

# **HYBRID EDUCATION – A CRITICAL REVIEW INTO CHALLENGES AND OPPORTUNITIES**

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## **ABSTRACT**

Hybrid education is a complex combination of simultaneous face-to-face and online teaching. This model of teaching comes with a wide range of benefits, primarily being able to offer the same content to a wider audience. Hybrid education became an effective form of teaching during the COVID-19 pandemic. In these post pandemic years, the benefit of hybrid education can still be utilized, allowing for improved flexibility in teaching schedules, engaging students in interactive learning, bringing online students closer to the teacher and face-to-face students, and offering education to students who could not otherwise participate. However, with all the benefits of hybrid education, there are some significant challenges which restrict the implementation or hinder the full potential of hybrid education. Some key challenges are student engagement from the online students with the teacher as well as with other students, technological requirements, physical classroom set-up, education of the teachers, and time investment in re-structuring courses. In this article, we review the challenges of hybrid education, strategies to address these challenges focusing on implementation and effectiveness, as well as evaluating student feedback from students at Jönköping University that have been a part of hybrid education.

## **KEYWORDS**

Hybrid education, Student engagement, CDIO Standards: 8, 10

## **INTRODUCTION**

Hybrid education combines traditional face-to-face instruction with online learning, offering a unique approach to teaching and learning that has numerous potential benefits. The objective with the study was to evaluate the effectiveness of hybrid education in some of the courses that have adopted this educational approach, to examine the pros and cons encountered by students and teachers, and to observe the impact in a real-world setting. At the School of Engineering (JTH) at Jönköping University (JU), the decision was taken to conduct a study on hybrid education due to its increasing popularity in the educational landscape.

The students' perspective on hybrid education was collected through an online survey while the teachers' perspective was collected through semi-structured interviews. The study and its

results have provided an improved insight into understanding hybrid education, its advantages, and its drawbacks. The applied research methods, the questions posed, and the obtained results are presented further on, but first the theoretical background of hybrid education with its challenges and opportunities, and the results from some previous studies in the same field, are presented.

### ***Hybrid education – theoretical background***

Amidst the pandemic, universities have adapted by finding new ways to teach and progress with courses as traditional face-to-face teaching became restricted. Alongside this forced shift, the rapid development of technology has been instrumental in the adaptation of hybrid education, as it was already being used to a degree before the COVID-19 outbreak. The pandemic, however, has caused a significant increase in the implementation of hybrid education. Hybrid education is one of the newest educational methods, which allows some students to attend classes in person and others to join online simultaneously (Raes, 2022). Hybrid education is used when you have two cohorts of students, at the same time, that cannot be together in the same space due to time, physical or other constraints. Hybrid education often has different definitions, however for this study, the authors refer to hybrid education as a combination of face-to-face and online synchronous teaching that creates a cohesive learning experience.

The development of hybrid education has caused the traditional pedagogical methods to evolve, as the customary resources, functions, and classroom settings are being broadened, re-evaluated, and renamed. Hybrid education is emerging as an educational option that allows access to people who, for various reasons, are unable to access more traditional educational approaches, such as face-to-face learning. For this to be successful, a collaborative atmosphere needs to be established, with equal communication for all parties involved (Gao et al., 2020). livari et al. (2020) posed that the concept of learning will go through a radical transformation, taking us to where we should have been from the start. This implies that teaching cannot be restricted to the classroom (Ayub et al., 2022) and could be extended through forms of online education to have a positive impact on the students' learning.

The research in the literature does not always present a clear definition of hybrid teaching, which includes not clearly distinguishing it from other forms of lesson delivery (such as blended learning) or describe how this type of teaching is conducted in the classroom setting, especially after the COVID-19 pandemic (Ulla & Perales, 2022). However, there is still a strong support for hybrid education, and it can be seen as one of the answers to 21st-century education (Singh et al. 2021). The evolution of teaching techniques has resulted in the emergence of hybrid education. Nowadays, the concept of hybrid education is one of the most talked about topics when it comes to forms of online education; it involves a considerable amount of course material and interactions between teachers and students that take place virtually and physically simultaneously. It encompasses various forms of communication and collaboration, as demonstrated in Figure 1, for creating an effective learning environment.

