

## Hyflex Learning within the Master of Teaching Program@KU Leuven

KU LEUVEN, Belgium

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HyFlex

EDU

Belgium

Master of Teaching Program

Hybrid Virtual Classroom

Technology

student experience

presence

Video

In this chapter, we will discuss:

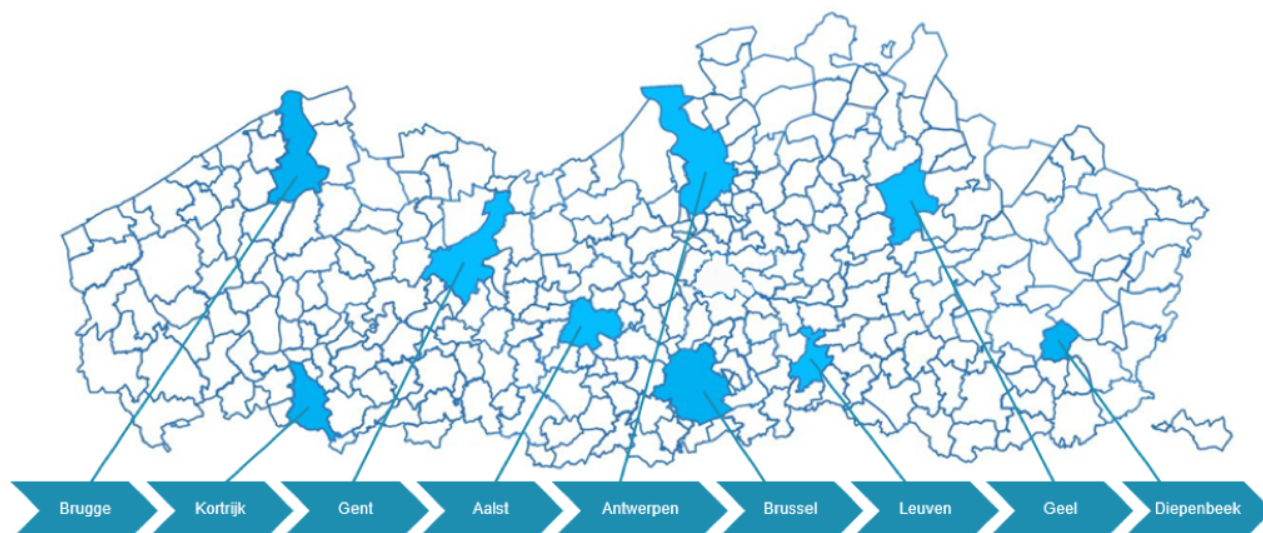
- The institutional needs for modifying the concept and redesigning the curriculum of the Teacher Training Program
- The unique approach and design of the hybrid virtual classroom@KU Leuven, Kulak
- Impacts on Students and Teachers
- Design Guidelines

### Why Hyflex Learning@KU Leuven?

KU Leuven, one of Europe's oldest universities, is dedicated to education and research in nearly all fields (more info on <https://edtechbooks.org/-hqW>). As can be seen in the map in Figure 1 below, KU Leuven boasts fourteen campuses, spread across 9 cities in Flanders, the northern part of Belgium. KU Leuven also offers the **Master of Teaching Program**, which in Dutch is called 'Educatieve Master' (<https://edtechbooks.org/-PgYy>). In September 2019, KU Leuven started with **EDU**, a brand new concept for Teacher Training (<https://edtechbooks.org/-VyN>).

**Figure 1**

*Locations of KU Leuven Campuses*



The institutional goals of the transformative **EDU@KU Leuven program** are the following:

### 1. **Flexible organization**

Within EDU, maximum flexibility is provided to students. As EDU is part of an extensive cooperation network all over Flanders, students are allowed to follow certain courses, seminars or projects at the location of their choice, in line with their interests or because a certain location better suits their personal schedule.

Next, the program offers an alternation between face-to-face education, distance learning and blended forms in line with the HyFlex model presented by Beatty (2019). This flexible approach makes the program more accessible to students who are combining work and education.

In the EDU program, students have the flexibility to choose the specific campus and their mode of participation in classes.

### 2. **Exchanging expertise and bringing people together independently of place**

Next to fixed courses as part of the different Master of Teaching Program, some courses at the different campuses and institutions are open to all students, independently from which program they are enrolled in. This means that within the new EDU concept we are able to bring together people from different places, with different backgrounds and with different expertise. This leads to a more open and multidisciplinary approach in which students get acquainted with different perspectives.

