Research on innovation in asynchronous and synchronous distance learning
STATE OF THE ART REPORT

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Spis treści

Introduction

The COVID-19 pandemic has dramatically transformed the landscape of education, prompting a shift to online learning. Asynchronous and synchronous learning are two different types of online learning that have gained prominence in this context.

Synchronous learning refers to live, real-time learning that takes place through video conferencing, online chats, or webinars, where students and instructors interact in real-time. This type of learning mimics traditional face-to-face classroom instruction and requires students to be present at a specific time and place to participate.

Asynchronous learning, on the other hand, refers to self-paced learning where students access pre-recorded lectures, discussion boards, readings, and other learning materials at a time that is convenient for them. This type of learning offers more flexibility and allows students to work at their own pace.

Both synchronous and asynchronous learning have their own advantages and disadvantages. Synchronous learning offers real-time interaction with instructors and peers, immediate feedback, and a sense of community. However, it can also be challenging for students who have limited access to technology or live in different time zones. Asynchronous learning, on the other hand, offers flexibility and convenience, but can be isolating and may require more self-discipline from students.

In the context of the COVID-19 pandemic, many educational institutions have opted for a combination of both synchronous and asynchronous learning, depending on the nature of the course, the needs of the students, and the availability of resources. Overall, the choice between synchronous and asynchronous learning largely depends on the specific context, goals, and resources of the educational institution or program

The COVID-19 pandemic has brought about significant changes in the way education is delivered, with many institutions adopting synchronous and asynchronous learning to ensure continuity of learning while adhering to social distancing guidelines. Here are some

examples of COVID-19 innovations in synchronous and asynchronous learning:

Virtual classrooms: With the use of video conferencing tools like Zoom, Google Meet, and Microsoft Teams, students can attend classes in real-time from the comfort of their homes. These virtual classrooms offer features such as screen sharing, chat, and recording capabilities, making it possible for students to engage with their instructors and classmates in real-time.

Asynchronous learning platforms: Institutions have also adopted online learning platforms such as Canvas, Blackboard, and Moodle to deliver course materials asynchronously. These platforms allow students to access course materials, assignments, and assessments at their own pace and convenience.

Hybrid learning: A combination of synchronous and asynchronous learning, hybrid learning has become a popular approach during the pandemic. With this model, some classes are held in-person while others are delivered online. This approach provides students with the flexibility to attend classes in person or remotely, depending on their preference or circumstances.

Digital tools and resources: The pandemic has also led to an increase in the use of digital tools and resources in education. For instance, video tutorials, online simulations, and interactive quizzes have become popular ways to enhance the learning experience for students.

The following report provides a number of good examples of how universities have dealt with the immediate need to move to online learning. The information and inspiration gathered in this report formed the basis for discussions on possible solutions within the ERASMUS + „A model for Interactive (A)Synchronous Learning in Online STEM Education" eCLOSE project. Particular attention has been paid to the distinction between the four stages of the educational process - preparation, delivery, assessment, evaluation - which form a unique axis of analysis in this report and throughout the project.

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Synchronous vs. Asynchronous Learning

Synchronous and asynchronous learning are two different modes of education delivery that have gained prominence in the context of online learning.

Synchronous learning refers to real-time, live instruction where students and instructors interact at the same time through video conferencing, chat, or other online tools. This mode of learning allows for immediate feedback and fosters a sense of community among students. Synchronous learning is similar to traditional classroom instruction, but it can be conducted remotely.

Asynchronous learning, on the other hand, is self-paced learning where students access pre-recorded lectures, discussion boards, readings, and other learning materials at a time that is convenient for them. This mode of learning provides flexibility and allows students to work at their own pace, but may lack the immediacy of feedback and sense of community that synchronous learning offers.

Both modes of learning have their own advantages and disadvantages. Synchronous learning allows for real-time interaction and immediate feedback, but requires students to be available at a specific time, which can be challenging for those with limited access to technology or who live in different time zones. Asynchronous learning, on the other hand, provides flexibility and convenience, but can be isolating and may require more self-discipline from students.