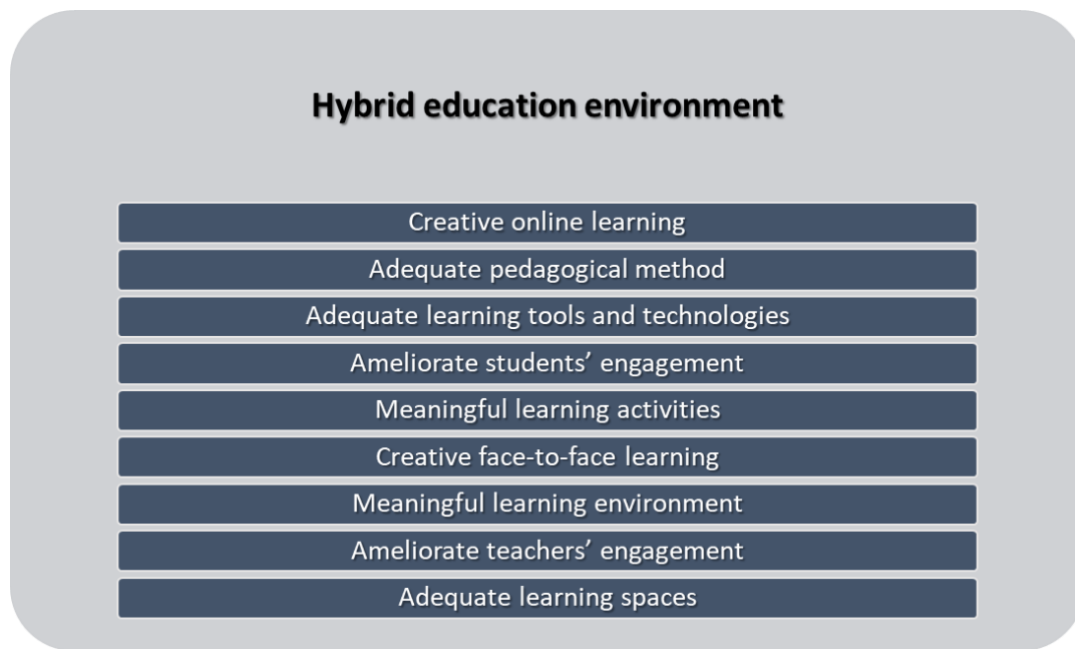


Figure 1. A hybrid education environment.

### ***Hybrid education – challenges and opportunities***

Effective learning requires that higher education institutions strategize ways to enable individuals to participate in enriching learning activities. In our increasingly international and interconnected world, it is becoming harder for people to be physically present in one place for a long time (Slavensky, 2019). Furthermore, the student demographic is altering, and individuals are finding it difficult to balance study, work, and family life. To solve this problem, education must become less dependent on location and timing and allow more flexibility within the learning program (Lakhal et al., 2017). Additionally, there is a need to collaborate beyond the borders of institutions, incorporate knowledge from external organizations, and deal with rising numbers of enrolment and diminishing institutional budgets (Stupnisky & Butz, 2016). One way of dealing with these issues is to introduce hybrid education as a pedagogical tool and technological platform where the synchronous modality is one alternative.

Although hybrid education can provide a wide range of benefits, such as cost savings, increased flexibility, and access to educational resources, it also presents some potential challenges. The concept of hybrid education is not simply a combination of online and face-to-face instruction. Rather, it focuses on optimizing the achievement of the intended learning outcomes by applying the “right” learning technologies to match the “right” pedagogical approach to the “right” student at the “right” moment in time (Graham, 2005).

Hence, teachers must adjust their pedagogical approaches to accommodate the new technologies in synchronous hybrid education environments (Cain, 2015; Ramsey et al., 2016). This type of education requires different teaching methods and engaging learning activities (Bower et al., 2015; Weitze, 2015; Weitze et al., 2013). When considering student engagement (and disengagement), all dimensions should be contemplated by the teacher, that is, behavioral - *follow rules & complete tasks*, cognitive – *adopt an active process of learning*, emotional - *reaction to learning*, social - *invest in a collegiate experience* and collaborative -

*create relationships* (Bergdahl, 2022; Redmond et al., 2018). Teachers should be aware of these dimensions and prepare different activities within the hybrid learning space to try to deal with these.