## Providing HyFlex Learning@KU Leuven

To meet the goals of flexible learning crossing borders, the KU Leuven invests significantly in the use of **educational technology** to facilitate collaborative learning and multi-campus education and to broaden the international reach (see <https://edtechbooks.org/-urS>). One specific technology that is currently changing the educational landscape and makes education more flexible and accessible for a larger and more diverse group of learners is the **hybrid virtual classroom**. The general concept of 'hybrid virtual classrooms' is connecting both on-site students and individual remote students during synchronous teaching and learning (See [Raes, Detienne, Windey, & Depaepe, 2019](#)) for a more detailed study of the concept). This provides the pedagogical freedom to reach students and teachers from any place in the world, increasing both societal access to education and improving the quality in education as knowledge transcends the boundaries of the classroom.

# The Unique Approach and Design of the Hybrid Virtual Classroom@KU Leuven, Kulak

ITEC, an imec research group at KU Leuven - to which the authors are affiliated to - is often involved in research and development projects in which academic partners work together with industry partners to meet bottom-up, practically oriented innovation goals. The LECTURE+ project<sup>[1]</sup> (see <https://edtechbooks.org/-Ejk>) more specifically aimed to make distance learning as seamless and vivid as learning in face-to-face classrooms, without sacrificing the affective features of face-to-face instruction by building a synchronous hybrid virtual classroom.

As one of the first steps in the project, we completed a systematic literature review (Raes et al., 2019) on synchronous hybrid learning to learn from earlier studies and experiences and avoid making the same mistakes as earlier project teams. We learned that past experiences and published research clearly shows the potential of this emerging practice, but also stresses the current challenges. Many studies state that 1) for remote students the learning experience is still not the same as being in the classroom and 2) many teachers mention the heavy workload and 3) the less natural way of teaching.

Together with the industry partners, we investigated how a hybrid virtual classroom should be designed to improve the learning and teaching experience. Besides that, we designed our approach so that the extra technical support required would be as low as possible to make the solution **easy to use for teachers and students, supporting natural teaching and cost-efficiency**.

The project resulted in a hybrid virtual classroom that is **innovative and unique** compared to the previous video- and web-conferencing platforms for two reasons. First, the system includes improved software to connect students and the teacher to make spontaneous interaction possible. Second, we also invested in a redesign of the physical learning space to meet the challenge of offering all students comparable learning experiences regardless of their location. Special attention has been paid to making the **hardware lightweight and ensuring ease of use** of the set-up from the perspective of the **teacher**, the **students** and the **room operator**.

The pictures in Figures 2 and 3 below show the hybrid virtual classroom in which both on-site students and remote students can follow the course, at the same time, but from different locations. Remote students are projected on the screens accompanied by their name. This makes it very easy to interact with the remote students. The screens are placed in the back of the classroom, as they are the last row of students.

<sup>[1]</sup> The imec.icon project LECTURE+ is a research project bringing together academic researchers and industry partners. In this project the research groups ITEC, Distrinet and PSI collaborated with the industry partners Barco, Televic Education and Limecraft. The LECTURE+ project was co-financed by imec and received project support from Flanders Innovation & Entrepreneurship (project number HBC.2016.0657).

## Figure 2

*Pictures Taken in the Hybrid Virtual Classroom at Edulab, KU Leuven Campus Kulak Kortrijk, Belgium*



The teacher can easily interact with on-site and remote students by asking oral questions or launching a quiz or poll via the system. To launch quizzes or polls, a more experienced teacher can make use of the tablet on which he/she can manage the different sources (e.g. learning content, the interactive whiteboard, chat platform, silent questions and the quiz/poll platform). Newcomers to the hybrid virtual classroom prefer that the room operator manage the quizzes or polls. The room operator has the same authorizations as the teacher and can assist when and where needed, including muting some or all students, pushing certain content, launching polls or quizzes, presenting the results, and chatting with students.

