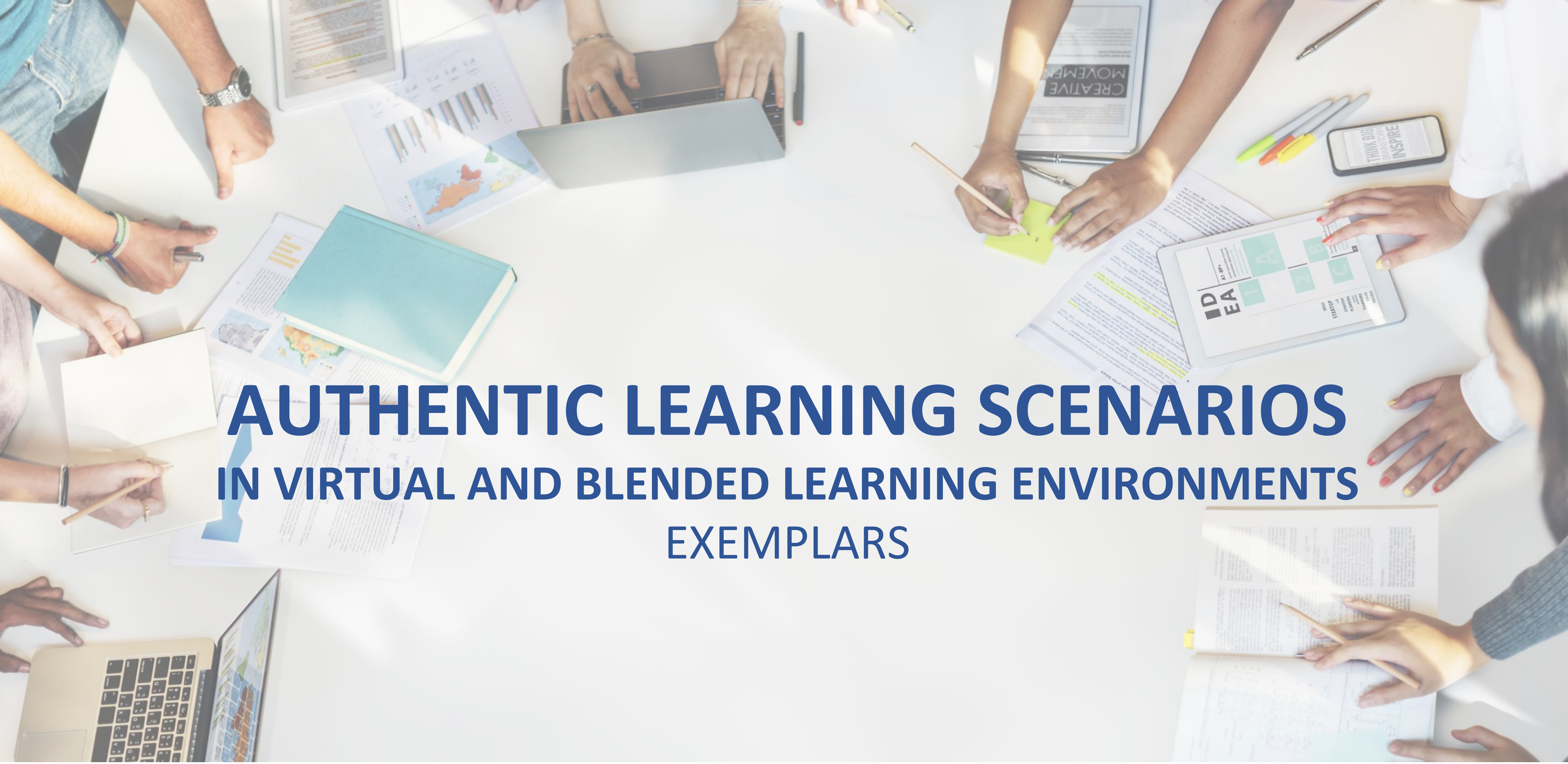


AUTHENTIC LEARNING SCENARIOS

IN VIRTUAL AND BLENDED LEARNING ENVIRONMENTS

EXEMPLARS

iLed Innovating Learning Design in Higher Education

Co-funded by the European Union

foi

Sveučilište u Zagrebu Medicinski fakultet

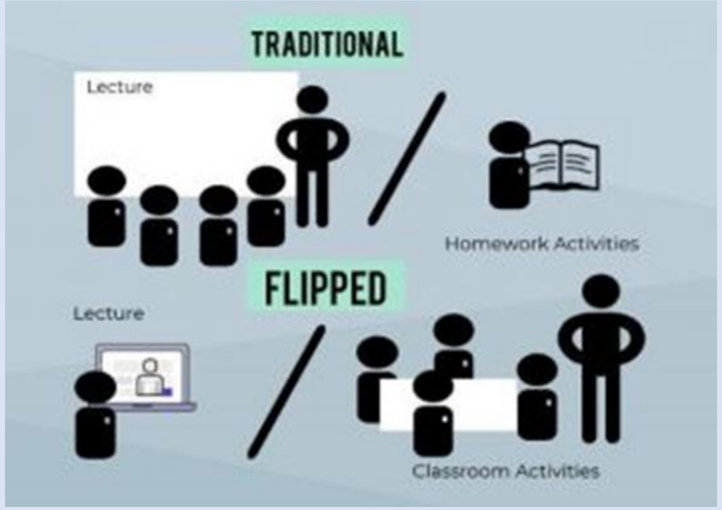
Oulun Yliopisto

The Open University

Goethe Universität Frankfurt am Main

Flipped Classroom

Flipped Classroom is **defined** by Divjak et al. (2022) as "a strategy that flips the traditional education setting, i.e., the information transmission component of a traditional face-to-face lecture is moved out of class time… [It] is an active, student-centered approach that is designed to increase the quality of the period within class, provides opportunities for structured, active learning, and encourages students to inquire and to interact with teachers, peers, employers and learning materials"



Source: [University of Florida (2022)](https://teach.ufl.edu/resource-library/flipped-classroom/)

Key ingredients include:

- Learners using pre-class preparation (e.g., multimedia lectures, podcasts, pre-readings) through self-paced learning prior to class
- Class time is used for student-centered learning activities
- Educators' awareness of students' understanding, and higher-order learning during class time

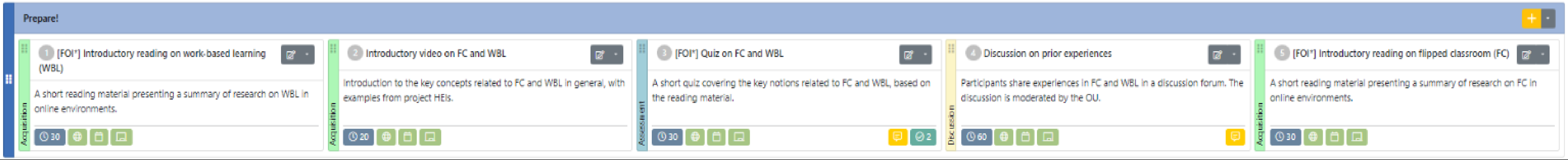
Challenging aspects:

- Not suitable for all subjects and topics
- Difficult to motivate students to prepare for the classes

Example: RAPIDE e-course on relevant pedagogies and LA

Pre-class preparation

Class time (student-centred)



Divjak, B., Rienties, B., Iniesto, F., Vondra, P., & Žižak, M. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: findings and future research recommendations. International Journal of Educational Technology in Higher Education, 19(1), 9. https://doi.org/10.1186/s41239-021-00316-4

University of Florida (2022). Flipped Classroom. https://teach.ufl.edu/resource-library/flipped-classroom/

Student Engagement in Learning Design (SELD)

SELD can be **considered** in different ways, e.g:

- Healy et.al (2014) state working **as partners** is related to 'joint ownership and decision making over both the process and outcome.'
- Snowball and McKenna (2017) assert that **co-creation** 'allows teachers to bring student experiences and voices into the centre of the community of practice and acknowledges the importance of their prior experiences in knowledge production.'
- Whilst Gravett et.al (2019) explain that to **co-design** with students as a 'process recognises students as experts; rather than seeking student perspectives 'after the fact'... 'allows a bottom up design approach where student users drive the design process.'