Teachers must be able to maintain comparable education standards while adapting to the new environment (Grant & Cheon, 2007; Lightner & Lightner-Laws, 2016). For teachers to successfully use the technology and create high quality teaching, they must have the opportunity to practice and assess the results based on evidence (Grant & Cheon, 2007; Weitze et al., 2013). Consequently, CDIO standard 10 needs to be addressed as it focuses on teachers' competence development in relation to possibly new and different teaching methods.

Teachers must also take on extra coordination for hybrid education environments (Ørngreen et al., 2015). During instruction, teachers must pay attention to both the remote and the face-to-face students, as well as the technological platform. This requires a heavy mental load, known as hyper-zoom or hyper-focus (Bower et al., 2015; Zydney et al., 2019; Ørngreen et al., 2015). The goal of hybrid education is to provide a similar learning experience for both remote and face-to-face students (Szeto, 2014; Zydney et al., 2019). To do so, teachers must design and implement pedagogical strategies and technological systems that will create a sense of co-presence (Bower et al., 2015; Cain et al., 2016). Care should be taken, however, to ensure that teaching strategies, such as a slower pace with more repetition, do not compromise the learning of face-to-face students (Bower et al., 2015; Szeto, 2014; Szeto, 2015).

Olt (2018) studied the phenomenon of hybrid education from the perspective of the remote participant and found that the negative experience could be explained by the concept of 'ambiguity' in terms of group membership, technology functionality, and location. Huang et al. (2017) also noted that the remote students felt excluded from the main class due to physical separation and technical difficulties without adequate support. On the other hand, the face-to-face students felt neglected when the teacher devoted time to resolving these issues. Activating and engaging the remote students at the same level as face-to-face students is difficult in hybrid education. Weitze (2015) found that remote students learned less, were more passive, and seemed to be watching TV rather than attending the lesson. This is attributed to many teachers using monologue-based teaching strategies, which are not appropriate for this setting. A way to get around this problem is to use online student-driven active learning modules that ensure that all students (and not only the face-to-face students) are active and engaged (Ahlin, 2021).

Weitze et al. (2013) found that remote students find it difficult to make the teacher aware that they want to answer a question, leading to frustration and disengagement. The hybrid education environment requires more self-discipline from remote students (Wiles & Ball, 2013), as the teacher is not physically present to monitor their engagement. To address this, teachers must invite remote students to participate in class activities (Weitze et al., 2013). One way could be to apply quizzes and polls to monitor student engagement (Bower et al., 2015; Pick & Cole, 2021; Raes et al., 2020; Sebae et al., 2019). They benefit both the teacher and the student. Teachers can use the results to adjust their teaching and identify gaps in student understanding (Bower et al., 2015; Lightner & Lightner-Laws, 2016). For the students, it is a way to give feedback to the teacher and let them know when a student is struggling with a topic (Lightner & Lightner-Laws, 2016).

Remote learners also feel a sense of distance from their institution, so there must be a way to connect remote students, teachers, and face-to-face classmates (Ramsey et al., 2016). To address this the audience response system (ARS) could be used. It has shown good results regarding student satisfaction, learning outcomes, engagement, and levels of confidence (Assad et al., 2022). Every 15-20 minutes during a lecture, both face-to-face students and remote students alike will be exposed to a short practice and exercise related to the topic of the lecture followed by thinking-aloud pair problem solving (Brent & Felder, 2012), ending with clarifications and class discussions. This active classroom approach is in line with CDIO standard 8 that stresses the importance of “teaching and learning based on active experiential learning methods”.

