

Hybrid Teaching & Learning

A literature Review

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1. Introduction

The use of (information) technology has become ever more prevalent in higher education. Driven by the availability of affordable devices and easy access to the internet, it is now possible to deliver one's courses either partly or fully online. One such *mode of delivery* is the so-called synchronous hybrid form of education; here, students have the opportunity to take courses either with the instructor(s) on-site at the university or participate online from a remote location in real time (Raes et al., 2020). This phenomenon is also referred to as 'Here or There' (HOT) education (Mannheimer Zydney et al, 2019), the 'Hyflex' design (Abdelmalak & Parra, 2016) and 'blended' education (Bower et al., 2014). As such, there is no agreement upon terminology within the field when discussing this educational approach.

Although the hybrid model has been a topic of academic interest for almost twenty years (see, for instance, Rogers et al., 2003), the impact of the COVID19 pandemic has pushed it into the limelight. Faced with the need to limit the number of students allowed on campus due to (among others) self-isolation regulations, universities around the world have been looking for ways to ensure the continuation of their education by connecting on- and offline students. It is here that the hybrid approach holds the most promise, especially seeing the state of affairs will not change for the foreseeable future.

In order to help instructors quickly transition from the conventional onsite model to the hybrid one, the department of Educational Consultancy & Training has been commissioned to carry out a review study that aims to identify both the benefits / drawbacks of the hybrid approach and the dos and don'ts when implementing hybrid teaching and learning activities in bachelor and master education. As such, the focus of this report is on both the practical aspects to be found in the extant literature and the associated (dis)advantages so that instructors can quickly make the necessary adjustments to their course design. This means we do not intend to engage in an extensive discussion concerning the broader reasons for considering the hybrid approach *in general*. Such issues will only be touched upon to the extent that they are relevant for the purpose at hand.

As our point of departure, we use the work of Raes et al. (2020) who carried out the first systematic review of the literature on the synchronous hybrid mode of education. It should be noted that Raes et al. (2020, pp. 270) focused on two variations of the aforementioned hybrid model: 1) a setup in which a number of students are located at another campus, the so-called Remote Classroom Setting and 2) a setup where a number of students are participating from a location of their choice, the 'Hybrid Virtual Classroom'.¹ In this study, we focus on both variations because they correspond with the definition used by the ["Werkgroep hybride leren" of the Universiteit Utrecht \(2020\)](#):

¹ In both cases, it is possible for both students and instructor(s) to see one another either directly or via digital means.

*'At Utrecht University hybrid education is **defined** as: education in which students on location (on-campus) and remote students (online) simultaneously take part in the education. The **principles** of hybrid education at Utrecht University are:*

- Strive to offer qualitatively equivalent education for both student groups*
- All students and the teacher should be able to interact with each other by seeing and hearing each other. This stimulates a feeling of community.'*

2. Methodology

To obtain a comprehensive overview of the literature on synchronous hybrid education, we carried out a literature search to identify as many relevant publications as possible. We focused on peer-reviewed journals, written in English, to ensure a minimum level of quality with regard to the findings. We started by using the same approach as Raes et al. (2020: 273) and used the following search string with terms commonly used to refer to our topic of interest:

TS = (simultaneous OR synchronous) AND TS = (hyflex OR hybrid OR blended) AND TS = (face – to – face OR face to face) AND TS = (education OR teaching OR learning) NOT TS = (asynchronous)

For our purpose, we carried out one more search using the following terms: 'Emergency Remote Teaching' or 'ERT'. Emergency remote teaching refers to the shift from onsite to online education in times of crisis (Hodges et al, 2020). Seeing the need to move education online as a result of the COVID19 pandemic (Trust & Whalen, 2020), publications on ERT could contain relevant insights for our study. In order to avoid excluding relevant publications beforehand, we decided not to add any other additional terms to this search. For both of our searches, we used the most relevant electronic databases for research in education that were available to us: Web of Science, ERIC and Scopus.