### Figure 3

*Picture Taken in the Hybrid Virtual Classroom at Edulab, KU Leuven Campus Kulak Kortrijk, Belgium*

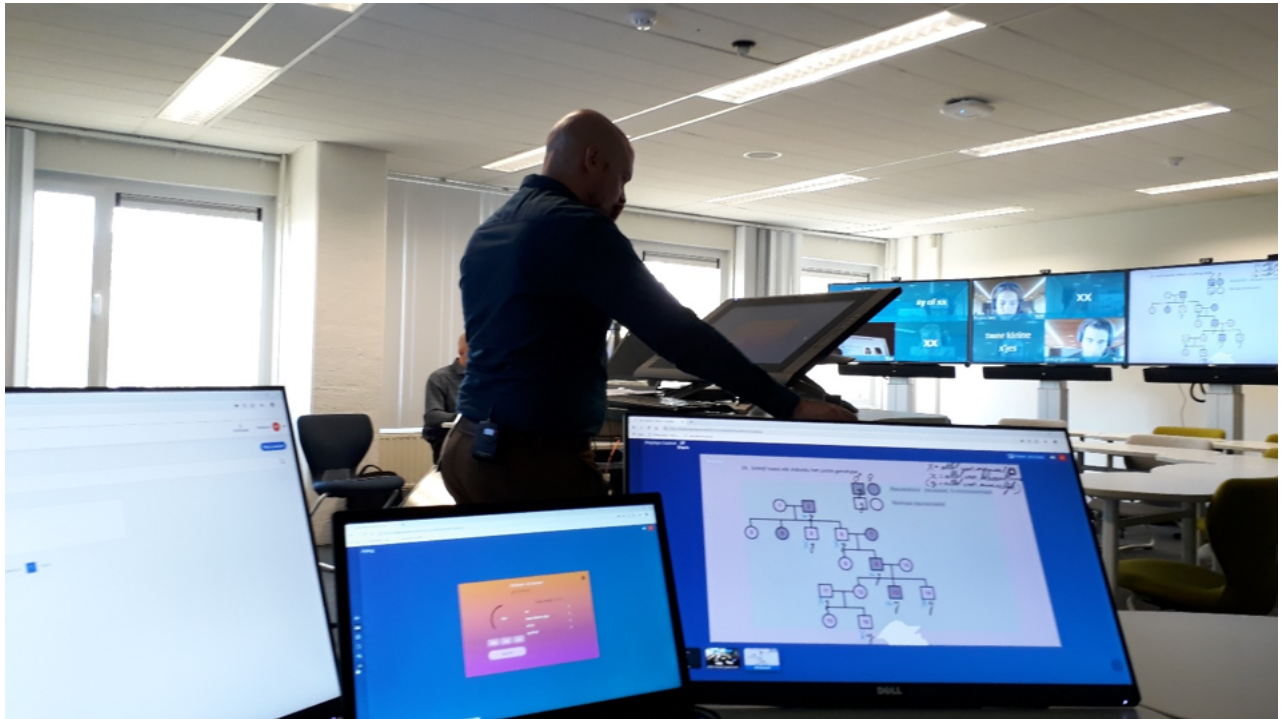
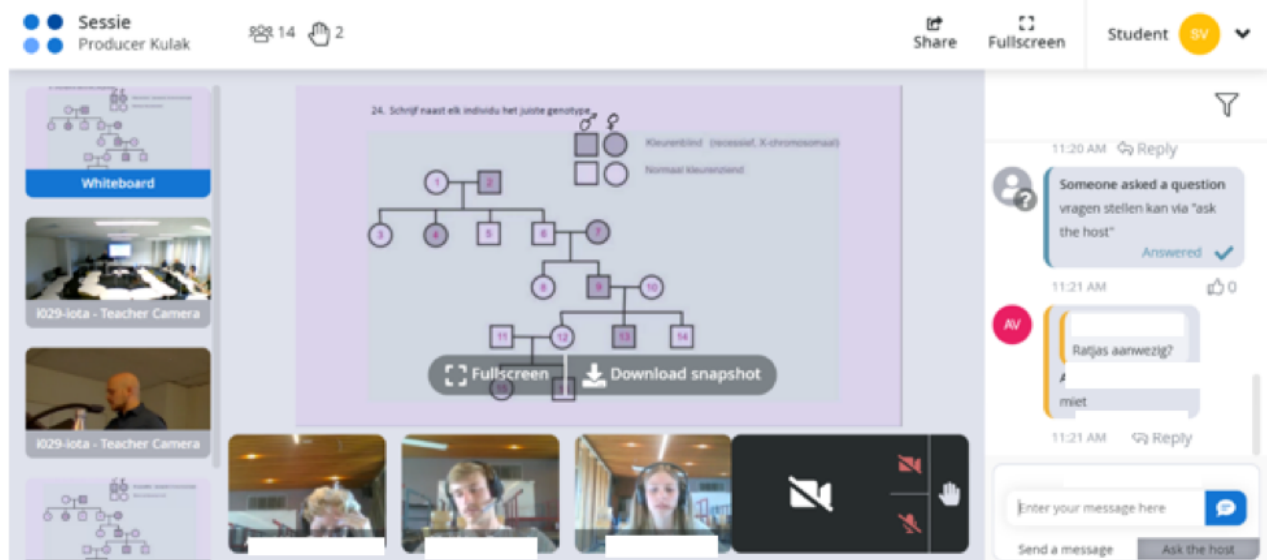