## **FINDINGS AND DISCUSSION**

In order to better understand how hybrid education is both taught by teachers and received by students, interviews with teachers and a survey which was sent out to students at JTH who had taken part in hybrid education were used. The survey was limited to 10 questions as shorter surveys are found to improve the response rate. The survey was designed to address the challenges and opportunities as identified in the previous sections, and the interviews were an open dialogue discussion with some pre-planned questions to get the teachers' perspective. It is pertinent to point out that the majority of the courses involved in these results were a necessity during the COVID-19 pandemic.

The survey showed that the majority of the students adapted positively to hybrid education, with an average of 5.3/7 when asked to rank how they would describe their experience in hybrid education from 1 (negative) to 7 (positive). The method of hybrid education that the students took part in was primarily lectures/seminars at 92.3%, with 23% of students also taking part in laboratory or other forms of activities. This is interesting to show that hybrid education does not need to be limited to classroom lectures but can also be adapted to other forms of teaching that typically require more interaction. The students showed that there was an even split between online and in-class students, and when asked if they felt a greater (or lower) motivation and engagement in their personal learning approach because of hybrid education, 35.7% of the students responded with a higher impact, 42.9% no impact while 21.4% mentioned they had lowered their motivation. This could be expected as the challenges for student engagement have been well documented with online students, however, it is interesting to note that the primary source of students that mentioned it had lowered their motivation were on-site students. From the students' open comment responses, this is primarily linked to the teacher requiring him/her to spend more time dealing with online students or technical issues instead of the typical focus the teacher would have in class.

The students were asked questions around the benefits of hybrid education and what could be improved to increase their positive experiences, and the common key words are presented in Table 1. The most observed response for the benefits with hybrid education was the flexibility that it offers. This allowed several students who would otherwise miss the lecture to attend, with the most common reason being sickness or travel time/difficulty. The second most common response was that they had the opportunity to re-watch the recorded lecture as most of the lectures are now also recorded due to the online component. This was even seen with the ways to improve the learning experience where the students who did not receive a recording after the lecture commented that this was missing. This is therefore a simple yet useful tool for the students in the learning process, however it could be seen as a method for

students to easily miss the live lecture and instead watch the video. This is not necessarily an issue for typical lectures, however if there are discussions throughout the teaching period, the students will miss this learning opportunity and the teacher may have fewer students for the activities than planned. The students also identified that the quality of a video is important in order to improve the experience.

Table 1. Common student feedback on hybrid education.

What do you see as the benefits of hybrid education?	What could have been improved to increase your positive experiences?
<ul style="list-style-type: none"> <li>• Flexibility – Sick, travel</li> <li>• Re-watch lectures that are recorded</li> <li>• More students are able to attend</li> </ul>	<ul style="list-style-type: none"> <li>• Better video quality</li> <li>• Keep online students engaged</li> <li>• Always record the lectures</li> <li>• Delay between online and on-site student/presenters</li> </ul>

Finally, the students were asked if they would take part in hybrid education again, with 85.7% responding that they would with positive comments of the schools' approach to move towards hybrid education. From the students' perspective, it appeared that the students adapted quickly and efficiently to hybrid education, and really appreciated the flexibility that it offers. Further investigations are being conducted into the student course satisfaction surveys to identify the long-term trends of courses switching between on-site and hybrid courses. This will ideally give further insights into the impact of hybrid education.

While it is extremely important to identify the effect of hybrid education on students, the impact that switching to hybrid education has on teachers is often discussed as a challenge caused by an increased workload. The teachers identified that they did not greatly change their course content, and the adaptation to hybrid education was the simultaneous filming and streaming to the online students, and that this form of teaching was chosen out of necessity or request as opposed to personal choice. The teachers that were interviewed did not attempt cross-engagement between online and on-site students during problem-based learning which reduced some of the challenges typically identified within hybrid education. While the teachers did not note a significant increase in the preparation, they found that it was a learning curve to ensure that the lectures run smoothly in practice, and there was an increase in energy during the class to ensure that both online and on-site students received the attention required to not diminish the learning experience that was noted from the students' perspective. It is a reasonable assumption that hybrid education could be improved if there was an assistant present to help with the recording and the online students so that the teacher can focus on teaching, knowing that both groups are well attended. This would improve the online experience, and not break up the on-site experience. However, this does come at an additional cost and time commitment of having an extra person in the classroom for all teaching sessions. It was also interesting to hear that most teachers would prefer not to use hybrid education unless they see that it gives students, who otherwise would not be able to attend, a chance to attend, for example students with visa issues who are unable to enter the country.