Our initial search led to the identification of 49 papers. After an initial scan of the contents to ensure compatibility with our research interest, we were left with a total of 29 papers. The main reason for excluding the remaining ones was a difference in defining the key concepts, such as using 'blended' or 'hybrid' to refer to asynchronous teaching and learning activities. Subsequently, we engaged in a more thorough reading of the remaining papers based on the following criteria for inclusion: 1) discussion of (dis)advantages for implementing the hybrid model, 2) discussion of dos and don'ts when implementing hybrid teaching and learning activities, 3) findings that are directly relevant to higher education and 4) findings based on empirical studies. This led to the exclusion of an additional 8 papers, leaving us with a grand total of 21.

We then proceeded to analyse the contents by labelling the relevant insights using an open coding approach (such as 'students' experiences', 'teachers' experiences', 'student benefits', 'modes of hybrid teaching', 'design strategy', 'benefits students' and so on). In a second step, we clustered the findings regarding the experiences and perceptions of teachers as well as the online and onsite student populations in order to retrieve the main challenges in providing hybrid education. Finally, the findings regarding possible strategies, solutions, tips & tricks were clustered in relation to these challenges. The results of this analysis are described accordingly in paragraph 3.

3. Results Review

In this section, the results are described regarding the information gained from the literature. First, the experiences and perceptions of teachers and students involved in hybrid teaching & learning studies are described. Then the strategies mentioned in the selected studies to overcome problems, difficulties & challenges in hybrid teaching & learning are described, followed by options and requirements in organizing for hybrid settings.

3.1. Experiences & perceptions

Several studies describe the experiences and perceptions of the participants involved in hybrid teaching and learning. Most of the studies describe the experiences and perceptions of the teachers and students who participate online. There seems to be, however, less focus on the experiences of the students who participate onsite. This will be elaborated in the following sections.

3.1.1. Teachers

Communication between teachers and students and among students is an important aspect, especially in interactive teaching and learning activities. Particular in a hybrid setting, this could be a challenge because, instead of having one target population, there are two or more student populations using different communication channels, media and tools.

Bower et al. (2014) described a study in which a variety of interactive learning activities were implemented in a hybrid setting. The activities involved for example collaborative evaluation, group questioning, collaborative problem solving, role-play, whole-class discussions and collaborative design tasks. They concluded that all could be enacted in a variety of subjects and domains and that a wide range of technologies could be used, including video conferencing, web conferencing and virtual worlds. The main issues, identified by teachers, however, were communication problems (capturing and managing audio discussions) and cognitive load caused by the demands of teaching two cohorts of students at once (having to maintain awareness of the remote and face-to-face student view, operating the collaborative technology, troubleshooting technical issues for remote students, monitoring the reactions/discerning the perceptions of both student populations).

3.1.2. Students online

Based on an analysis of seven cases in Australia, Bower et al. (2015) described teachers and students to experience a cognitive overload using all these different ways of media and communication tools. They also described some students found the multiple channels of information kept them engaged and interested and this resulted in more active learning. The large majority of both onsite and online students believed they learnt at least as much, if not more, in the blended synchronous learning class as compared to their regular onsite classes. The majority of both online and onsite survey respondents felt a sense of co-presence with their alternately located peers, and qualitative feedback indicated students often felt a greater sense of community as a result of the blended synchronous mode. Online students overwhelmingly appreciated the flexibility afforded by blended synchronous learning and onsite students also saw how they benefited from the wider range of perspectives being shared. Across the seven cases, approximately three quarters of online and onsite students wanted

blended synchronous learning to be included in their other classes, providing a degree of validation for using the approach.

Not all studies in this review describe such positive experiences. For example, Hayes & Tucker (2021) described that online learners appear to find it more difficult than in-class students to 'jump in' and contribute to the learning environment. Vale et al. (2020) reported about lower grades for online participants that might be caused by distractions that are the result of not attending in person, but from a remote location. For example, the distance could complicate group work or the (un)reliability of the technology could cause problems that distract students' learning processes. They, however, also added a positive note that the use of chat feature allows students ask questions they wouldn't ask normally (anonymous).

Difficulties in communication in a hybrid setting might cause that online and onsite students do not experience the same learning opportunities. Comparing learning opportunities in terms of the teaching, cognitive, social and learner presence, Laforune & Lakhal (2019) concluded that (in their hybrid setting) especially the teaching presence was perceived as less by online students. More experience with hybrid teaching and learning settings could improve the communication and quality of discussions (Flynn-Wilson & Reynolds, 2021) and this could also enhance the learning opportunities for students who participate online.

