3.2. Pedagogical Strategies

In addition to the contextual factors, the design of collaborative learning in online university settings also faces challenges relating to pedagogical strategies relating to instructional design. These challenges include ensuring effective creating in the distribution of the groups (Jamridafrizal & Ibrahim, 2019; Kilis & Yildirim, 2018, Kwiatkowska & Wiśniewska-Nogaj, 2021; Mayweg-Paus et al., 2021), monitoring communication between their members (Mayweg-Paus et al., 2021; Metchik et al., 2021; Mohd-Kasim et al., 2022; Ngai et al., 2019), setting clear learning objectives (Cho & Cho, 2020; Kwiatkowska & Wiśniewska-Nogaj, 2021; Mayweg-Paus et al., 2021; Mohd-Kasim, 2022; Zhang, Zhang & Wang, 2022), and creating guidelines for collaboration (Hernández-Sellés et al., 2019; Kwiatkowska & Wiśniewska-Nogaj, 2021; Metchik et al., 2021; Mohd-Kasim et al., 2022; Yilmaz & Kraoglan-Ylimaz, 2020; Zhang et al., 2022).

More specifically, close attention must be paid to careful design of the digital learning environments to avoid superficial interactions (Barnes, 2008; Burch & Bunnag, 2023), moreover, and with regards to teaching skills, the capacity to manage effectively the interaction by groups in virtual settings is required to avoid conflicts and misunderstandings (Haugland et al., 2022; Ouyang et al., 2021) as well as knowledge in digital settings and skills for handling tools that allow sufficient attention to diversity in these learning settings (Wen, 2022).

However, the influence of the quality of the design of collaborative educational approaches on the results obtained is not only found in online learning. Both in virtual settings and face-to-face, features of collaborative learning are observed that must be taken into account when designing instruction in educational interventions with the aim of developing effective learning situations. Table 2 shows the concerns most frequently mentioned in both working modalities, which are drawn from the main conclusions of the works consulted.

One of the most frequently identified strategies for tackling the main challenges that collaborative learning in virtual settings encounters is to make students participants in the design of collaborative instruction, as Ergulec and Zydney (2019) suggest, regarding the functions and planning of the activities to do in the collaboration. Studies such as those by Leong et al. (2018), Ngai et al. (2019) and Zhang et al. (2022) conclude that when instructors offer students opportunities to participate in meaningful and purposeful collaborative activities, a sense of belonging and interrelation between students can be fostered that is already favoured by the collaborative process.

	Collaborative Face-to-Face Learning	Online collaborative learning
Social interaction	Face-to-face or technology-mediated interaction between students and teachers.	Interaction through online platforms and communication tools.
Technology	Limited use of technology compared with online learning.	Extensive use of technology, including online educational platforms, collaboration tools and multimedia.
Flexibility	Less flexibility in terms of times and location. Classes usually follow a fixed timetable in a physical space.	Greater flexibility with regards to time and location. Students can access content and participate in activities from anywhere with an internet connection.
Evaluation	Real-time evaluation, such as participation in discussions in class and group activities supervised by the teacher.	Online evaluation through platforms, that can include online exams, collaborative projects and discussions in forums. Difficulty determining individual participation is observed.
Motivation	In-person social interaction can increase students' motivation and dedication.	Motivation can depend to a large extent on students' self-discipline and capacity to participate actively online and so must be considered when designing the action.
Collaboration	Collaboration principally takes place in face-to-face classes and in physical study groups.	Attention to collaboration mainly done through online tools, such as chats, forums and shared documents.
Teacher supervision	The teacher must supervise and guide interactions in person during the classes.	The teacher must supervise and guide online interactions through. educational platforms and provide feedback using digital methods.

Table 2. Characteristics of face-to-face and online collaborative learning

Finally, an important aspect in the design of collaborative instruction in an online setting is selecting appropriate technological tools to support collaboration (Cuetos, 2021; Leong et al., 2018; Marden & Herrington, 2021; Tiruwa et al., 2018; Wang et al., 2020; Zhang et al., 2022). Therefore, it is considered necessary to end the analysis with a study of the ICT tools that have been used for this end.