## CONCLUSIONS

Hybrid education has emerged as a useful method of teaching, which has advanced due to various technologies and the requirement for alternative teaching methods during the COVID-19 pandemic. Several challenges and opportunities have been well documented within literature regarding hybrid education.

Surveys and interviews with students and teachers were implemented within this study to identify how hybrid education is taught and received by the students. It was found that the experience was positively received by the students at JTH, with the majority finding the benefit of flexibility and being able to re-watch the lessons when also recorded contributing factors to this experience. The students identified a poor video quality and interruptions as key areas for improvement in moving forward with hybrid education. The response of students showing that the majority would enroll in a course with hybrid education highlights that this is largely a positive experience and a teaching method that should be further investigated and practiced.

Further studies into the student satisfaction surveys from courses which have swapped between on-site and hybrid education are currently underway to supplement this study with longer term trends of engineering courses at JTH.

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## REFERENCES

- Ahlin, E. M. (2021). A mixed-methods evaluation of a hybrid course modality to increase student engagement and mastery of course content in undergraduate research methods classes. *Journal of Criminal Justice Education*, 32(1), 22-41.
- Assad, S., Salti, H., & Farhat, M. (2022). Engineering students' engagement in a hybrid learning mode: Comparative study. *18th International CDIO conference* (pp. 465-473).
- Ayub, E., Leong, L. C., Hoe Yeo, D. C., & Ismail, S. R. (2022). Developing a solution for hybrid classroom: A pilot study from a Malaysian private university. *Frontiers in Education*, 17 June 2022, Section Higher Education.
- Bergdahl, N. (2022). Engagement and disengagement in online learning. *Computers and Education*, 188, 104561.
- Bower, M., Dalgarno, B., Kennedy, G. E., Lee, M. J. W., & Kenney, J. (2015). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case analysis. *Computers & Education*, 86, 1–17.
- Brent, R., & Felder, R. (2012). Learning by solving solved problems. *Chemical Engineering Education*, 46(1), 29–30.
- Cain, W. (2015). Technology navigators: An innovative role in pedagogy, design and instructional support. In P. Redmond, J. Lock, & P. Danaher (Eds.). *Educational innovations and contemporary technologies: Enhancing teaching and learning* (pp. 21–35). UK: Palgrave Macmillan.
- Cain, W., Bell, J., & Cheng, C. (2016). Implementing robotic telepresence in a synchronous hybrid course. *IEEE 16th International conference on advanced learning technologies, ICALT: vol. 2016*, (pp. 171–175).
- Gao, B. W., Jiang, J., & Tang, Y. (2020). The effect of blended learning platform and engagement on students' satisfaction - The case from the tourism management teaching. *Journal of Hospitality, Leisure, Sport and Tourism Education*, 27, November 2020, 100272.