Source: GoNano

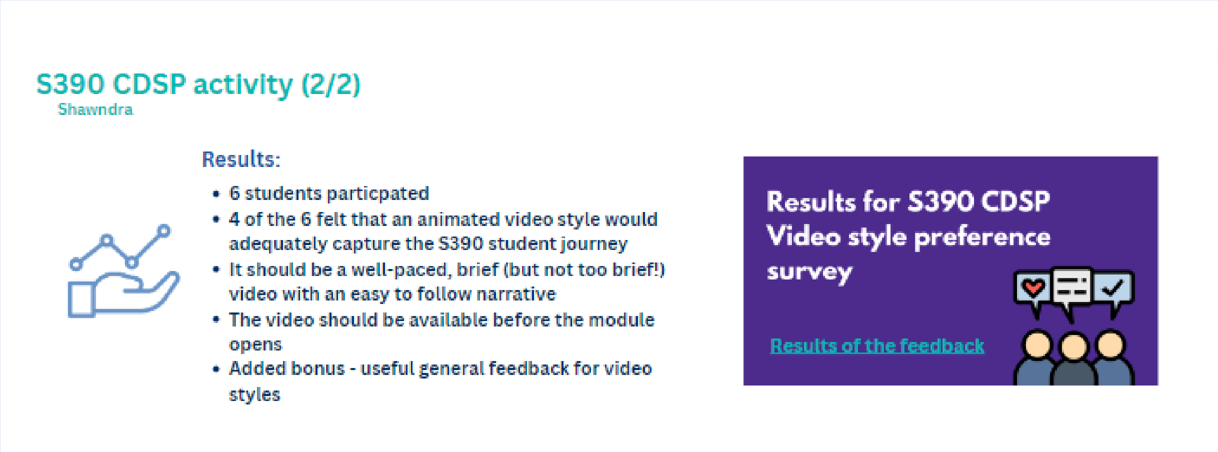
Key ingredients include:

- **Involvement of students** in the design process (identify scope)
- Clear indication of **what students contributed**
- Clear indication of what was changed or what insight was gained following student consultation

Challenging aspects**:**

- How to involve a broad range of students' perspectives
- How to reward students for co-creation/recognition

Example: Student co-design in video style preference



Snowball, J. D. & McKenna, S. (2017). 'Student-generated content: an approach to harnessing the power of diversity in higher education', Teaching in higher education, 22:5 (2017), pp. 604-618 (ref on page 605)
Gravett, K., Medland, E. & Winstone, N. (2019) 'Engaging students as co-designers in educational innovation', pp. 297-313 in Lygo-Baker, S., Kinchin, I.M., Winstone, N.E. (ed.) Engaging student voices in higher education: diverse perspectives and expectations in partnership.
Healey M., Flink, Harrington, (2014) Engagement through partnership: students as partners in learning and teaching in HE (HEA, July 2014)

Virtual Reality

VR can be defined as an environment that „capitalizes upon natural aspects of human perception by extending visual information in three spatial dimensions“, „may supplement this information with other stimuli and temporal changes“ and „enables the user to interact with the displayed data“ (Wann & Mon-Williams, 1996: 833).

Distinction between „non-immersive VR“ and „immersive VR“: Immersion is „a perception of being physically present in a non-physical world by surrounding the user of the VR system created with images, sound, or other stimuli“ (Freina & Ott, 2015: 133).

Key ingredients include:

- Can motivate learners a lot
- Enables self-directed learning
- Learning experiences are possible that would not be possible in reality (too dangerous, too far away, etc.)
- Conserves resources through simulation (which can also be repeated at will)
- Sensorimotor, affective learning
- Learners can slip into other roles
- Acquisition of action competence through risk-free trying out, repeatable as often as desired

Challenging aspects:

- Development effort very high
- Complex technical equipment required (e.g. HMDs for all)
- Needs a lot of preparation time (setting up and testing the technology...)
- Learners need time for onboarding: handling the HMD)
- Limited learning time (VR is exhausting: motion sickness, etc.)