3.3. Integrating ICT as Support for Collaborative Learning

The dynamic methodology of collaborative learning along with the progress digital technologies have undergone over the last decade offer new pedagogical opportunities and create a wide variety of possibilities for configuring learning environments. In fact, collaborative work is regarded as an excellent support for the appropriate use of ICT in the teaching–learning process (García-Lázaro, 2019). Genuinely collaborative work serves as the foundation for implementing digital resources and applications that positively influence meaningful learning and the suitability of the paces of learning (Lizcano-Dallos et al., 2019).

The integration of ICT into collaborative activities is proposed from the perspective of it being a catalyst for learning and, as a means of keeping education up to date and ensuring innovation, focussed on achieving better quality education (Pacheco, 2021). That is to say, treating ICT as an instrument and not as an end in itself, a tool whose primary objectives are to provide a better academic experience for students, to foster more efficient learning and, ultimately, to promote the integral development of the students (Reyna, 2023).

Multimedia resources consolidate participation, positively influence the learning of meaningful content and increase the transfer of this content to new situations (Yaxón-Batén, 2020). They enrich online collaborative activities because they facilitate active control of learning by students by optimising access to learning content, interaction and the exchange of ideas between peers and with the teacher (Hernández-Sellés et al., 2019). In turn, for the teacher, they facilitate oversight of individuals and the group, management and administration of the students and the creation of scenarios for co-evaluation and self-evaluation (Reyna, 2023).

ICT-supported collaborative activities must be structured in a way that involves true collaboration to achieve construction of learning. The design will be based on two essential principles: technology that is accessible to students and incentivisation of active collaboration (Hill, 2021). The teacher will coordinate learning situations for collective knowledge building, especially in 3 distinct fields: as a source of information, as an instrument for completing concrete tasks and as a roadmap for work.

There is a wide variety of digital tools with possible collaborative applications, and teachers must carefully choose the applications to use in each different phase of the process in order to build an end product or solution for the problem. It is generally advisable to integrate tools that boost real time communication, debates and collaborative publication of documents among the members of a team and also simplify pedagogical work (Lizcano-Dallos et al., 2019). Ultimately, the teacher must design with the aim of generating positive interdependency between activities, tasks and participants.

The trends in the use of the ICT tools in collaborative learning (Table 3) can be divided into three areas: communication on social networks, effective knowledge organisation and management and a work roadmap. These are analysed below.

	Utility	Tools	Review articles
Communication on social networks (Cho & Cho, 2020)	Group interaction in forums or chats Multimedia downloads and text messaging	WhatsApp Facebook WeChat	(Lee et al., 2023) (Tiruwa et al., 2018) (Burch & Bunnag, 2023)
Effective Organisation and Management of Knowledge (Anduware & Holmner, 2020)	Downloading/uploading materials Comprehension, writing and application Platforms	Wikis Linoit Microsoft TEAMS Blackboard Collaborate	(Flores-Cueto, Garay-Argandoña & Hernández, 2020) (Cuetos, 2021) (Voigt et al., 2021) (Rhaka, 2023)
Work roadmap	Development and construction Search, research and innovation Evaluation, feedback and personalization	Virtual reality Virtual avatar Artificial intelligence	(Dirin, Nieminen, Laine, Nieminen & Ghalabani, 2023) (Hu et al., 2023) (Oravec, 2023)

Table 3. Trends in the use of ICT tools in collaborative learning

3.3.1. Communication and Access to Information

Although social networks were not originally developed for collaborative work, teachers often use them to improve communication and collaboration among their students owing to their interactive and open character and adaptive nature (Cho & Cho, 2020). Social networks reinforce the collaborative process at 3 levels in particular: creating content; communicating with others; and sharing resources between students and teacher. The success of the process depends on the balance between the two key necessary components: the cognitive and the social. The cognitive dimension involves characteristics such as task regulation and knowledge construction while the social dimension involves aspects such as participation and social regulation.