Figure 4 displays what remote students see when participating in a session giving in the hybrid virtual classroom at Edulab. On the left side, remote students can select which screen they put in focus. Cameras in the virtual classroom record from 5 different angles. By means of the global view (i.e. camera on top of the presenter screen, remote participants can see how they are displayed in the classroom. The virtual room director, developed in the context of the LECTURE+ project, manages multiple camera views and shows based on AI algorithms the best camera view according to what is happening in the room.

By means of the 'Share Button', every (remote) student is able to share his/her screen. Once the screen is shared it becomes part of the sources in the teacher platform and the teacher or room operator can share the screen with all participants. On the right side of the interface, students can make use of the chat window. By using the chat, students can interact with the teacher and their fellow students. Students can also send a question to the host of the session (i.e. the teacher and room operator). A student can choose to do this anonymously or not. These 'silent' questions are made visible for the teacher and room operator on the tablet they use to manage the different sources. Students can see the questions on the right side of the interface (see the chat window on the pictures below). Students can 'like' a question of a peer which informs the teacher about the most relevant and urgent questions.

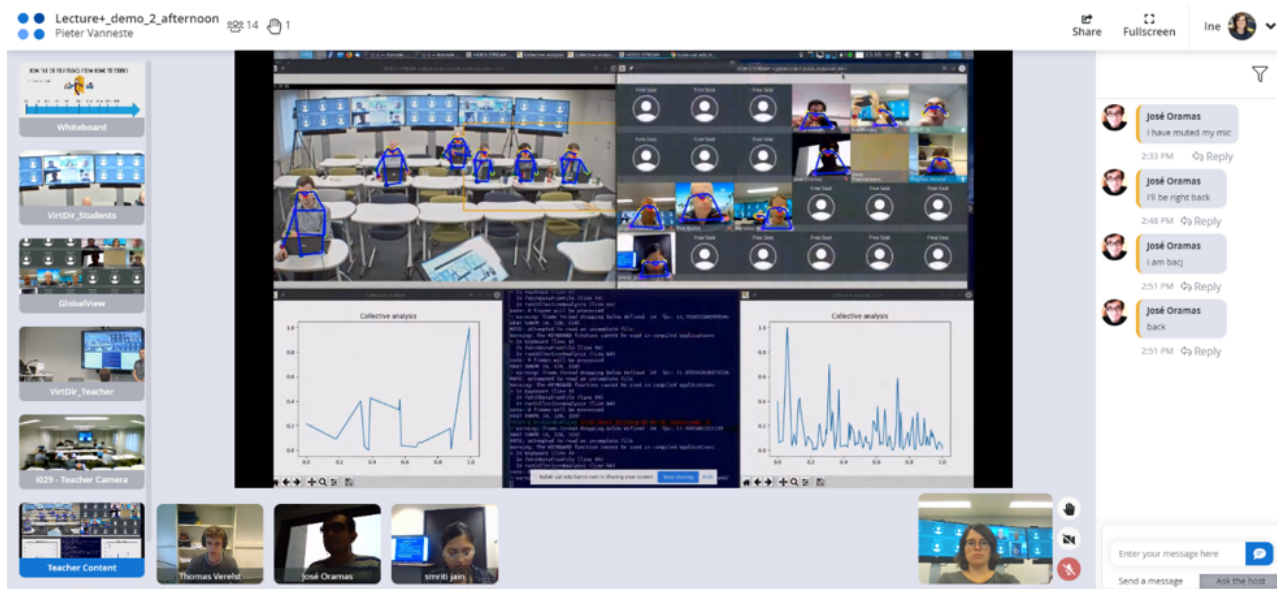
#### **Figure 4**

*Screenshots From a Remote Student Participating in Sessions Given in the Hybrid Virtual Classroom*



