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# Teaching in the hybrid virtual classroom

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**Abstract** Seven college lecturers and two senior support staff were interviewed during 2021 about their experiences teaching in hybrid virtual classrooms (HVC). These technology-rich learning environments allow teachers to simultaneously teach students who are in class (on campus) and students who are joining remotely (online). There were two reasons for this choice: first, ongoing experimentation from innovative teaching staff who were already using this format before the COVID-19 pandemic; secondly, as a possible solution to restrictions on classroom size imposed by the pandemic. Challenges lecturers faced include adjusting teaching practice and lesson delivery to serve students in the class and those online equally; engaging and linking the different student groups in structured and natural interactions; overcoming technical challenges regarding audio and visual equipment; suitably configuring teaching spaces and having sufficient pedagogical and technical support to manage this complex process. A set of practical suggestions is provided. Lecturers should make reasoned choices when teaching in this format since it requires continued experimentation and practice to enhance the teaching and learning opportunities. When external factors such as classroom size restrictions are the driving force, the specific type of synchronous learning activities should be carefully considered. The structure and approach to lessons needs to be rethought to optimise the affordances of the hybrid virtual and connected classroom. The complexity of using these formats, and the additional time needed to do it properly, should not be underestimated. These findings are consistent with previous literature on this subject. An ongoing dialogue with faculty, support staff and especially students should be an integral part of any further implementation in this format.

**KEYWORDS:** hybrid virtual classroom, blended synchronous learning, synchronous education, hybrid learning, split attention, pedagogy, technology

## INTRODUCTION

The restrictions placed on attending learning on campus during 2020 and 2021 due to the COVID-19 pandemic accelerated the development of hybrid virtual classrooms (HVC) in higher education. At a university of applied sciences in the Netherlands, practical experiences of this format were explored by interviewing two senior support staff and several lecturers. All faculty interviewed had experience before the pandemic of teaching in a hybrid virtual environment. Examples of their teaching practice are outlined, and practical pedagogical and technical suggestions are presented.

In the HVC there is a 'learning environment in which both on-site and remote students can simultaneously attend learning activities'.<sup>1</sup> This is also described as 'education in which students on location (on campus) and remote students (online) simultaneously take part in the education'. There is a goal of providing an equal learning experience for those on campus or online, while the two should be able to hear and see each other to foster a sense of community.<sup>2,3</sup>

Universities and colleges have been developing technology-rich learning spaces for several years<sup>4,5</sup> as part of their digital strategy.<sup>6</sup> The HVC can play a role in connecting the on-campus and online learning environments. This can contribute to inclusive, accessible and flexible education for diverse groups of students who may, for a variety of reasons, not be able to attend classes in person on campus.

Innovative teaching practices were already emerging before the pandemic. The pandemic restrictions created the need to find short-term solutions to allow education to continue. First this resulted in 'emergency remote teaching'.<sup>7</sup> Limited return to the campus was possible under imposed classroom restrictions and the HVC was seen as one possible solution to manage these restrictions. Several HVC variants had already been developed to facilitate this. In some cases, faculty had developed

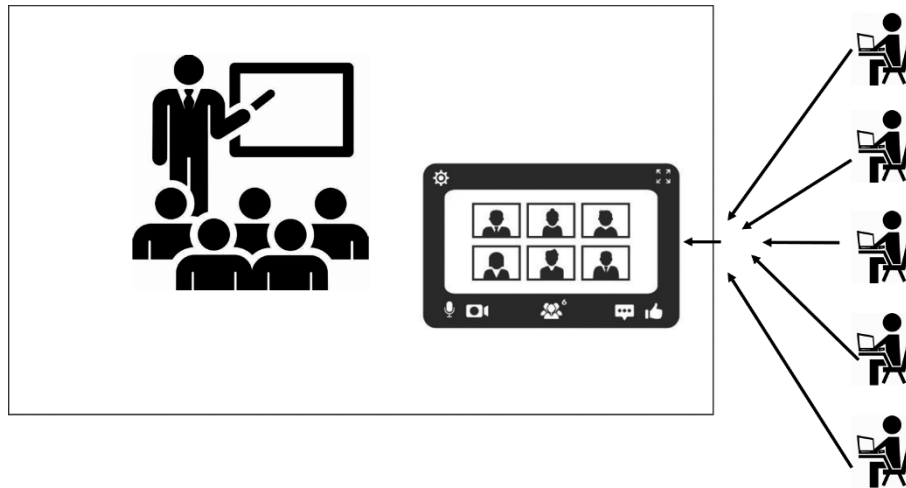
their own improvised solutions which enabled education to continue with students connected via video.

The current research examines the teaching practice of seven lecturers, the features and characteristics of the HVC settings within Inholland during 2021. Seven lecturers and two senior support staff were interviewed about their practice in the HVC. This research examines why this approach was implemented, the type of education that took place, and what we can learn regarding conditions to optimise these formats for teaching and learning. The objective of the research was to describe and gain insight into the choices, practices and experiences of lecturers from Inholland who used HVC settings to optimise the use of technology-rich learning spaces. The report examines possibilities to optimise the implementation of the HVC. Seven lecturers and two senior support staff were interviewed [Respondent 1–7].