In this digital era, use of social networks is common among young people, creating bonds of relationship and gradually changing how they socialise and interact with one another. The WhatsApp mobile instant messaging application is a very popular tool for communication between adolescents and is increasingly used as a tool in collaborative learning in higher education (Lee et al., 2023), as it supports multimedia downloads and text messages. Moreover, as almost all students are connected to Facebook, this also has great potential to be a useful educational tool. Specifically, Facebook enables communication and interaction between students as well as sharing academic study material, especially text, audio and video (Tiruwa et al., 2018). Although it is somewhat less popular, WeChat also has useful features for collaborative learning in learning communities as it promotes active learning, with an increase in commitment and academic performance being observed (Burch & Bunnag, 2023).

3.3.2. Organisation and Management of Knowledge

Effective knowledge management is an essential factor for organising learning. This involves providing a roadmap for the technology assisted collaborative process in the knowledge creation, storage and retrieval phases, in decision making to solve problems and finally in the application of the knowledge acquired (Anduware & Holmner, 2020). In this sense, specific multimedia tools are available such as wikis, Linoit and various platforms that support research, teaching and innovation activities.

Studies on the implementation of wikis underline their open and flexible nature (Vitalaru, 2019). They present information in a visually attractive way that stimulates student participation, and easy publishing of content, which can be updated by any member of the team, something that facilitates monitoring by the teacher (Flores-Cueto et al., 2020). Ultimately, it improves students' analytic competences and their capacity for critical evaluation.

Creating posters and murals is one of the most highly valued didactic strategies in the construction of learning and acquisition of competences. Linoit stands out as a tool for its versatility and dynamism, enabling the teacher to organise, insert and combine multimedia elements. As Cuetos (2021) notes, its integration in a collaborative-learning space allows teachers to explore learning strategies as it adapts to any type of information and/or subject, it fits the different learning styles of the students, and it extends to any phase of the teaching–learning process, from detection of ideas prior to starting, the collaborative work phase, synthesising conclusions, displaying results, and evaluation.

Platforms act as a digital centre that supports conversations, content, tasks and applications. Innovative use of Microsoft Teams allows effective organisation of the teaching programme, with online classrooms, a video portal and learning areas for individual and group learning (Voigt et al., 2021). Blackboard Collaborate is a powerful platform with a variety of tools that facilitate educational activities. It includes a fully interactive web conference environment, a public and private chat function, a blackboard, shared use of applications and a library of pre-designed images, and finally adding and editing content at any moment (Rhaka, 2023).

3.3.3. Process Roadmap

Virtual reality will become a generalised tool in education in the near future, because digital simulation involves immersion in a more experiential and practical knowledge setting. These immersive and interactive environments focus on learning through action and maximise student motivation (Dirin et al., 2023).

There are also online platforms that promote social interaction through personalised avatars. In this way, students communicate in real time using audio, video, emojis and text, and they interact in a safe and pleasant virtual space, designed by the teachers. The use of virtual avatars and the correct design of learning missions based on games provide guidance during the problem-solving process and promote positive effects on students' motivation and academic performance in a virtual setting (Hu et al., 2023).

Virtual reality and augmented reality technologies are also examples of how Artificial Intelligence (AI) is facilitating collaboration and feedback in the educational environment (Sanabria-Navarro, Silveira-Pérez, Pérez-Bravo & Cortina-Núñez, 2023). Collaborative learning platforms integrated with AI allow students to interact and share knowledge in virtual spaces, promoting the formation of learning communities, communities of practice and the development of collaborative and social skills, which are enriched by active methodologies.

4. Discussion and Conclusions

This systematic review analyses the characteristics of the design of collaborative activities used in higher education, specifically in online settings, and it sets out to answer three research questions.

Firstly, what are the characteristics of online collaborative activities that have been implemented with positive results in higher education?