3.1.3. Students onsite

As mentioned, only a few articles describe the experiences of students participating onsite in a hybrid setting. Rogers et al. (2003) described a case study in which 12 students participated onsite and 7 students participated online in a more or less traditional setup of a lecture combined with a discussion. In this case study, the online students had similar experiences and difficulties in the hybrid setting as described above; they did add that distance learners could help each other. The onsite students, however, were not always aware of the online students participating and there was a lack of communication between both groups of students. In addition, they describe that there were no major differences compared to other classes, however, the delays regarding the communication with the online participants disrupted the class dynamics. Szeto & Cheng (2016) described similar experiences among the students who participated onsite. They mentioned that the online students received too much attention from the instructor and that the onsite students felt neglected by the instructor due to the time spent on the online students. Onsite students experienced difficulties in interacting with the online students due to physical absence and technical issues. The interactions among both groups of students were perceived as business-like when carrying out group work.

3.1.4. Summary of main challenges

Based on the experiences described for teachers, online and onsite students, the following main challenges could be extracted:

- Facilitating communication among the teacher, onsite and online students;
- Avoiding overload due to the use of multimedia, communication channels and tools;
- Engaging students in hybrid learning activities;
- Creating equal learning opportunities that benefit both online and onsite students.

In the following section, strategies are retrieved from the literature in order to address these challenges.

3.2. Strategies to address the main challenges

Supporting students' learning in hybrid settings requires the design and implementation of dedicated learning activities. Bell et al. (2014) described possible modes for common classroom settings from a technical perspective. The students in the blue oval are considered to be participating onsite in one room. The students linked by the arrows participate online (Figure 1).

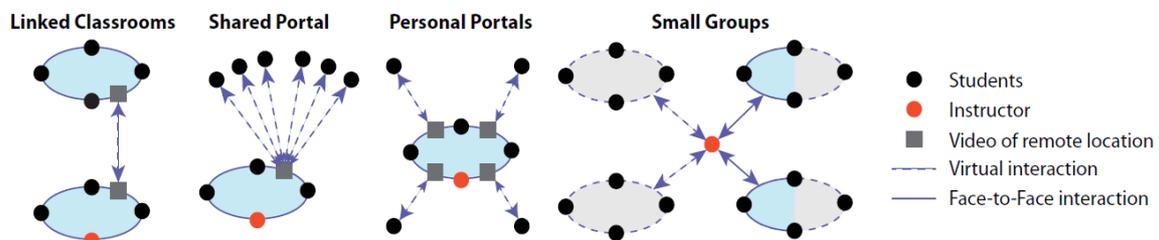


Figure 1 Possible modes for common classroom settings in hybrid teaching (Bell et al. 2014)

Based on case studies in which these modes of hybrid settings were implemented, they concluded that in general pedagogy should drive technology and that instructors need to choose the mode that fits their course design. They also concluded that implementation requires additional planning, risk tolerance, and additional support from a so-called navigator in the technologies as well as the need for continuous professional development when technology evolves. This means the role and expertise of the teacher and instructors are very important in hybrid teaching a learning settings. Focusing specifically on the main pedagogical challenges teachers face (described in 3.1), there are several studies used in this review mention strategies that could enhance teaching and learning in hybrid settings. In this section these are described accordingly.

3.2.1. Facilitating communication among the teacher, onsite and online students

In hybrid settings, communication between the teachers and students is as important as in a regular setting. At the same time, dividing attention equally between the online students and onsite students is a challenge. Lakhal et al. (2020) described some conditional requirements for teaching in a hybrid setting. First of all, teachers having experience in teaching and a clear idea of the objectives to be achieved in the course are important. Furthermore, including a teaching assistant for the technical aspects could be useful but technical literacy of the teachers is also important. During the lesson, explicitly being aware of and paying attention to the online students has a positive effect on their learning process, but paying too much attention to them can negatively impact the learning process of onsite students. In addition, for online students it is important to have the teacher face the camera. It can also be annoying when participants do not follow proper etiquette for participating in class. Lastly, not being recognized by the onsite students can be a problem for online students.