## TERMINOLOGY AND FRAMEWORK

In a combined face-to-face (in-person) and online (virtual) learning environment two groups of students participate: a group of students present on campus and another consisting of students joining online synchronously (see Figure 1). In a hybrid classroom 'face-to-face activities are combined with technology-mediated activities which allow more active learning in the face-to-face setting and more intentional guidance for those learning outside the classroom'.<sup>8</sup>

Currently 'there is no agreement upon terminology within the field when discussing this educational approach'.<sup>9</sup> Different terms have been used to discuss the format,<sup>10</sup> including synchromodal classes,<sup>11</sup> synchronous blended learning and multi-location learning.<sup>12</sup> Other terms are the HVC, the remote classroom, the hybrid remote virtual classroom, blended synchronous learning, hyflex, synchronous education and blended<sup>13</sup>. For this paper, the term hybrid virtual classroom (HVC) is used.



**Figure 1:** A hybrid virtual classroom in which online students from remote locations join a face-to-face class

Since 2020 there has been an increase in the use of the HVC. It remains a challenge to learn as a remote participant.<sup>14</sup> Furthermore,

‘existing research clearly shows the potential of this emerging practice. Despite the challenges, all studies provided cautious optimism about synchronous hybrid learning, which creates a more-flexible, engaging learning environment compared with fully online or fully on-site instruction.’<sup>15</sup>

### THE CONNECTED CLASSROOM

Synchromodal classes can have different configurations<sup>16</sup> such as linked classroom model, shared portal model, personal portal model and small groups model. In the linked classroom model (or ‘connected classroom’), there are two groups at two different locations, with the teacher at one location. The teacher alternates their location and

can teach both groups at the same time. Both groups experience the teacher in a face-to-face setting, and online.<sup>17</sup> Students are distributed over the classrooms. The teacher is present in one main room (Room D in Figure 2) and communicates between classrooms via the video link.

In hybrid classroom settings ‘face-to-face activities are often combined with technology-mediated activities so that there is more active learning in the face-to-face setting as well as more intentional guidance when students are learning outside the classroom’.<sup>18</sup> In a hybrid course the teacher needs to shift pedagogy (teaching methods for children) to apply andragogical principles (teaching methods for adult learners).<sup>19</sup>

Hybrid learning, or hybrid education, is often equated with blended learning<sup>20</sup> and with practical learning in which learning activities take place on and off campus in a practical environment.<sup>21</sup> Students work on complex, realistic professional tasks and



**Figure 2:** Connected classroom configuration

products. This is a development in higher education where institutes are experimenting with learning environments such as living labs, which are a multi- and transdisciplinary learning environment.<sup>22</sup>

## **PEDAGOGICAL AND TECHNICAL VARIABLES**

In the HVC several pedagogical variables influence the teaching context. These include the number of students in the class and online, the learning goals, the level of the students and the learning phase of the students. Technology variables include the exact room configuration and size, the location and number of screens, microphones and speakers, the systems used and the technical support available.

To illustrate some of the possible configurations, six scenarios are illustrated in Figure 3. These are based on a classroom with two screens at the front — one for lesson content and one for online students. There are also microphones and speakers that allow the two student groups and the teacher to hear and see each other. The scenarios progress in complexity. Scenario 0 has students only in the classroom, with teacher in the class using the screen. Scenarios 4 and 5 are an interactive HVC. Scenario 6 is a connected classroom with separate classrooms on campus that are connected with classrooms at other locations. These scenarios are not a complete list. They present some possible configurations and pedagogical uses of a classroom.

### **Pedagogical affordances of the HVC**

The added value of these teaching contexts can be specified by clarifying options available. Affordances of the learning environment can refer to accessibility and flexibility, social interaction and individual choices. Educators face challenges of communication and cognitive overload caused by split attention.

## **Accessibility and flexibility**

There are organisational advantages to making the education more flexible by increasing accessibility,<sup>23</sup> since students can choose whether to join in person or online. If a student is unwell or has accessibility issues, they can still join the class online. Social developments in higher education mean students must manage their study alongside work and family commitments.<sup>24</sup> The flexibility offered also applies to faculty. Education is becoming more accessible to a broader and more diverse target group.<sup>25</sup> This allows students to consider education regardless of their location, making education more inclusive and increasing equity.

## **Continuity of instruction**

Courses can be offered synchronously for institutions that have multiple locations. This helps faculty who have limited time to travel between campuses to teach the same class. A unit of study can be offered at one time to several locations, benefiting staff and room scheduling.

## **Social interaction and experts**

The combination of offline and online student groups, and the interaction between these groups, provides affordances for learning. Students are exposed to multiple perspectives including new learning experiences of cooperation and connection between dispersed groups, which can enrich social interactions. External experts can be brought into the classroom,<sup>26</sup> exposing students to a wider range of perspectives and ideas.<sup>27</sup> This exposure to multiple perspectives and interaction between groups is affected by the composition of the students in the class and those online.<sup>28</sup>

## **Designing and evaluating learning practices in the HVC**

It can be complex to design rich learning experiences that support the learning of

### Scenario 0

- Teacher in the class
- Students in the class
- Teacher shares laptop
- Use pen and touch screen
- Sharing screen via Teams



### Scenario 1

- Teacher in class
- Students online



- Teacher shares laptop
- Use pen and touch screen
- Sharing screen via Teams



### Scenario 2

- Teacher online
- Students in the class



- Screensharing via Teams



- Guest speakers
- Students on work placement

### Scenario 3

- Teacher in class
- Students in class
- Students online



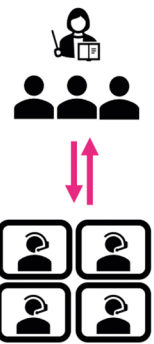
- Sharing laptop screen
- Use pen and touch screen
- Share screen via Teams.