The choice between synchronous and asynchronous learning depends on the specific context, goals, and resources of the educational institution or program. Some courses may lend themselves better to synchronous learning, such as those that require group collaboration or discussions, while others may be more suitable for asynchronous learning, such as self-paced courses or those that require students to work independently.

As we move deeper into the remote learning landscape, course designers and instructors have to consider the unique needs of students who are learning 100% virtually. As they plan for the weeks and months ahead, educators are struggling with a central question: Is synchronous or asynchronous learning more effective for the remote learner?

Course designers must now get creative about how to provide learning content that works best for online students. That means they need to be strategic about the mix of synchronous and asynchronous learning content they offer—and both types of learning have their place in a fully remote environment

The Benefits of Synchronous Learning

Synchronous learning refers to real-time, live instruction where students and instructors interact at the same time through video conferencing, chat, or other online tools.

Here are some of the benefits of synchronous learning:

- Immediate feedback: Synchronous learning allows for immediate feedback from instructors and peers, which can help students better understand the course material and quickly address any misconceptions they may have.
- Increased engagement: Synchronous learning fosters a sense of community among students, which can increase student engagement and motivation. This is especially important in online learning, where students may feel isolated and disconnected.
- Active learning: Synchronous learning encourages active learning through discussions, group activities, and other interactive exercises. This can help students better retain information and apply it to real-world situations
- Students develop a community. When students and instructors meet in real time, whether in-person or via live video, they form a true community. Indeed, it's that community, more so than learning content, which prompts people to pay thousands of

dollars per semester to colleges and universities. Even when separated by a screen, students can interact directly with one another and with their teacher when learning synchronously.

- It allows organic conversations to unfold. When students engage with the learning material at the same time and in the same place (whether that place is a classroom or a Zoom room), organic conversations unfold in real time. Students can interrupt lectures to ask questions and interject with comments that enliven the discussion. Moreover, instructors can encourage collaboration among students by separating classes into smaller groups where lively conversations offer varying perspectives and deepen understanding.
- It can boost participation. When given the option to complete tasks on their own timetable, many students will wait until the last possible moment. Synchronous learning creates a sense of urgency. Real time deadlines and expectations lead to greater participation.
- Students can gain immediate feedback from instructors. When meeting in real time, students can ask instructors to elaborate or clarify in the moment—something they can't do when learning asynchronously. This can enhance students' understanding of the material more quickly.
- Personalized attention: Synchronous learning allows for personalized attention from instructors, who can address individual questions and concerns in real-time.
- Flexibility: While synchronous learning requires students to attend class at a specific time, it can be more flexible than traditional classroom instruction. Students can attend class from anywhere with an internet connection, which can save time and money on commuting.

Overall, synchronous learning can be an effective mode of instruction for students who thrive in a collaborative, interactive environment. However, it may not be suitable for all students or all courses, and a combination of synchronous and asynchronous learning may be the most effective approach.

While synchronous learning is difficult to execute in a fully remote learning environment, it does present unparalleled opportunities for a sense of community and camaraderie to develop, and opens the door to powerful peer learning experiences.

Challenges of Synchronous Learning

While synchronous learning has several benefits, it also poses some challenges. Here are some of the challenges of synchronous learning:

- Technical difficulties: Synchronous learning requires a stable internet connection and access to reliable technology, which can be a challenge for some students, particularly those in remote or low-income areas.
- Time constraints: Synchronous learning requires students to attend class at a specific time, which can be challenging for students who have other commitments or live in different time zones.
- Limited flexibility: Synchronous learning may not be suitable for students who prefer to learn at their own pace or have other obligations that prevent them from attending live sessions.
- Lack of personalization: Synchronous learning may not provide the same level of personalized attention as traditional classroom instruction, as instructors may have limited time to address individual questions and concerns.
- Increased distractions: Synchronous learning can be more prone to distractions, as students may be tempted to multitask or check their devices during class.
- Synchronous learning becomes challenging when it's remote. The very benefits that make synchronous learning appealing in person—i.e., opportunities for real-time discussion, questioning, and instructor feedback—are more difficult to execute online. Instructors teaching to a screen of small, student-filled boxes may find it challenging to identify when students are confused or

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disengaged. Moreover, the limited capabilities of videoconferencing software make it harder for students to attract the instructor's attention when they have a question or comment.