Unlike face-to-face collaborative learning, the literature review identified some key aspects such as prioritising clarity, structure and alignment with learning objectives. Likewise, to facilitate effective online collaboration, it is recommended that teachers shift their focus from being the sole provider of knowledge to become facilitators and guides in the learning process. Therefore, activities should be designed in a way that fosters active participation by all students, promotes interaction and facilitates meaningful learning. In addition to these strategies, it is crucial to establish clear rules and guidelines for online collaboration. These rules must include clear expectations about results (Almahdi et al., 2023; Haugland et al., 2022; Hernández-Sellés et al., 2019; Mohd-Kasim et al., 2022; Yilmaz & Kraoglan-Ylimaz, 2020), establish specific rules on mutual respect (Leong et al., 2018; Mayweg-Paus et al., 2021; Ngai et al., 2019), and also include timely sending of work that is appropriate to the needs of the students (Cho & Cho 2020; Mohd-Kasim et al., 2022; Zhang et al., 2022).

An analysis was also conducted to answer the second question regarding which ICT tools have been used to complement the collaborative activities designed for higher education. We analysed them from 3 areas of interest.

Messaging apps have been used (WhatsApp or WeChat) have been used to facilitate communication and as information sources and social networks such as Facebook have been used as instruments for developing concrete tasks and as working roadmaps (Burch & Bunnag, 2023; Lee et al., 2023, Tiruwa et al., 2018).

Various platforms for supporting effective organisation and management of knowledge have been studied, such as wikis (Flores-Cueto et al., 2020), Linoit (Cuetos, 2021) and Microsoft TEAMS (Voigt et al., 2021), as these provide a digital centre that hosts conversations, content, tasks and applications that support management of collaboration.

Furthermore, to provide the roadmap for the process, online platforms have been used that promote social interaction and foster the use of personalised avatars (Hu et al., 2023) as well as virtual reality which, in the near future, will provide more experiential and practical immersion (Dirin et al., 2023).

Whatever the purpose of each ICT tool, it is advisable to regard them as instruments and not as ends in themselves (Reyna, 2023) as they boost participation in a way that influences collaborative learning (Hernández-Sellés et al., 2019, Yaxón-Batén, 2020). Therefore, it is important to structure the activity on the basis of two fundamental principles: technology must be accessible to all students and active collaboration between them must be incentivised.

Finally, what general recommendations about the design and implementation of collaborative activities can be concluded from this analysis?

Having analysed all of the information, the authors make a number of recommendations for design and collaborative instruction in online education (Figure 2). There are specific recommendations to take into

account in Phase 1 (the preliminary design of the activity), Phase 2 (during the realisation of the collaborative activity) and Phase 3 (once it has been completed).

The design of the activity is very important, but it is necessary to take into account that the key factor will be achieving interaction between the different members of the team and so the choice of the ICT tools and the role of the teacher are fundamental.
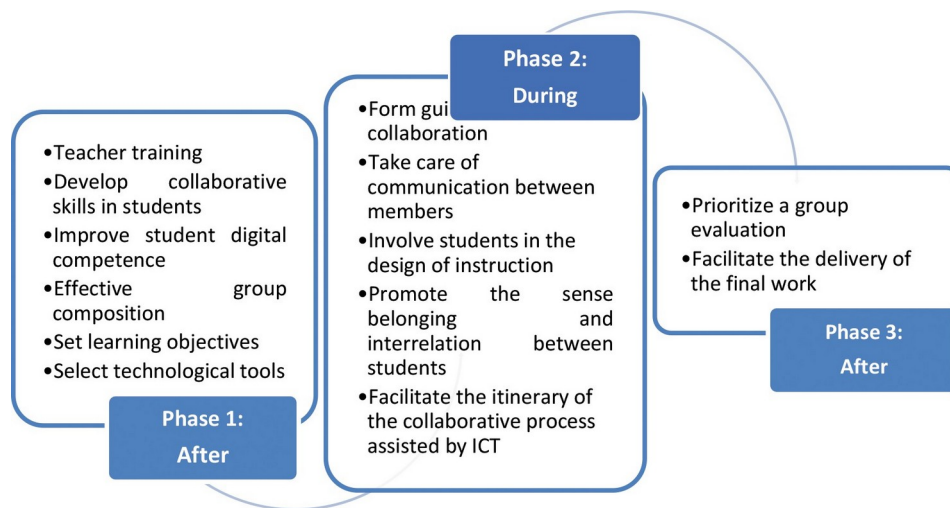

Figure 2. Recommendations for the design and instruction of a collaborative
higher education activity in an online environment

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