- Lecture

### Scenario 4

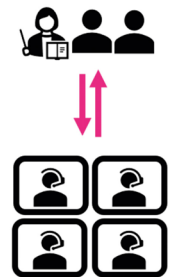
- Teacher in class
- Students in class
- Students online
- Sharing laptop screen
- Use pen and touch screen
- Share screen via Teams.



- Lecture
- Active interactions

### Scenario 5

- Teacher in class
- Students in class
- Students online
- Sharing laptop screen
- Use pen and touch screen
- Share screen via Teams.
- Interactive workshop/discussion
- Interactive didactics
- Group discussion
- Student group working on-campus and online.
- Online in breakout rooms
- Presentations from different project groups.
- Group choose same 'Teams background'
- Teacher visits groups in class and in breakout rooms.



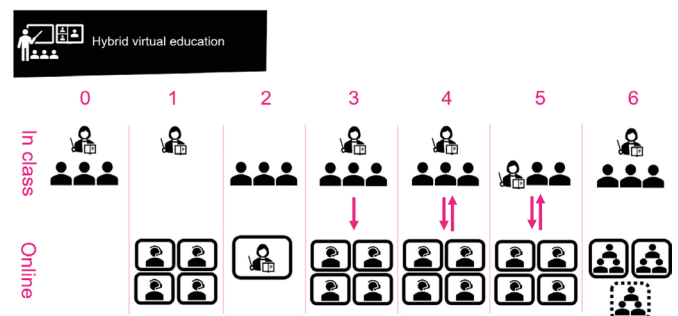
### Scenario 6

- Teacher in the class
- Students in the class
- Groups of students in (online) classroom(s)



- Share screen via Teams

- Lecture/
- Project groups on-campus and online.
- Online in breakout rooms
- Presentations by different project groups.
- Teacher visits project groups in different physical classrooms and also online in breakout rooms.



**Figure 3:** Possible configurations in the HVC, progressing from simple to more complex

online students and face-to-face students during synchronous sessions. The designing process can go through these phases: planning and design, implementation and adjustments.<sup>29</sup> The Community of Inquiry framework<sup>30</sup> examines the different types of 'presence' that contribute to the educational experience: social, cognitive and teaching.<sup>31</sup> These should be designed for when developing education in this format.

In this context, the 'social presence' is split between those in the room with the teacher and those online. The importance of 'social presence' is stressed when creating a positive atmosphere in the class and for strengthening interactions.<sup>32</sup> The 'HVC demands other methods of teaching and different learning activities'. The teacher 'needs to pay attention to both locations and needs to perform certain operational actions on the teaching and learning platform'. This can result in a 'heavy mental load' for the teacher. It can be difficult to know the involvement of online students and to find ways to reduce their sense of being 'excluded' from the main class.

Students construct meaning through sustained reflection and discourse as part of 'cognitive presence'. This discourse is more complex when students are in different locations. 'Teaching presence' is mediated by different student experiences, whether in the room with the teacher or learning via the online image.

There are similarities and differences when evaluating online and traditional courses.<sup>33</sup> Evaluations of online teaching often focus on instructional behaviours; however, it is important to focus on building relationships and community in the classroom, and to develop a more comprehensive model for evaluating teaching competencies in this context.

### **Asynchronous versus synchronous learning**

The 'decision tool for online learning'<sup>34</sup> provides an overview of different teaching

contexts. Five stages of learning include activating prior knowledge, actively acquiring new knowledge, processing new knowledge, applying new knowledge and reflecting on the learning process. The HVC is education synchronously delivered by an expert. The 'lecturer and students are directly in contact with each other in person or online through a video and/or audio connection'. This decision tool can function as a guideline for analysing a specific learning context and support the decision-making process to determine which learning activities should take place at which point and with what type of interactions (see Figure 4).

Examining this model in a hybrid context shows that careful choices for learning activities need to be made during synchronous delivery. Delivering an interactive lecture and facilitating a discussion are possible in a hybrid setting, but practising tasks, facilitating peer review or organising a skills lab with two separate groups is an additional level of complexity.

## **TEACHING IN THE HYBRID VIRTUAL CLASSROOM**

The experiences of the seven teachers and two senior support staff who were interviewed are presented below.