- Virtual conversations are harder to interrupt. Synchronous learning works well when an organic discussion emerges among the students and teacher. It's harder to interrupt the flow of an online lesson with the kind of impromptu interjection that would feel perfectly natural in an in-person environment. Without these vibrant conversations, synchronous virtual lessons can feel stale, and students might suffer from a lack of engagement or a deficit of attention.
- Successful online synchronous learning requires high-performing technology. A successful remote synchronous class requires access to necessary tools, including a strong internet connection. Technical difficulties can preclude students from fully understanding or engaging with the lesson.
- Inadequate participation: Synchronous learning may not provide an equal opportunity for all students to participate in class, as some may be more reluctant to speak up or may have difficulty accessing the necessary technology.

In conclusion, while synchronous learning has several benefits, it also poses challenges that should be taken into consideration when designing and delivering online courses. In some cases, a combination of synchronous and asynchronous learning may be the most effective approach to provide students with the benefits of both modes of learning.

The Benefits of Asynchronous Learning

Asynchronous learning refers to self-paced learning where students access pre-recorded lectures, discussion boards, readings, and other learning materials at a time that is convenient for them. Here are some of the benefits of asynchronous learning:

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- Flexibility: Asynchronous learning provides students with the flexibility to access course materials at a time that is convenient for them. This can be especially beneficial for students who have work or family commitments or who live in different time zones.
- Self-paced learning: Asynchronous learning allows students to learn at their own pace, which can help them better retain information and work through difficult concepts.
- Improved accessibility: Asynchronous learning can improve accessibility for students with disabilities, as they can access course materials at their own pace and in a format that works best for them.
- Greater participation: Asynchronous learning provides opportunities for all students to participate in discussions and activities, as they can contribute to the course content at any time.
- Increased engagement: Asynchronous learning can increase student engagement, as students have more time to reflect on course content and can participate in discussions when they are more comfortable and prepared.
- Reduced distractions: Asynchronous learning can reduce distractions, as students can work in a quiet environment without the potential distractions of live sessions.
- Students can access materials on their own time. Asynchronous learning gives students the flexibility to learn at a time that works for their own learning styles and within their schedules. This is particularly helpful now, as students navigate pandemic-related financial, health, and mental challenges.
- Students learn at their own pace. When learning asynchronously, students engage more directly with the material they find most interesting and/or challenging—pausing lessons they find confusing, rewinding and replaying the most salient content, and proceeding at the pace that works best for them. When instructors use collaborative tools like Eduflow, they can further enhance student engagement with learning flows and interactive content designed for individual learners.
- All types of learners have equal access and attention. An asynchronous format produces uniquely empowered students

who take control over their learning in a way that might not have been possible in a purely synchronous environment. Asynchronous learning prevents more reserved students from getting bulldozed by louder voices as they might in a live environment. It essentially levels the playing field, offering each student the same opportunity to control their learning.

- It's more cost-effective and scalable for instructors. Rather than teach the same lesson multiple times to multiple classes, instructors can create a single lesson for each section. This frees up time and resources for instructors to be more personally available to individual students.

Overall, asynchronous learning can be an effective mode of instruction for students who prefer to learn at their own pace and have other commitments that may prevent them from attending live sessions. However, it may not be suitable for all students or all courses, and a combination of synchronous and asynchronous learning may be the most effective approach.

Asynchronous learning is a helpful option for all learners, but especially for remote ones. When learning asynchronously, students interact with learning content at their convenience and can delve deeper into topics that interest them.

The Challenges of Asynchronous Learning

While asynchronous learning has several benefits, it also poses some challenges. Here are some of the challenges of asynchronous learning:

- Limited interaction: Asynchronous learning may limit student interaction and collaboration, as students may not have the opportunity to engage in real-time discussions or activities.
- Lack of immediate feedback: Asynchronous learning may not provide immediate feedback from instructors, which can make it

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difficult for students to address misconceptions or fully understand course material.