To improve and enhance the communication among teachers and students in hybrid teaching and learning settings, Olt (2018) described that by using names and asking questions explicitly, online students felt included on a regular basis. In addition, to make online students feel recognized and included, instructors need to spend extra time and effort on them. Rogers et al. (2003) suggested that, to make sure that those present become aware of those online, a teacher could provide asynchronous means of communication during the live classes. This can create an ongoing exchange

that allows the online students to be included. They also suggested that the use of a tool for open and spontaneous communication among all students, in combination with a live feed of the classroom, could help to facilitate communication among online and onsite students. Hayes & Tucker (2021) recommended to purposefully provide additional time and opportunity for online students to 'jump in' and contribute in the discussions and using backchannels tailored to specific student populations.

Bower et al. (2014) described that more preparation was needed to facilitate communication, including advanced organization of resources as well as clear and explicit instructions to students. They recommended using onsite students to relay communication to online students, utilizing workarounds when systems fail, having a focused environment in which to conduct collaborative activity and preparing online students for the hybrid classes in terms of their technological setup, technological skills, and expectations. In addition, they mentioned that the technological setup and capabilities of the teacher were critical to the success of the blended synchronous lessons and activities.

More advanced technological strategies were used to enhance communication. Bower et al. (2017) described a study in which augmented real (physical) and augmented virtual spaces were combined to create a "blended reality" learning environment that lets participants interact within and across these spaces. They concluded that the blended reality approach can lead to greater engagement as well as increased co-presence and sharing among students in both the onsite and online cohorts. However, both learning task design and technology reliability affect communication between cohorts in a blended reality lesson. Gleason & Greenhow (2017) described a study in which robot-mediated communication (RMC) was used as a strategy in a hybrid setting. They concluded that it had an advantage over traditionally used videoconferencing by the affordances for fostering students' embodiment in the classroom, their feelings of belonging and trust, and their ability to contribute ideas in authentic ways.

3.2.2. Avoiding overload due to the use of multimedia, communication channels and tools

To teach online and onsite students at the same time, using a variety of communication channels, multimedia and tools can lead to experiencing a cognitive overload as well for the students as the teacher. Bower et al. (2015) suggested that strategies for managing cognitive load could include directing communication to one particular mode (e.g., audio or text chat) or having students help monitoring the text chat. In addition, providing teachers with appropriate support, including technical help, teaching assistance, professional development, automated teaching spaces, and preparation time contributes in avoiding an overload. Specifically, regarding a hybrid flipped classroom setting, Mannheimer Zydney et al. (2019) suggested strategies as simplifying technology, making interacting as straightforward as possible and having an environment that is dedicated to this type of education. In addition, they also mentioned to distribute the workload among the instructor and students by giving students roles as well.

3.2.3. Engaging students in hybrid learning activities

In order to support student learning, it is important to create an environment in which students are stimulated to engage in (active) learning activities. In hybrid settings, engaging students in learning activities seems to be a challenge. Shi et al. (2021) did address this challenge by describing that,

besides the stability of technology for communication, one should consider a supportive and comfortable learning environment for interaction and a sound pedagogical design providing equivalent focus for students at both sites. They elaborated that, in terms of the pedagogical aspect, specially designed strategies should be considered seriously as crucial factors to motivate online students to be engaged in deep learning. Strategies that were suggested are employing central instructors with richer pedagogical knowledge, customizing learning content according to the level of prior knowledge of online remote students, paying more attention to remote students, providing remote students more opportunities to ask questions and to participate in discussions, and cultivating intimacy between central instructors and remote students.

In order to activate students in hybrid settings, Mannheimer Zydney et al. (2020) suggested to distribute roles and responsibilities among participants, during the lesson as well as in the course design, so that no one is overwhelmed and everyone feels successful in his or her role. In addition, they suggested that the content of the lesson should add something that cannot be included otherwise.

Butz & Stupnisky (2016; 2017) described that in hybrid settings, like in conventional settings, contextual support for the basic psychological needs, autonomy (being the perceived origin of one's own behaviour), competence (feeling effective and capable), and relatedness (feeling connected to others) enhance motivation and well-being among students. They suggested that additional participation in an asynchronous online intervention can improve students' self-efficacy for relatedness development with individuals in the online attendance mode. Shi et al. (2021) described that enhancing interaction among instructors, online students, and onsite students will encourage the sense of relatedness of online students and in turn stimulate their sense of competition and engagement.