### *Pedagogical*

Lecturers used the HVC in a number of different ways, for both large and small groups, to deliver lectures with supporting PowerPoint (PPT) slides, giving instruction for in-class activities and livestreaming medical videos. In one case, experts joined the class online to give their perspective on a specific case.<sup>35</sup> Individual students and project groups gave presentations, there was a practical session which involved handling a piece of scientific equipment, and there were collaborative assignments on building a website. In another case, students present in the classroom gave a presentation and the



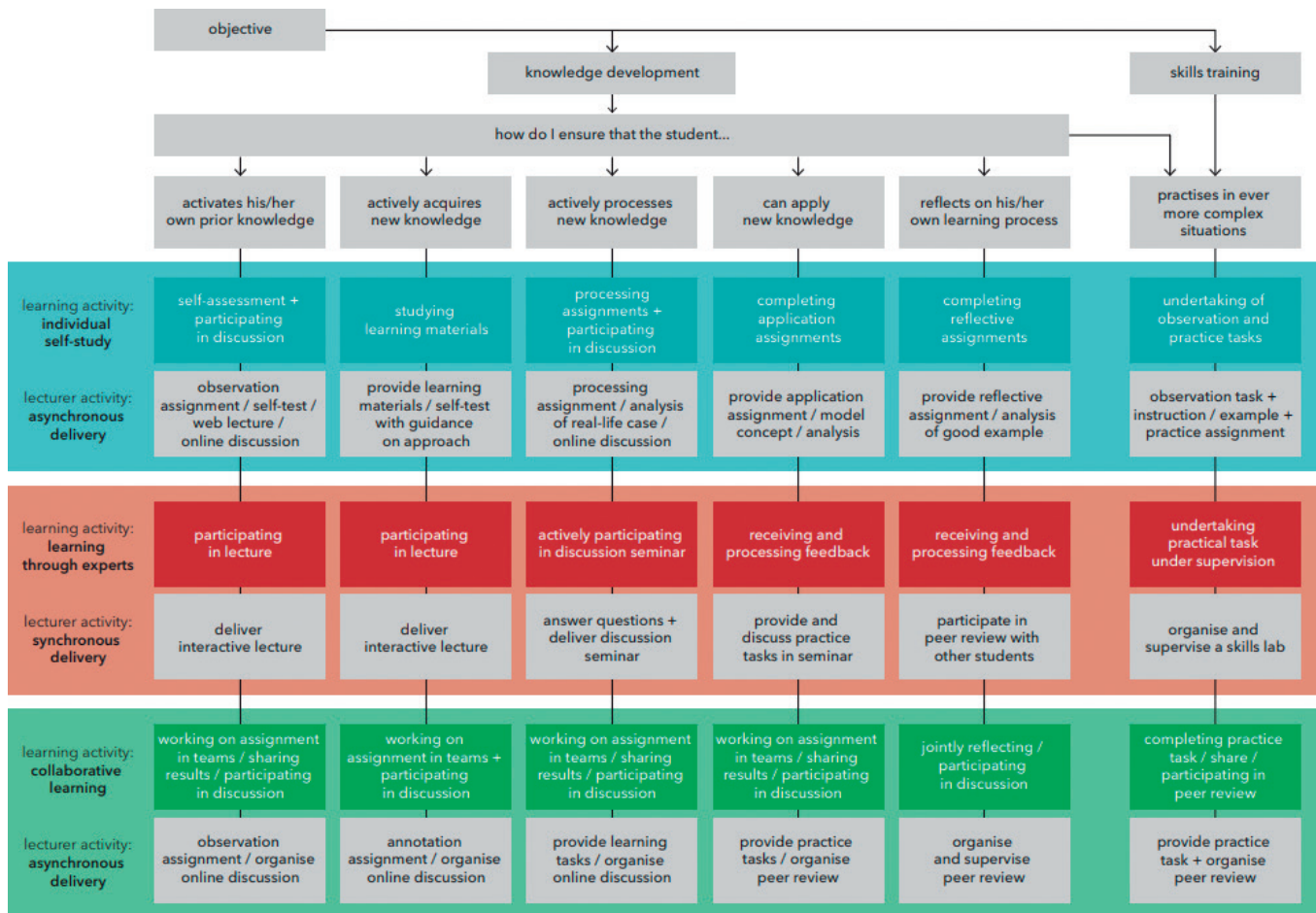


Figure 4: Decision aid for online learning<sup>37</sup>

online students were allocated the role of ‘online jury’, giving feedback to the students in the class.

### Room configurations

Each lecturer used a unique room configuration and configured their rooms differently. This was determined by several factors such as room size and the number of students. This ranged from one student online with four students in the class, to ten students online and up to 20 across several classrooms. Some rooms were specifically designated for this purpose, with specific camera and microphones set-up, such as round tables with voice-activated cameras. Three of those interviewed connected

several classrooms on campus, teaching simultaneously to two rooms with ten students in each. One lecturer taught to seven rooms simultaneously, each with ten students, by teaching from a ‘mother’ room and communicating to students through the screens in their individual connected classrooms. In two cases, a student in each remote room was required to connect their own laptop to the screen so other students in their room could view the teacher in the ‘mother’ room. Some teachers were alone, others had moderators and student assistants.

### How lecturers decided to use this format

All lecturers interviewed were already experimenting with hybrid formats before

the pandemic. One had already combined Master's students: one group in the Netherlands and one abroad. Another had decided to bring two different student groups together, to combine classes that would not normally be able to meet each other, thereby enriching the mix of students. One lecturer was connecting classrooms pre-pandemic to ensure consistency in instruction during project work. During the pandemic, capacity in classrooms was reduced to 20 per cent and some lecturers chose to facilitate 'Covid Compliant Learning' to avoid students missing class sessions.