- Difficulty with time management: Asynchronous learning requires students to manage their own time and stay motivated to complete coursework on their own. This can be challenging for students who struggle with time management or need more structure in their learning environment.
- Reduced accountability: Asynchronous learning may reduce accountability, as there may be less monitoring of student progress and participation.
- Technology issues: Asynchronous learning requires access to reliable technology and internet connectivity, which can be a challenge for students in remote or low-income areas.
- Potential for isolation: Asynchronous learning may lead to feelings of isolation and disconnection from the instructor and other students, as there may be limited opportunities for social interaction and community building.

In conclusion, while asynchronous learning has several benefits, it also poses challenges that should be taken into consideration when designing and delivering online courses. In some cases, a combination of synchronous and asynchronous learning may be the most effective approach to provide students with the benefits of both modes of learning.

In a completely asynchronous environment, students miss the camaraderie that comes from real-time conversation and face-to-face (or screen-to-screen) interaction. The solitary nature of asynchronous learning can be detrimental to student's mental health and academic results, if it's not paired with some sort of real-time follow-up.

A Blend of asynchronous and synchronous learning

So which type of learning is most effective in the end? We believe a hybrid approach is best for the virtual learner. A mostly asynchronous environment empowers students to learn at their own pace and according to their own schedule, while strategic opportunities for synchronous meetings foster a sense of community and prompt more in-depth discussions of relevant topics.

	Advantages	Disadvantages
Synchronous	• Instant interaction for communication and collaboration • Less isolation • Corporate feeling • Fast reactions to uncover misunderstandings	• Rigid time window • Fast internet connection needed • Sophisticated hardware and software needed • Quiet and acoustically as well as brightness adequate environment needed
Asynchronous	• content can be downloaded everywhere any time – *i.e.* flexibility for time and place • Students could spend more time on task – *e.g.* review material • Permanent availability	• Very limited communication and collaboration • Missing social interaction • Misunderstandings undetected • Huge amount of data • Copyright and privacy violations if content is stored publicly available

Source: The online inverted classroom model (oICM). A blueprint to adapt the inverted classroom to an online learning setting in medical and health education

A blend of synchronous and asynchronous learning can be an effective approach to online instruction. By combining these two modes of learning, students can benefit from the flexibility and self-paced nature of asynchronous learning, while also engaging in real-time interactions and collaboration through synchronous learning.

Here are some ways in which a blend of synchronous and asynchronous learning can be effective:

- Flexibility and convenience: Asynchronous learning can provide students with the flexibility to access course materials at their own pace, while synchronous learning can provide opportunities for real-time interactions and collaboration that may not be possible in asynchronous learning alone.

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- Personalization: A blend of synchronous and asynchronous learning can provide opportunities for personalized learning, as students can engage with course materials in a way that works best for them.
- Increased engagement: Synchronous learning can increase student engagement, as students can participate in real-time discussions and activities, while asynchronous learning can provide students with time to reflect and think deeply about course material.
- Improved accountability: A blend of synchronous and asynchronous learning can provide opportunities for increased monitoring of student progress and participation, which can improve accountability and motivate students to stay on track.
- Enhanced learning outcomes: By combining synchronous and asynchronous learning, instructors can provide students with a variety of learning experiences that can enhance learning outcomes.

To take advantage of the benefits of asynchronous learning while optimizing opportunities for synchronous interaction, instructors could consider flipping the classroom, which engages students in asynchronous coursework before meeting synchronously to discuss what they learned. Educators should plan to optimize synchronous time with plentiful debates, breakout conversations, and student presentations to avoid the pitfalls that can characterize remote synchronous lessons.

When relying heavily on asynchronous learning, instructors should focus on making lessons more interesting and engaging for students by creating customized learning flows and interactive experiences. Collaborative learning tools can help course designers create content that keeps students interested, empowered, and in control of their educational experience.

Overall, a blend of synchronous and asynchronous learning can be an effective approach to online instruction that provides students with the

benefits of both modes of learning. However, it is important for instructors to carefully plan and design their courses to ensure that the blend of these two modes of learning is used effectively and efficiently.