**Figure 5**

*A Picture Taken During a Demo Session With the Research Team*



## Impacts on Students and Teachers

As indicated above, the EDU format results in courses with participating students spread over Flanders. Several teachers started using the hybrid virtual classroom to teach all or part of their courses in the context of the Teacher Training Program. As we were one of the first institutions that tested the hybrid virtual classroom, it was important to continuously assess the experience as it developed, revising the approach as necessary to support effective teaching and student learning. To be able to update the solution along the way, interviews were organized with the involved teachers to gauge their experiences. We also systematically evaluated students' experiences by sending them online questionnaires. In the context of the LECTURE+ project more specifically, one within-subject experimental design study was set up to investigate the effect of launching quizzes on students' engagement during hybrid virtual learning (see [Raes, Vanneste, Pieters, Windey, Van Den Noortgate, & Depaepe, 2020](#)). Below we summarize the results of the experiences from the perspective of the teacher and the students.

## Teachers' Experiences

What we found in every interview with teachers who taught in the hybrid virtual classroom is that the experience exceeded the expectations they had beforehand. One teacher stated: *"I thought that teaching to virtual students would have been very artificial and weird, but this was not at all the case. I had the feeling that my [virtual] students were very close to me and I could see their faces and expression even better than in a traditional F2F classroom; ... I could easily interact with them as I do in a normal class setting and I had the feeling my students were very attentive."*

Seeing the remote students as good as the on-site students is expressed by every teacher as an important benefit. The fact that students' names and students' answers on the quizzes or polls are also visible on the screens additionally improves the interaction and supports the natural way of teaching.

Most of the teachers had had experience with traditional videoconferencing systems and indicate the facilitation of spontaneous interaction as the biggest advantage of the hybrid virtual classroom.

Although it is a big advantage that the teacher can see the remote students, one teacher indicated that she often had to make her students aware that they are visible and that they should behave as if they were in the physical classroom. Some students, for example, start eating during the course and others did not choose the most appropriate background. This teacher suggested that we provide students with some basic behavior and visual awareness rules as 'digital etiquette', in addition to providing the basic technical requirements for participation.

Teachers indicate that professional training focusing on the do's and don'ts of teaching in the virtual classroom is key. Next to this, teachers indicated that they were very happy with the assistance of the room operator. This is especially needed if teachers are newcomers to the virtual classroom. Consistent with our literature review ([Raes et al., 2019](#)), teachers express that in the beginning, teaching in the new learning environment creates a heavy cognitive load to give attention to both on-site and remote students, managing the new technology and focusing on the learning content. Yet, more experienced teachers testify that after getting more acquainted with teaching in the new environments, it is sufficient if the room controller only assists with the system set up at the start of a session. After the session begins, experienced teachers often feel secure enough to teach without the continuous assistance of the room operator.

Teachers express that professional training is not only needed from a technical point of view, but also from a pedagogical point of view; a point which is also in line with our literature review. Teachers shared that teaching in the hybrid virtual classroom requires them to think in advance about how to transform their lecture into an interactive lecture. Some teachers believed at first that their learning content (e.g. law) is not applicable for launching quizzes and polls. Yet, in the professional training, we make clear that interaction can be applied easier than initially thought. In line with Merrill's first principles of instruction (Merrill, 2002), we also advise starting lectures with activating prior knowledge about the content of the course. Halfway and at the end of the course teachers can also organize formative assessments to check students' understanding. Yet, interaction can also be based on non-content related issues. For example, teachers can ask students if they need a 15 min break or prefer to skip a break and end the lecture 15 min sooner. The platform supports 'on the fly quizzing and polls' which means that preparation in advance is not needed. Teachers express that they appreciate the easy use of the "on the fly quizzing and polling" as it supports spontaneous interaction with all students, no matter if they are on-site or remotely. However, if teachers apply formative assessment, we advise them to prepare their questions in advance and include them in their presentation slides.

Teachers also expressed that – especially as a newcomer – they wondered how they were visible for the students. The nice thing about the system is that the room operator can show the teacher the student visual perspective. As part of the development in the LECTURE+ project, an automatic room director has been a development which provides the students with a dynamic view of the teacher. This feature means that teachers do not have to pay particular attention to where they stand during teaching, as the virtual director follows the teacher throughout the classroom.