'This form of teaching was used in order to teach to a large number of students, divided in difference rooms. This was the solution to overcome the limitations due to the corona-measures.' [R7]

In other cases, scheduling meant it was not possible to teach the class multiple times, so teaching to multiple classes was a practical solution to facilitate larger groups. This also provided an option for students who could not attend class in person due to health concerns, travelling times or other personal reasons. Therefore, from those seven lecturers interviewed, the two main reasons for choosing this format was due to ongoing educational innovation and imposed pandemic conditions.

### **Educational scenarios based on learning goals**

Choices were also made to reach some learning goals. A lecturer brought experts in online to discuss specific medical videos and facilitate a discussion between student groups. The experts did not have time to travel to the campus but were able to join the lesson between their professional consultancies. Two lecturers emphasised the importance of bringing separate student groups together who would not normally meet, due to distance, scheduling or teaching availability. The online hybrid option made this possible.

Several lectures ran flipped classroom formats in which students prepared in advance and then discussed content in class. Students watched an instructional video in advance about a piece of technical equipment, then the actual piece of equipment was handled in class by the students while those online viewed the interaction. In another context, students received instruction and then worked in project groups for a full day in different classrooms. They had support from a project coach and subject expert and common information was shared synchronously online across all the locations. One lecturer gave instructions on statistics to the whole class, and then students completed exercises with structured feedback and interaction between the different student groups.

### **Support needed to help educators when teaching in these contexts**

#### *Pedagogical support*

There was limited adjustment of 'standard lessons' which were often unmodified. Teachers taught on their own or had technical support staff available. Occasionally, two or more teachers were present as project coach or content expert, fulfilling roles of moderator and support. Teachers found it difficult to monitor the chat and interactions during class when moving to different classrooms and this caused cognitive overload when teaching.

#### *Technical support*

Most faculty said they needed help booking and scheduling specific classrooms. Support staff facilitated practice and experimenting in advance. In one case, student assistants were paid to provide technical support in the classroom. In most cases, additional support was needed regarding issues such as audio quality, camera set-ups, lighting, cable connections, laptop docking stations, external microphones and other hardware



and software issues. One teacher experienced challenges with logging into the correct online session, using software and accessing the account, particularly when multiple sessions were open at the same time. In some cases, audio 'feedback' occurred due to lag time between devices. Online support sessions and training courses were made available by the service desk, including instructional videos on using the equipment. One teacher who had a high level of technical competence commented:

'As a teacher, the HVC set-up worked well for both groups. The content could be presented fairly similarly, there were no technological issues. The online students could follow as if they were "in" the classroom.' [R2]

### **Teachers' experiences of teaching in these contexts**

#### *Pedagogical*

Teachers stated that they were glad to bring various student groups together. This enriched the diversity of the student mix. They found that the split attention (teaching to two 'groups' at once) makes it more difficult. Teachers 'like to see the eyes of their students' and miss the energy and personal interaction.

'The students were very appreciative to be able to follow the lessons at all. They did notice I was not always speaking to them. In the mother room, it was much easier to remember students were there, on the screen because you don't have to worry about being in view.' [R5]

Teachers found it difficult to engage the students online in a discussion via the screen since it is more difficult to read non-verbal signals on the screen than in class. Teachers wanted to speak to students online directly and engage them in the discussion, but it required additional effort. Focus was needed

to consciously create a safe and comfortable environment for exchanging ideas. One teacher found there to be fewer distractions in the live environment. It was difficult to get students to turn on their cameras and microphones. And there is little insight into what the online students were doing, or what their learning environment was.

Students joining via the screen may have less 'presence' in the physical class, so it is important to have a clear strategy for teaching in these classes. Learning activities often take more time than in a regular class, switching between the students in the class and those online and monitoring the chat. An adjusted lesson plan and teaching approach is needed to make the class useful for all and it costs more energy to keep both groups engaged.

When a teacher shares their screen online it makes the video image of the teacher appear 'smaller' on the screen. This in turn requires more mental effort from students in class to follow the teacher's non-verbal communication.

Creating an equal experience for both groups of students, particularly for those online, is a challenge. Students online often worked more slowly than those on campus. Teachers saw benefits of efficiency of time and resources when giving a class one time to a larger group.

### **Students**

One lecturer commented,

'For students in the classroom it is like watching a football match live in a stadium. There is high involvement, and the experience is more intense. For those following online, it is like watching a football match on a TV in a bar. You are following what is going on but are much less involved.' [R6]

Students attending online said they appreciated being able to attend the class

and told teachers it was worth their effort. Students physically present in the classroom have already made a commitment by travelling to school, which creates an extra degree of engagement than those studying online. For those online, it required more self-efficacy and intrinsic motivation to stay focused. Students were hesitant to turn on their microphone and camera and join the class discussion via the screen.

‘Some online students were hesitant to join the screen in the classroom because it makes them “larger than life” and they felt that attention. It is difficult to get the online and offline students to interact due to social issues, it felt a bit awkward.’ [R2]

It may require more effort for a student to say something online than when they are in the class. Online students sometimes had less energy in their interactions. Teachers find it hard to read non-verbal communication online. Wearing headphones can help online students concentrate. If students in class physically ‘stand up’ for an activity, those online felt awkward joining.

### Technical

Managing all the technical issues and teaching in this environment is challenging and there is a steep learning curve to get equipment set up and tested.