The most useful tips for online teaching and learning

Research has shown that the institutions that were most successful in online learning made clear to their students why they were implementing online learning, how it could benefit the students, and what was expected from them. So, after deciding to use online learning in organization, but before actually implementing it, it is important to explain the objectives of that implementation, how it's going to make the learners' life easier, how they will be able to improve in their careers/academic life after taking the training and so on. This preparation is very important to make sure that interested learners are engaged, interested learners once the process starts.

Preparation stage

Preparing for online classes requires careful planning and organization to ensure that the course materials and delivery methods are effective and engaging.

Here are some best practices for preparing online classes:

- Set clear learning objectives: Clearly define the learning objectives for the course and for each lesson. This will help guide the course design and ensure that students understand what they are expected to learn.
- Create a well-organized course structure: Organize the course content in a logical and easy-to-follow manner. Use headings, bullet points, and other formatting techniques to make the content

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easy to scan and navigate. Creating a well-organized online course structure is crucial for effective online instruction.

- Use a consistent layout and navigation: Use a consistent layout and navigation throughout the course to make it easy for students to find and access course materials.Use headings and subheadings: Use headings and subheadings to break up long blocks of text and make the content easier to scan.
- Provide a course overview: Provide a course overview that outlines the learning objectives, course schedule, and expectations for student participation and assessment.
- Organize content into modules: Organize course content into modules based on topics or themes. Each module should contain related readings, videos, assignments, and assessments.
- Use multimedia resources: Use multimedia resources such as videos, images, and interactive activities to engage students and enhance learning.
- Provide clear instructions: Provide clear instructions for each assignment and assessment. This includes instructions for how to submit assignments, the grading criteria, and the due dates.
- Provide a course calendar: Provide a course calendar that outlines the due dates for assignments and assessments. This will help students stay on track and manage their time effectively.
- Use a learning management system (LMS): Use an LMS to manage course content, assignments, and assessments. This will make it easier to organize and deliver course materials and track student progress.

By following these best practices, instructors can prepare and deliver effective and engaging online classes that facilitate student learning and promote student success.

Delivery stage

Delivering online classes can be challenging, but with the right approach and preparation, it is possible to provide an engaging and effective learning experience for students. Here are some best practices for delivering online classes:

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- Be prepared Prepare your materials in advance and test your technology to ensure that everything is working properly.
- Prepare all aspects This goes without saying, but an online class can only help achieve the goals of its learners through proper preparation. This entails not only the preparation of all necessary resources, but also the creation of backup plans in case of unforeseen circumstances and events. Proper preparation is crucial to deliver learning in a seamless manner.
- Be engaging: Engage students through a variety of activities such as discussions, case studies, and interactive activities. Use multimedia resources such as videos, images, and audio recordings to enhance the learning experience.
- Be clear and concise: Communicate clearly and concisely, and provide clear instructions for assignments and assessments.
- Manage time effectively: Manage your time effectively and keep track of the time allotted for each activity.
- Encourage participation: Encourage participation and interaction through discussion forums, group projects, and live online sessions.
- Provide feedback: Provide feedback on student performance and encourage student self-reflection and self-assessment.
- Foster a positive learning environment: Foster a positive and supportive learning environment by providing constructive feedback, acknowledging student achievements, and promoting respectful and inclusive interactions among students.
- Be available and responsive: Be available to answer questions and provide feedback to students in a timely manner. This will help build a sense of community and encourage students to stay engaged.
- Open a platform for feedback Online classes can only be effective if it caters to the specific learning goals of its learners. With that said, teachers must encourage feedback from their students through online forms or surveys. Use their feedback to improve upon and personalize the current online course.

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- Use a variety of delivery methods: Use a variety of delivery methods such as synchronous and asynchronous learning to cater to different learning styles and preferences.
- By following these best practices, instructors can deliver effective and engaging online classes that facilitate student learning and promote student success.
- Expect multi-tasking As the main facilitators of an online class, teachers are expected to be well-versed with the platform being used. This means keeping track of how the content is delivered, how activities are delivered, and how the participants are responding. These tasks often overlap one another most of the time, and teachers must flex their multi-tasking skills to keep track of all of them.