All teachers express that they have the intention to use the hybrid virtual classroom in the future. One teacher specially mentions looking forward to use the newest features in the platform, such as, organizing break-out sessions during synchronous virtual teaching.

## Students' Experiences

Teachers told us that some students were very skeptical about the new format of EDU as they thought the model would harm them if they chose to follow the course remotely. One student even shared her complaints by email with the teacher as her personal situation forced her to follow the course remotely and she thought this would be a disadvantage for her. The teacher testifies that now, this student is one of the most enthusiastic students in her course even though she participates remotely.

Yet, we should acknowledge that the student's belief was reasonable as many studies conclude that on-site students and remote students still experience the lesson differently in the hybrid synchronous situation (Szeto 2014; Zydney et al. 2019). As already mentioned above, we set up an experimental within-subjects design study comparing the students' learning experiences of on-site versus remote students in the hybrid virtual classroom (Raes et al., 2019b). A mixed-methods approach was used including real-time measurements of intrinsic motivation next to retrospective self-report surveys and interviews. Our study found, in line with previous studies, that the relatedness to peers and the intrinsic motivation is the lowest for students following remotely, while other students attend the course on-site. No significant difference in motivation was found if all students follow the course remotely or all students follow the course on-site. A limitation of this study was that the participants were twelfth graders and that the remote experience was rather artificial for them.

In contrast to the participants in our experimental study, students in the context of the teacher training program often combine study and work and many live far away from the campus. For these reasons, these students appreciate the flexibility which is offered by means of the hybrid virtual classroom much more, as it gives students the choice where to attend the course. Teachers testify that at the beginning of their courses the majority of the students came to campus to follow the session in the classroom. Yet, week after week the amount of students coming to campus reduced as students became convinced that the learning experience as a remote student was much better than they initially expected.

Students mentioned the following actions as the most effective to guarantee and support a pleasant learning experience:

- You can easily indicate if you want to say or ask something. This is made possible by pressing the 'raise hand' button, but it is also possible in the traditional way by raising the hand as the teacher can see us on the screens in the back of the classroom.
- Quizzes and polls launched during sessions enhance cognitive understanding and make sure we stay engaged. The positive effect of quizzes on students' engagement is also confirmed in the experimental study ([Raes et al., 2020](#)).
- If there is a technical problem, we can ask this without disturbing the session by using the chat window, which can be followed up by the room controller, the teacher and fellow students.

Most participants found it quite easy to follow sessions in the hybrid virtual classroom. The possibilities for interaction are highly appreciated and students indicate that teachers should even make use of them more systematically. On a technical level, few problems were experienced. To participate in a hybrid session, students need a personal computer with webcam and microphone, a good internet connection and Google Chrome are the only requirements. The use of a headset is recommended for optimal audio quality.

**Table 1**

*Summary of the Main Benefits for Teachers and Students*

Benefits for teachers	Benefits for students
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- Teachers don't have to sit behind a screen, but can teach as they normally do: standing or walking around.
- Teachers can naturally interact with on-site and remote students as both are visible.
- The teachers do not have to bother about his/her position, as the virtual room director follows the teacher.
- Multiple options for interaction make it easier to know if your students are still engaged.
- Based on students' personal situation, they can choose to come to campus or follow the session remotely.
- Remote students are projected on the screens in the back of the classroom as they are the last row in the classroom. This makes them part of the classroom.
- Remote students can select different viewpoints.
- Multiple options for interaction make it easier to stay motivated during lessons.
- Interaction between onsite and remote students is possible.

## Design Guidelines

Based on the experiences of the teachers and students who used the hybrid virtual classroom and based on the academic research results, we formulated five design guidelines for teaching in the hybrid virtual classroom. These guidelines are also printed on a poster that was hung in the hybrid virtual classroom, so teachers would have a constant reminder in their field of view.