‘The quality of audio and image were not always good: problems with echoes, the video in the rooms was not always in sync with the home-room and also the quality of images and videos in these rooms was not always good. In the first few weeks a student and an IT-staff member was present to help with the starting of the lecture.’ [R7]

In a roundtable setting the camera automatically highlighted the person speaking. Without the right cameras, it is

not clear to those online who the teacher is talking to or who in class is talking. Teachers used the online forum and chat to create more interaction between the groups. Students communicated within their own informal channels such as WhatsApp or Messenger. Online students asked questions to the teacher in the room via the laptop of a student in the room or joined the class directly through a fellow student’s laptop. When the teacher wrote on a board in the classroom, it was difficult to ensure that all students could see the written information.

### Advice when teaching in these contexts

All those interviewed had suggestions based on their own practical experiences of teaching in these settings. Some key points are outlined here.

#### *Pedagogical advice*

#### **Advice for preparation, planning and choices**

- Be well prepared and plan all teaching activities in advance. Decide in advance when to switch between the online and offline groups and try to minimise these moments;
- Create a complete and detailed plan for the lesson overview. Specify roles in advance, learning goals and timing. Each teacher should know their role and when they need to do what. Provide a moderator to manage the flow of communication and check the chat;
- Decide which teaching activities are synchronous and which asynchronous. Classes take longer than a normal class. Determine specific activities to engage the online students;
- Make lesson content (such as PPT slides) available in advance to students so those online can follow more easily;
- Practise in the classroom setting as an actor would practise in a new theatre. Get a ‘feel’ for the space. Role-play with

colleagues and experience being the 'student' online;

- Use this format for interaction and not to deliver lots of content in a lecture. Brief delivery of content should be combined with carefully planned interactive exercises and discussions;
- Think carefully before using this format due to complexity, planning and additional staff costs.

#### **Advice for classroom management**

- Always ask questions to online students first, then to those in the classroom;
- Plan for active connection and immersive interaction between the two groups;
- Address online students by name and ask them to use the chat. Expect less direct interaction from those online and work to engage them;
- Put online students in break-out rooms for discussion. Allocate each group a separate screen in the classroom to make interaction with them easier;
- Allocate an additional teacher to focus exclusively on the online students;
- Ensure there is time for online students to test their audio and video in both directions;
- Have online students vote 'yes' or 'no' by showing a red or green object to encourage engagement via their camera;
- Have online students share their screen to involve them in presenting;
- Synchronous learning activities should be meaningful. Check that the class could not have been delivered in another format such as a pre-recorded lecture;
- Allocate online students with specific tasks to keep them involved (such as 'online jury');
- Ask students online to ask their questions via a student who is in the classroom;
- Check that students joining class via the screen are not 'larger than life' and privacy is maintained;
- Experiment and take time to get comfortable in the context.

#### **Advice regarding technology**

- Expect a steep learning curve with technological aspects. Practise in advance to develop competence in the room. Go through the technical aspects in advance with support staff;
- Fully test all equipment in advance and practise with colleagues in break-out rooms;
- Ensure you are visible in the camera and can be seen and heard by those online. Use an automatic tracking camera when possible;
- Check the best place to stand to be seen by the camera and to optimise audio. Follow multimedia principles to make slides easy to view and follow;
- Use a clip-on microphone in a large room or mesh microphones hanging in the room to hear student questions in the room;
- The institution must provide the technology and not the students;
- Encourage students to open their own backchannel for communication;
- Ensure that adequate support is given to provide on-the-job training;
- Pay students to act as technical support.

#### **CONCLUSIONS**

In this small-scale exploratory research, the use of the hybrid virtual and connected classroom within Inholland was examined through nine semi-structured interviews. Before the pandemic, Inholland had already been developing and trying out variations of hybrid classroom configurations. Due to the number of variables, it is complex to describe and compare the multiple configurations, with each teacher having their own approach relevant to their own context. Pandemic policy determined that fewer students were allowed to attend classes in person, so teachers experimented with this format or had no other choice than to use it. The two senior support experts interviewed gave a critical overview of the complex

realities of facilitating these formats in a short timeframe.

Teachers stated they needed pedagogical and technological support to teach in these technology-rich classroom environments. Those interviewed were either innovators or teachers who were already experimenting with technology-rich learning environments before the pandemic. Additional preparation time is needed to teach in these classes. Additional planning and budgeting is required to facilitate moderators or student assistants. Accessing and booking the classrooms requires additional technological support. Teaching in these settings can be stressful when learning to manage the technical and pedagogical interactions. Understanding the different student groups (reading non-verbal communication) and engaging with both groups adequately is a challenge.

As outlined in the literature review, the use of these teaching formats allowed for increased accessibility and flexibility for students. It allowed for continuity of instruction and interaction. Although there was some social interaction in the class, there was not so much between the two groups. Blended learning approaches allow course content to be prepared before class, which frees up time for interactive activities during the synchronous sessions, but this needs to be carefully planned.

Teachers explained that their students were grateful this option was offered and that they could attend online based on their own circumstances, travel time, health issues, etc. This connects to an important theme in the literature regarding the continuity of instruction.<sup>37</sup> Bringing experts into the classroom was seen as added value, since these experts would not normally have been able to attend the class in person. Sometimes they joined online for as little as 20 min to share their expert perspective.<sup>38</sup> There were some efficiencies mentioned due to being able to teach more students at one time, reducing the need to teach lessons twice.<sup>39</sup>

Teachers adapted to the pandemic situation to find a quick solution, or to develop their experiments further. Optimising teaching and learning in these technology-rich environments requires substantial investment in resources. These include time, equipment, training and support.<sup>40</sup> The improvised and experimental approaches covered in the cases here show that improvising and experimenting is a good starting point for educational innovation. As part of a structured didactical concept, however, there may be a long way to go before these formats are integrated into a larger-scale educational vision.