- Graham, C. R. (2005). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.). *Handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco: Pfeiffer Publishing.
- Grant, M. M., & Cheon, J. (2007). The value of using synchronous conferencing for instruction and students. *The Journal of Interactive Online Learning*, 6(3), 211–226.
- Huang, Y., Shu, F., Zhao, C., & Huang, J. (2017). Investigating and analyzing teaching effect of blended synchronous classroom. *2017 International conference of educational innovation through technology (EITT)* (pp. 134-135).
- Iivari, N., Sharma, S., & Ventä-Olkkonen, L. (2020). Digital transformation of everyday life - How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? *International Journal of Information Management*, 55, 102183.
- Lakhal, S., De Sherbrooke, U., & Bateman, D. (2017). Blended synchronous delivery mode in graduate programs: A literature review and its implementation in the master teacher program. *Collected Essays on Learning and Teaching*, 47–60.
- Lightner, C. A., & Lightner-Laws, C. A. (2016). A blended model: Simultaneously teaching a quantitative course traditionally, online, and remotely. *Interactive Learning Environments*, 24, 224–238.
- Olt, P. A. (2018). Virtually there: Distant freshmen blended in classes through synchronous online education. *Innovative Higher Education*, 43(5), 381–395.
- Pick, L., & Cole, J. (2021). Building student agency through online formative quizzes. *17th International CDIO conference* (pp. 645-654).
- Raes, A., Vanneste, P., Pieters, M., Windey, I., Van Den Noortgate, W., & Depaepe, F. (2020). Learning and instruction in the hybrid virtual classroom: An investigation of students' engagement and the effect of quizzes. *Computers and Education*, 143, 103682.
- Raes, A. (2022). Exploring student and teacher experiences in hybrid learning environments: Does presence matter? *Postdigital Science and Education*, 4(1), 138–159.
- Ramsey, D., Evans, J., & Levy, M. (2016). Preserving the seminar experience. *Journal of Political Science Education*, 12(3), 256–267.
- Redmond, P., Heffernan, A., Abawi, L., Brown, A., & Henderson, R. (2018). An online engagement framework for higher education. *Online Learning*, 22(1), 183-204.
- Sebae, A. A., Rihawi, Z., & Azmat, F. (2019). Moodle quiz: A method for measuring students' engagement. *15th International CDIO conference* (pp. 333-343).
- Singh, J., Steele, K., & Singh, L. (2021). Combining the best of online and face-to-face learning: Hybrid and blended learning approach for COVID-19, post vaccine, & post-pandemic world. *Journal of Educational Technology Systems*, 50(2), 140–171.
- Slavensky, H. (2019). Evaluation of novel learning spaces for mixed on-campus and online students. *15th International CDIO conference* (pp. 591-602).
- Stupnisky, R. B., & Butz, N. T. (2016). A mixed methods study of graduate students' self-determined motivation in synchronous hybrid learning environments. *The Internet and Higher Education*, 28, 85–95.
- Szeto, E. (2014). A Comparison of online/face-to-face students' and instructor's experiences: Examining blended synchronous learning effects. *Procedia - Social and Behavioral Sciences*, 116, 4250–4254.
- Szeto, E. (2015). Community of inquiry as an instructional approach: What effects of teaching, social and cognitive presences are there in blended synchronous learning and teaching? *Computers & Education*, 81, 191–201.
- Ulla, M. B., & Perales, W. F. (2022). Hybrid teaching: Conceptualization through practice for the post COVID-19 pandemic education. *Frontiers in Education*, 22 June 2022, Section Digital Learning Innovations.
- Weitze, C. L. (2015). Pedagogical innovation in teacher teams: An organisational learning design model for continuous competence development. In A. Jefferies, & M. Cubric (Eds.). *14th European conference on e-Learning, ECEL-2015* (pp. 629-638). Reading, UK: Academic Conferences and Publishing International.
- Weitze, C. L., Ørngreen, R., & Levinsen, K. (2013). The global classroom video conferencing model and first evaluations. In I. M. Ciussi, & M. Augier (Eds.). *12th European conference on E-learning:*



SKEMA Business school, Sophia Antipolis France, 30-31 October 2013 (Vol.2, pp. 503-510). Reading, UK: Academic Conferences and Publishing International.

Wiles, G. L., & Ball, T. R. (2013, June). The converged classroom. *2013 ASEE Annual Conference & Exposition* (pp. 23.1176.1-23.1176.10), Atlanta, Georgia.

Zydney, J. M., McKimm, P., Lindberg, R., & Schmidt, M. (2019). Here or their instruction: Lessons learned in implementing innovative approaches to blended synchronous learning. *TechTrends*, 63(2), 123–132.

Ørngreen, R., Levinsen, K., Jelsbak, V., Möller, K. L., & Bendsen, T. (2015). Simultaneous class-based and live video streamed teaching: Experiences and derived principles from the bachelor programme in biomedical laboratory analysis. In A. Jefferies, & M. Cubric (Eds.). *14th European conference on E-learning (ECEL 2015)* (pp. 451–459). Reading, UK: Academic Conferences and Publishing International.

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