3.2.4. Creating equal learning opportunities that benefits both online and onsite students

Even if communication, interactions and engagement in learning activities for both online and onsite students are facilitated and stimulated in a hybrid learning environment, it is still a challenge to create equal opportunities that benefit both online and onsite students. Hayes & Tucker (2021) explained this by suggesting that participating in onsite learning activities may be more conducive to encouraging deeper levels of learning, which can create inequities between online and onsite learners in a hybrid setting. In addition, Bower et al. (2015) described potential reasons including the delays in communication in order to accommodate online students (e.g., by repeating comments from in-class students), the teacher being distracted by the presence of online students, or the requirement to work in groups with online students and consequently having to communicate through the software rather than face-to-face. They suggested strategies to promote equity of experience including deliberately distributing attention between online and onsite participants, encouraging regular contribution from both cohorts, clearly identifying the focus of learning and discussion, avoiding duplication of explanations, and circulating among both online and onsite groups during small-group activities.

A specific challenge in creating equal learning opportunities is lab work, due to the fact that the hands-on activities require facilities that often are not available outside the lab. Koort & Avall-Jaaskelainen (2021) described a case in which they addressed this challenge in the design of their lab class for veterinary students. In this case, a hybrid model was used in which an onsite student

works with an online partner. During the first week all students had to do onsite work individually. During weeks 2 - 4 students worked in pairs and communicated via Zoom. The onsite student carried out all activities and the online partner supervised as well as collected information and drew conclusions based on the lab work. Students took turns working online and onsite, because hands-on experience for all students is important. Based on the experiences and results, they concluded that students performed better on certain dimensions, likely due to the increased need for communication as a result of their interdependence in the lab.

4. Observations & recommendations

Note that the studies do not include or compare in the results the actual learning progression and outcomes of onsite and online students, they hardly focus on (negative) experiences and outcomes of onsite students, and focus on emergency teaching or accessibility and equality in (higher) education. Despite these limitations, the most important dos and don'ts with regard to designing and implementing the hybrid model could be identified based on the outcomes of the review. To this end, the relevant insights are brought together using the following overarching themes: 1) communication & interaction, 2) motivation & engagement, 3) teaching support & professional development.

4.1. Communication & interaction

For any synchronous hybrid session to be successful, it is necessary to ensure interaction between the onsite and online students on the one hand and between the instructor and both student groups on the other. Doing so not only leads to a sense of belonging among the online students but it also makes possible equitable learning opportunities for both groups of students. To this end, one can:

- Make use of the proper technologies for communication such as video conferencing solutions for the audio-visual aspects of the lectures and chat applications for additional (a)synchronous exchanges between the participants as well as the instructor;
- Make sure to pay attention to specific aspects in communicating to the online students. In particular, it is important for instructors to not turn their back to the camera and to actively engage the online students by directly addressing them with their first names;
- Provide clear instructions beforehand concerning the proper use of the technologies employed and the rules for participating in class discussions / activities;
- Spend enough time on both groups. By spending too much time and effort on the online students, the onsite group can experience feelings of neglect which is potentially detrimental to their learning opportunities and motivation;
- Have online and onsite students partner up for in-class activities. Especially where more practical activities are concerned, having them cooperate using a clear division of labour can lead to the realization of the desired learning outcomes. Here, it is imperative to have students trade places by alternating between online and onsite participation.

4.2. Motivation & engagement

The importance of student motivation for learning outcomes is well-established. Depending on the remote environment the students find themselves in, there is the possibility of them becoming distracted. To keep online students motivated in a hybrid setting, one can do the following:

- Use different means for communicating (media/channels) to keep students engaged. This obviously could have an unintended effect seeing how the need to manage multiple channels can, as mentioned, lead to students experiencing cognitive overload. Unfortunately, there is no a priori way of determining what the ideal mix of channels is to avoid such a scenario from unfolding. One possible solution is to have each communication channel serve a single purpose;
- Establish clear rules for participation and pay sufficient attention to the online group. Doing so does not only help motivate them but also stimulate interaction among all participants, thus serving a dual purpose. The same goes for having them partner up with an onsite student;

- Use asynchronous means for participating. Although this might sound contradictory in a synchronous course, having asynchronous means can help students participate by sharing ideas and comments with one another. In addition, by having a teaching assistant monitoring the chat, important issues or questions can be brought into discussion;
- Create opportunities for online students to participate in a flexible fashion. Seeing that the personal circumstances of the remote students often lead to competing commitments on their part, it is not always possible for them to be present during sessions. Having alternative assignments for them as a means of compensating for their absence can help to keep them engaged. Obviously, doing so increases an instructor's workload even more and negates the point of offering hybrid education in the first place.