In order to optimise the HVC, careful choices need to be made when teaching in these formats. When they are a result of specific pedagogical choices linked to specific learning goals, then continued experimentation and practice can lead to enhanced teaching and learning opportunities. When a result of external factors such as the pandemic affecting classroom size, then the learning goals and the use of synchronous teaching time should be carefully considered before deciding to use these formats. It can be beneficial to redesign lessons formats and evaluate which learning goals are linked to which learning activities in the synchronous learning moment. Simply copying a regular lesson into this format does not appear to work. The structure and approach to the class may need to be completely redesigned to optimise the affordances of the hybrid virtual and connected classroom.

## RECOMMENDATIONS

The teachers interviewed provided several tips and suggestions regarding planning and teaching in these contexts. In general, teachers advised only teaching in this context when it was necessary, or when carefully planned. The hybrid virtual and connected classrooms can be used in situations when there is limited space, or when health

restrictions require it as an option. Since the pandemic, much experimentation has taken place and new equipment, room configurations and options continue to emerge.

This option may be used when there is limited space for teaching based on group size. The centralised instruction from an expert can be used to ensure efficiency and consistency of message for all students. When a larger room and a suitable flexible learning space is available, however, this instruction could be provided in one central room with students being supervised by coaches. It is recommended only to use these set-ups when necessary. Due to the complexity of the technical and pedagogical requirements, this format should be used when there is sufficient training, adequate equipment, enough support staff and a clear pedagogical choice for using this format. Where that is not the case, another option could be to teach the class either completely online or completely in-person. Lesson content can be pre-recorded.

The complexity of using these formats, and the additional time needed to do it properly, should not be underestimated. It may have appeared as a quick fix but is not easy to implement. An ongoing discussion with teachers, support staff and especially students should be an integrated part of any further implementation in this format.

## DISCUSSION

A goal should be for these formats to have a positive impact on student engagement and student outcomes. Further research into the pedagogical and technological design is important. As one teacher mentioned,

‘Teaching like you would in a regular class really does not work online. So, it also does not work in a hybrid virtual classroom. Because you are basically teaching an online class when you are in a classroom.’

This captures some of the challenges of teaching in the hybrid classroom. We may naturally default to familiar teaching habits, but the situation is different, and an adjusted pedagogy is needed. It becomes clear that what may at first appear a simple solution is in fact more complicated at many levels. As one of the senior support staff mentioned, ‘It is an illusion that you can walk in, and the technology will all work automatically’.

It is important to create realistic expectations with staff and management about what is possible and can realistically be expected in these contexts. It should certainly not be viewed as a quick fix. These formats should be used when choices are based on a pedagogical vision. In the pandemic situation, creative and practical solutions were implemented, and some of the experiences are referred to in this report. The process of optimising teaching and learning in the hybrid virtual and connected classroom requires further research regarding measuring learning differences.

Since this was a small-scale sample of nine professionals, no general conclusions can be drawn. Suggestions<sup>41</sup> for further research are to include larger and more diverse samples to improve generalisability and understand meaningful effects. Real-time tracking on student attention in the different settings could lead to insight in different pedagogical scenarios. Questions to explore in this educational context are:

- What is the difference in learning between students online and in the classroom?
- How do practical issues of room allocation, costs and sufficient support affect the optimal delivery of the lesson from the teacher?
- What additional pedagogical adjustments and techniques can result in more proficient and fluid interactions and increased learning to enrich the student experience in their ongoing educational process?



- Which learning goals should be managed in which learning contexts?
- How do pedagogical approaches need to be adjusted to maximise the learning outcomes in these contexts?

### Author's note

This paper is adapted from provisional research by Woolfitt and Bottema.<sup>42</sup>