1. **Prepare yourself and your session in advance:** both on the technological and pedagogical level. Make sure that you have followed the demo and that you have thought about integrating interactivity.
2. **Trust the room operator; focus on teaching:** As a newcomer in the virtual classroom, you can focus on teaching, the room operator can assist you with managing everything, including launching quizzing and presenting the results. You will see, you will learn by doing and make the room operator redundant.
3. **Welcoming students:** Ensure that the remote students always feel included in the class to reduce some of the distancing effects. Address them by using the names visible on the screens.
4. **Clear communication:** Communicate requirements to students in advance: headset, syllabus, charger, etc. (the most typical problems can already be addressed outside of class). If you will start 5 minutes later than planned, communicate this to the remote students as they do not 'feel' it that people are still coming in.
5. **Cognitively activate students:** Use students names, frequently ask questions, launch poll/quizzes and discuss the results.

## Conclusion

We strongly believe that educational institutions, including universities, should embrace technology as the implementation can offer opportunities for innovative teaching approaches and supports the current societal transitions. Our hybrid virtual classroom is found to be a teaching and learning facilitator that support multi-location learning and enables people, at any stage of their life, to take part in stimulating learning experiences. Yet, to ensure that innovative projects can be scaled up and be implemented university-wide, a well thought-out policy is required dealing with both pedagogical and technical challenges.

According to us, the main pedagogical challenge is that it requires from the teacher's perspective a shift in the pedagogical methods in order to accommodate to the new technology. In addition, because the quality of the teaching is partly dependent on the teacher's competence in using the technology, the teacher needs to actively learn how to work with the technology and has to get opportunities to try things out and evaluate the outcomes on the basis of evidence. To deal with this challenge, the university invests in a university-wide expertise center, KU Leuven Learning Lab (see <https://edtechbooks.org/-fHEA>) to support project teams that want to test and roll out innovative ideas and to work together on the realization of the policy priorities.

The most important technological challenge is that innovative technologies are continuously altered, which can be frustrating, especially for teachers. It is found that small usability issues, caused by the continuous updates of innovative technologies, may confuse, delay or hinder the learning process. Consequently, reliable educational technology calls for a trustworthy IT foundation. This means that a good network infrastructure and adjustments to meet the newest developments are self-evident, but this is not achieved without continued efforts. A technological update, well spread out, scalable and financially feasible forms the essential link to incorporating technology in contemporary university education.

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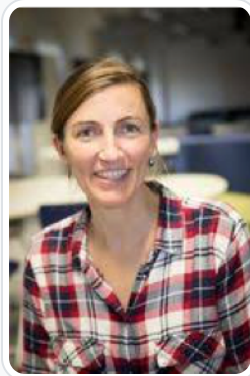




## Annelies Raes

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Annelies Raes holds a PhD in Educational Technology by Ghent University and is currently working as Postdoctoral Researcher at the Centre for Instructional Psychology and Technology (CIP&T) at the University of Leuven (KU Leuven), campus Kulak in Kortrijk, Belgium. Annelies Raes is also co-Principal Investigator within imec's Smart Education Program (<https://www.imec-int.com/en/articles/smart-education>). Her main fields of interest are new innovative education models as active learning and problem-based collaborative learning and how this can be supported by emergent technologies. From 2017 Annelies was in charge of the research conducted in the context of the TECOL project (<https://www.kuleuven-kulak.be/tecol?lang=en>), the research and development project on Technology-Enhanced Collaborative Learning at KU Leuven, campus Kulak Kortrijk. Annelies also conducted the research from a pedagogical perspective in the imec.ICON project LECTURE+ about effective remote learning (<https://www.imec-int.com/nl/imec-icon/research-portfolio/lecture>).



## Marieke Pieters

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Marieke Pieters holds a Master in Geography and was teacher for more than 15 years in a secondary school in Kortrijk (<https://lyceumolvlaanderen-kortrijk.rhizo.be/>). In 2018 she joined ITEC, imec's research group at KU Leuven, campus Kulak in Kortrijk as a full time researcher in the context of the LECTURE+ project. In this 2-year project her role was to set up the research projects focusing on Technology Integration together with the secondary school. Since 2020 Marieke Pieters combines her job as teacher in geography with a job at the KU Leuven where she is responsible for the professional development of teachers who want to integrate the technology for collaborative and distance learning (including the hybrid virtual classroom) in their courses.



## Piet Bonte

KU Leuven

Piet Bonte is IT staff at KU Leuven and core member of the Technology-Enhanced Collaborative (TECOL) project. He provides central IT-AV support for education, research, administration and policy and manages the IT-AV infrastructure. He strongly collaborates with the Industry Partners (e.g. the one in the LECTURE+ project) for the rollout and implementation of the IT solutions.

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