4.3. Teaching support & professional development

Adequate support concerning the practical aspects of hybrid sessions serves two purposes. First of all, it ensures the continuity of the process by preventing communication breakdowns such as severed connections, time lags and so on. Of equal importance, it also avoids placing an excessive cognitive load on instructors (as a consequence of having to take care of too many tasks at once) and students alike (due to the need for managing multiple media and tools simultaneously). Here, it is necessary to:

- Design learning activities specific for implementing in hybrid settings. This includes different didactic approaches for involving both online and onsite students, especially for instructor ↔ student and student ↔ student interaction and cooperation compared to teachers' regular practice. As such, it requires adequate professional development in providing hybrid education;
- Make all the necessary preparations beforehand. Due to the more intensive nature of hybrid sessions, it pays to be prepared by having a clear idea of what one wants to do in terms of learning activities, goals to be achieved and so on. Given that there is not much room for improvisation when using this format, it might be prudent to also have a 'plan B';
- Make sure instructors are sufficiently 'tech savvy'. Knowing one's way around the digital classroom by being familiar with the various technologies and their (im)possibilities is necessary to avoid disruptions to the process. It should be noted this goes for the students as well. They too, should know how to properly use the technology/applications in question;
- Have a teaching assistant present for taking care of the technological side of things and any troubleshooting. This helps the instructor focus on the in-class activities. An additional benefit of a teaching assistant is that he or she can also provide support by managing part of the communication with the online group;
- Have students assume responsibility for managing part of the process. This is another way of decreasing the workload for the instructor. An additional benefit of having students take on an active role is increasing their sense of connectedness to the group. One option would be to have a student manage the chat function during class;
- Use dedicated equipment whenever possible. The onsite facilities should be provided by the university. A BYOD (bring your own device) policy increases the likelihood of technical problems due to performance or compatibility issues. Of course, this does little to mitigate any potential issues on the side of the online students.

5. Discussion

Based on the preceding, we formulate the following recommendations concerning the use of hybrid forms of education:

- Successful hybrid education requires more than translating an existing course design to an online environment. Interaction with and between students comes with its own challenges and requires a didactic approach that directly addresses those. In addition, there is also a need for dedicated tools for participating, encompassing both synchronous and asynchronous means of communication. Furthermore, the increased cognitive load for instructors necessitates the use of teaching assistants and also the involvement of students (ideally) in class management. As such, schools (universities) need to invest in training their faculty by offering them courses geared towards acquiring the aforementioned skills;
- Given the laborious nature of managing hybrid classes and courses, it is our belief that their use should be restricted to situations where conventional, onsite options are not available. The aforementioned increase in cognitive load unduly taxes instructors. Given that there are still questions in need of answers with regard to hybrid forms (as mentioned in the previous paragraph), the benefits do not outweigh the drawbacks at this point in time. In addition, the literature hardly identifies any benefits or advantages possessed by hybrid modes of education when compared to either the synchronous online or onsite blended (asynchronous) ones. It is therefore not recommendable to pursue a large scale implementation of the hybrid mode;
- Given these concerns and considerations, there are two situations one can identify where the use of the hybrid approach is warranted. The first one is the already mentioned situation where there are no apparent alternatives as a result of unforeseen circumstances, i.e. those that can be classified as Emergency Remote Teaching. The second one concerns situations where constraints would otherwise prohibit the exchange of and access to information, knowledge and so on among staff and student who are far away from each other. One example would be the cooperation between geographically dispersed organizations and institutes engaged in collaborative learning activities.

In closing, it can be said that the successful deployment of the hybrid mode in education depends on creating the necessary conditions and making the right choices in line with those identified in this report. But even then, hybrid education is far from the panacea it is made out to be when it comes to meeting the challenges of today's educational landscape.

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