### References

1. Raes, A., Detienne, L., Widney, I. and Depaepe, F. (2020), 'A systematic literature review on synchronous hybrid learning: Gaps identified', *Learning Environments Research*, Vol. 23, No. 3, pp. 269–290.
2. Hagemeyer, R. and Dolfing, R. (2022), 'Hybrid Teaching & Learning: A literature review', Utrecht University, available at <https://www.uu.nl/sites/default/files/Hybrid%20Teaching%20%26%20Learning%20Review.pdf>
3. Universiteit Utrecht, 'Hybrid education: How do you make it manageable (and maybe even fun)?', available at <https://www.uu.nl/en/education/educational-development-training/knowledge-dossier/hybrid-education-how-do-you-make-it-manageable-and-maybe-even-fun> (accessed 4th November, 2022).
4. Fransen, J. and Griffioen, E. (2019), 'Verkenndend onderzoek naar technologierijke learning spaces in het hoger onderwijs' [Exploratory research into technology-rich learning spaces in higher education], Inholland, available at <https://www.inholland.nl/onderzoek/publicaties/verkenndend-onderzoek-naar-technologierijke-learning-spaces-in-het-hoger-onderwijs> (accessed 4th November, 2022).
5. Woolfitt, Z. and Swager, P. (2019), 'Facilitating language teaching in a hybrid classroom over three locations via streaming video on a first-year bachelor course', Inholland, available at <https://www.inholland.nl/onderzoek/publicaties/facilitating-language-teaching-in-a-hybrid-classroom-over-three-locations-via-streaming-video-on-a-first-year-bachelor-course> (accessed 4th November, 2022).
6. University of Leeds, 'Digital Strategy for Student Education', available at [https://ses.leeds.ac.uk/info/22170/quality\\_assurance-related\\_policies/639/digital\\_strategy\\_for\\_student\\_education](https://ses.leeds.ac.uk/info/22170/quality_assurance-related_policies/639/digital_strategy_for_student_education) (accessed 4th November, 2022).
7. Hodges, C., Moore, S., Lockee, B., Trust, T. and Bond, A. (2020), 'The difference between emergency remote teaching and online learning', EduCause, available at <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning> (accessed 4th November, 2022).
8. Linder, K. E. (2017), 'Fundamentals of hybrid teaching and learning', *New Directions of Teaching and Learning*, No. 149.
9. Hagemeyer and Dolfing, ref. 2 above.
10. Raes *et al.*, ref. 1 above.
11. Bell, J., Sawaya, S. and Cain, W. (2014), 'Synchromodal classes: Designing for shared learning experiences between face-to-face and online students', *International Journal of Designs for Learning*, Vol. 5, No. 1, pp. 68–82.
12. Last, B. and Jongen, S. (2021), *Blended learning en onderwijsontwerp; van theorie naar praktijk [Blended Learning and Educational Design; From Theory to Practice]*, Boom, Amsterdam.
13. Hagemeyer and Dolfing, ref. 9 above.
14. Raes, A., Vanneste, P., Pieters, M., Windey, I., Van Den Noortgate, W. and Depaepe, F. (2020), 'Learning and instruction in the hybrid virtual classroom: An investigation of students' engagement and the effect of quizzes', *Computers & Education*, Vol. 143, 103682.
15. Raes *et al.*, ref. 1 above.
16. Bell *et al.*, ref. 11 above.
17. *Ibid.*
18. Linder, ref. 8 above.
19. *Ibid.*
20. Trentin, G. and Bocconi, S. (2014), 'The Effectiveness of Hybrid Solutions in Higher Education: A Call for Hybrid-Teaching Instructional Design', *Educational Technology*, Vol. 54, pp. 12–21.
21. Zitter, I., Hoeve, A. and De Bruijn, E. (May 2016), 'A design perspective on the school–work boundary: A hybrid curriculum model', *Vocations and Learning*, Vol. 9, No. 1, pp. 111–131.
22. Fransen, J. (2020), 'Naar maatwerk in toekomstgericht onderwijs' [Towards customization in future-orientated education], Inholland, available at <https://www.inholland.nl/onderzoek/publicaties/naar-maatwerk-in-toekomstgericht-onderwijs> (accessed 4th November, 2022).
23. Raes *et al.*, ref. 1 above.
24. *Ibid.*
25. *Ibid.*
26. Bell *et al.*, ref. 11 above.
27. Raes *et al.*, ref. 1 above.
28. Bell *et al.*, ref. 11 above.
29. *Ibid.*
30. Garrison, D. R., Anderson, T. and Archer, W. (Spring 1999), 'Critical Inquiry in a Text-based Environment: Computer Conferencing in Higher Education', *The Internet and Higher Education*, Vol. 2, Nos. 2–3, pp. 87–105.
31. Cleveland-Innes, M. (2020), 'The Community of Inquiry Theoretical Framework: Designing Collaborative Online and Blended Learning', in Beetham, H. and Sharpe, R. (eds), *Rethinking Pedagogy for a Digital Age: Principles and Practices of Design*, 3rd edn, Routledge, London.
32. Raes *et al.*, ref. 1 above.
33. Thomas, J. E. and Graham, C. R. (2019), 'Online teaching competencies in observational rubrics: What

- are institutions evaluating?', *Distance Education*, Vol. 40, Vol. 1, pp. 114–132.
34. Fransen, J. (2020), 'Decision aid for designing (online) learning', Inholland, available at <https://www.inholland.nl/onderzoek/publicaties/decision-aid-for-designing-online-learning> (accessed 4th November, 2022).
35. *Ibid.*
36. *Ibid.*
37. Bell *et al.*, ref. 11 above.
38. Raes *et al.*, ref. 1 above.
39. Bell *et al.*, ref. 11 above.
40. Sailer, M., Schultz-Pernice, F and Fischer, F (March 2021), 'Contextual facilitators for learning activities involving technology in higher education: The Cb-model', *Computers in Human Behavior*, Vol. 121, 106794.
41. Raes *et al.*, ref. 1 above.
42. Woolfitt, Z. and Bottema, J. (2022), 'Delivering education in the Hybrid Virtual and Connected Classroom', Inholland, available at <https://www.inholland.nl/onderzoek/publicaties/delivering-education-in-the-hybrid-virtual-and-connected-classroom>. A link to recent author research is available at Inholland, 'Publication – Zac Woofitt', <https://www.inholland.nl/onderzoek/zoek/resultaten/#/?c=publicaties&q=zac%20woolfitt> (both accessed 4th November, 2022).