As online classes become the norm of the academe, these techniques will be crucial not only in the coming days, but also in the near future.

Assessment stage

Assessment is an essential part of online learning, and it is important to ensure that assessments are valid, reliable, and aligned with the learning objectives of the course. Here are some best practices for assessing online learning:

- Use multiple assessment methods: Use a variety of assessment methods such as quizzes, essays, assignments, and projects to assess different types of knowledge and skills.
- Align assessments with learning objectives: Ensure that the assessments are aligned with the learning objectives of the course and measure what students are expected to learn.
- Provide clear instructions: Provide clear instructions for each assessment, including the format, criteria for grading, and the due date.
- Use rubrics: Use rubrics to provide clear and consistent grading criteria and feedback to students.
- Ensure academic integrity: Ensure that the assessments are designed to prevent plagiarism and academic dishonesty.
- Provide timely feedback: Provide timely feedback to students on their performance to help them improve their understanding of the material and their performance in the course.

- Monitor student progress: Monitor student progress throughout the course and provide additional support or resources to help struggling students.
- Use technology to facilitate assessment: Use technology to facilitate the assessment process, such as online quizzes or automated grading tools.
- Use formative and summative assessment: Use both formative and summative assessment to evaluate student progress and provide ongoing feedback and support.

By following these best practices, instructors can ensure that assessments are fair, reliable, and aligned with the learning objectives of the course, and provide students with the opportunity to demonstrate their knowledge and skills.

Evaluation stage

Effective evaluation of online learning involves assessing student learning and engagement, as well as evaluating the effectiveness of the course design and delivery methods. Here are some strategies for effective evaluation of online learning:

- Provide frequent and timely feedback: Provide frequent and timely feedback to students on their performance to help them stay on track and improve their learning outcomes.
- Monitor student engagement: Monitor student engagement with the course materials and activities, such as tracking participation in discussion forums or measuring the time spent on the course site.
- Evaluate the effectiveness of course design: Evaluate the effectiveness of the course design and delivery methods through student feedback and performance data to identify areas for improvement.
- Solicit student feedback: Solicit feedback from students on their experience in the course, including the course materials, delivery methods, and support resources.
- Use data analytics: Use data analytics to measure student performance and engagement, and identify areas for improvement in the course design and delivery methods.
- Compare results to benchmarks: Compare student performance and engagement to benchmarks or previous course offerings to identify trends and areas for improvement.

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- Continuously improve the course: Use evaluation data to continuously improve the course design and delivery methods to better meet the needs of students and improve learning outcomes.

By using these strategies, instructors can effectively evaluate online learning and continuously improve the course design and delivery methods to better support student learning and engagement

CONCLUSIONS

Delivering content online requires a different approach compared to traditional classroom instruction. Here are some best practices for delivering content online:

- Chunk content: Break the content into smaller, manageable chunks to help students digest the information more easily. Use headings, bullet points, and images to break up the text and make it more visually appealing.
- Use multimedia resources: Use multimedia resources such as videos, images, and audio recordings to supplement the text and make the content more engaging.
- Provide clear instructions: Provide clear instructions on how to access and interact with the content, including navigation, tools, and assignments.
- Use a variety of delivery methods: Use a variety of delivery methods such as online lectures, readings, videos, and interactive activities to cater to different learning styles and preferences.
- Encourage participation: Encourage participation through discussion forums, group projects, and online polls to foster collaboration and engagement.
- Provide feedback: Provide feedback on student performance and encourage student self-reflection and self-assessment.
- Keep it simple: Keep the content simple and focused on the learning objectives. Avoid using overly technical language or jargon that may confuse students.
- Be accessible: Ensure that the content is accessible to all students, including those with disabilities or who may have limited access to technology.

- Be organized: Organize the content in a logical and consistent manner to make it easier for students to navigate and find what they need.

- By following these best practices, instructors can effectively deliver content online and facilitate student learning and engagement.

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