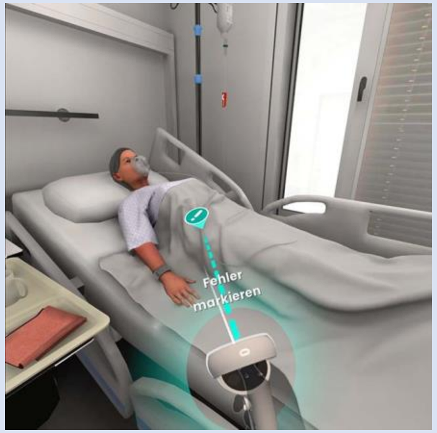
Source: studiumdigitale

Example 1: Serious Game meets VR:

Simulating a plenary session in the European Parliament. They take on the roles of various delegates.

Example 2: Room of Error

In the virtual "Room of Error", medical students students and employees must specifically recognize and resolve the constructed dangerous situations. They learn to recognize errors quickly and to avert dangers for patients.



Source: Room of error

Wann, J. & Mon-Williams, M. (1996). What Does Virtual Reality NEED? Human Factors Issues in the Design of Three-Dimensional Computer Environments. International Journal of Human-Computer Studies, 44(6), 829-847.
Freina, L. & Ott, M. (2015). A Literature Review on Immersive Virtual Reality in Education: State of the Art and Perspectives. In The international scientific conference elearning and software for education, 1, 133-141.
Makransky, G. & Petersen, G. B. (2021). The Cognitive Affective Model of Immersive Learning (CAMIL): A Theoretical Research-Based Model of Learning in Immersive Virtual Reality. Educational Psychology Review, 33(3), 937-958. https://doi.org/10.1007/s10648-020-09586-2.
Tillmann, A. & Kersting, P. (2018). Geographische Fachlichkeiten zwischen Gegenstands- und Subjektorientierung. In Martens, M., Rabenstein, K., Bräu, K., Fetzer, M., Gresch, H., Hardy, I. & Schelle, C. (Hrsg.). Konstruktionen von Fachlichkeit. Ansätze, Erträge und Diskussionen in der empirischen Unterrichtsforschung. Bad Heilbrunn: Klinkhardt, 95-107.
Tillmann, A. & Kersting, P. (2021). Mit Virtual Reality für Nachhaltigkeit sensibilisieren: Virtuelle Exkursionen als emotionalisierende und produktive Methode. Praxis Geographie (3), 32-35

Using AI in Education

Definition: Artificial intelligence (AI) is a broad field encompassing various techniques and approaches to create intelligent machines that perceive their environment and take actions. Machine learning is a subfield of AI that allows computers to learn and improve their performance on a task without being explicitly programmed using algorithms that can identify patterns and make predictions based on data. Generative AI refers to AI systems that generate new data or outputs, such as images, music, or text, rather than classify or process existing data. Typically, generative AI uses machine learning. Large language models (LLMs) are a type of machine learning model that can process and generate natural language text. LLMs are a type of generative AI because they can produce novel text outputs based on patterns and learn from large amounts of input data. https://digital.uni-hohenheim.de/fileadmin/einrichtungen/digital/Generative_AI_and_ChatGPT_in_Higher_Education.pdf

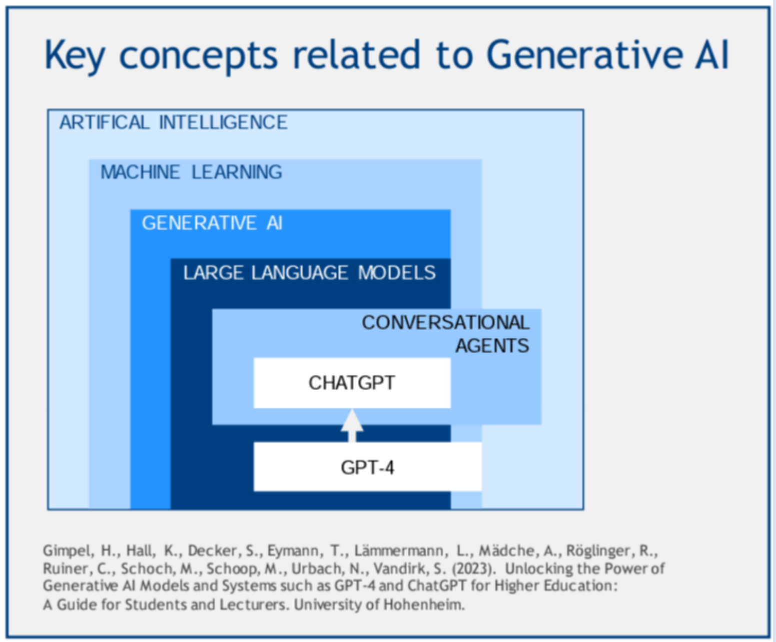
Key ingredients include:

- AI can support the writing process of students (e.g. theses)
- supports the creation of individual learning materials (e.g. quizzes, assignments, tests)
- assistance in learning design
- automated feedback on student performance

Challenging aspects:

- critical reflection on content: AI applications are not search engines, results are based only on statistical methods
- handling of personal data
- possibly copyrighted material in the training data
- What is still the individual performance of students?
- Who has access to AI applications (financial, organizational, technical barriers)?

Example: Automated, AI-generated feedback for students (IMPACT)

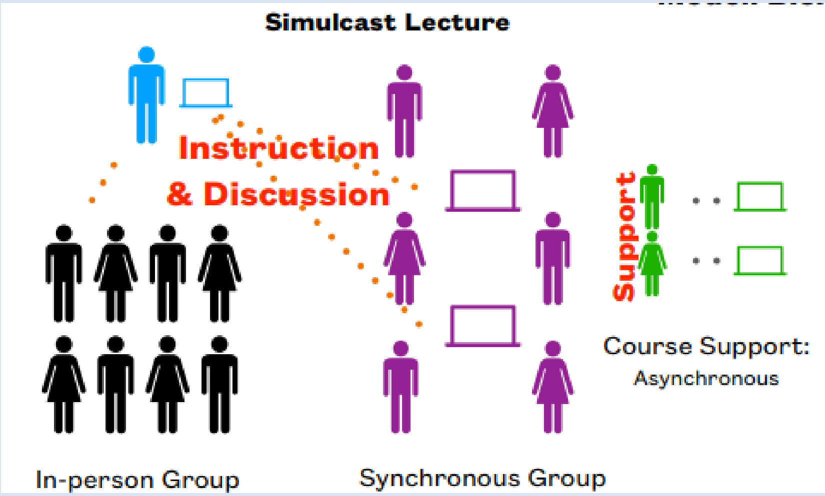


Source: https://digital.uni-hohenheim.de/fileadmin/einrichtungen/digital/Generative_AI_and_ChatGPT_in_Higher_Education.pdf

Gimpel, H., Hall, K., Decker, S., Eymann, T., Lämmermann, L., Mädche, A., Röglinger, R., Ruiner, C., Schoch, M., Schoop, M., Urbach, N., Vandirk, S. (2023). Unlocking the Power of Generative AI Models and Systems such as GPT-4 and ChatGPT for Higher Education: A Guide for Students and Lecturers. University of Hohenheim, March 20, 2023 Online: https://digital.uni-hohenheim.de/fileadmin/einrichtungen/digital/Generative_AI_and_ChatGPT_in_Higher_Education.pdf

Hybrid Teaching in Large Collaborative Classrooms

Hybrid mode: "students are simultaneously present in the same classroom, either physically or remotely" (Svetec et al, 2022).
Hybrid teaching "describes a situation where a lecturer is teaching a group of students physically present in a lecture or seminar venue, whilst other students are remote and join the same session using systems such as Microsoft Teams or Zoom. The lecturer or keynote speaker(s) may also join the session remotely." (The Oxford University)



Source: Clemson University

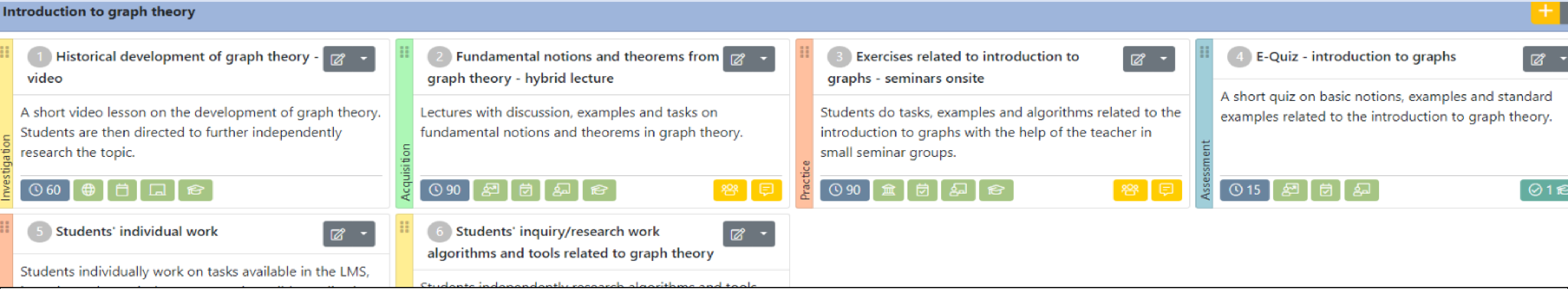
Key ingredients include:

- Integrate students who are at health risk, on mobility etc.
- All students have access to the appropriate learning resources in advance, irrespective of whether they will be joining the class in person or remotely
- Formative assessment and feedback need to be implemented in both environments simultaneously and with big learners groups teaching assistant is needed

Challenging aspects:

- Substantial equipment and support for teachers and students is required
- Interactions with onsite and online students simultaneously
- Difficult to implement in some subjects/learning outcomes
- Out of f2f, fully online, blended and hybrid, hybrid is the most difficult to implement (Svetec et al., 2022)

Example: Discrete Mathematics with Graph Theory



Svetec, B., Oksanen, L., Divjak, B. & Horvat, D. (2022) Digital Teaching in Higher Education during the Pandemic: Experiences in Four Countries. In: Vrček, N., Guàrdia, L. & Grd, P. (eds.) Proceedings of the 33rd CECIIS conference.
The Oxford University. Centre for Teaching and Learning. (2023) Planning and presenting a hybrid teaching session.

Hybrid Teaching and Learning with a Small Collaborative Group

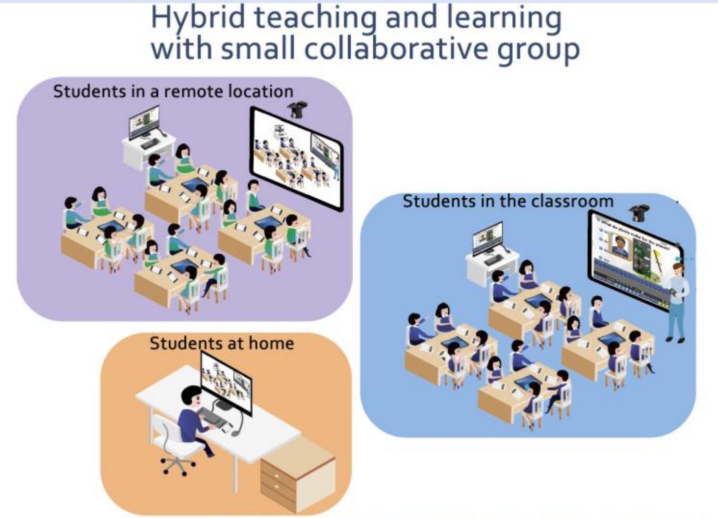
Hybrid teaching and learning mode: “students are simultaneously present in the same classroom, both physically or remotely”
Hybrid teaching and learning with a small group refers to a scenario where two separate cohorts of students, each comprising up to 25 students, attend a lecture or seminar concurrently while being geographically separated. In this setup, one student group is physically present in the same classroom with the teacher, while the other assembles in a remote location and connects through platforms like Zoom or the BBB system. Within this arrangement, the educator effectively engages and communicates with both student assemblies – the on-site students within the classroom and the remote students connected via the video conferencing system.

Key ingredients include

- ***communication***: Establishing clear communication for both in-person and remote students (in France)
- ***access***: All students, whether physically present or remote, have equal access to learning materials, resources, and technology before the session
- ***collaboration and group work:*** Collaborative groups consist of a mix of both in-person and remote students
- ***collaborative activities:*** Designing collaborative activities that encourage interaction among both in-person and remote students
- ***engagement:*** Designing activities that will keep both groups actively participating and feeling included
- ***assessment:*** Implementation of the formative assessment strategies (polling tools, quizzes) that can be conducted both in-person and remotely

Challenging aspects:

- ***technology integration:*** Ensuring seamless technology integration for both in-person and remote students
- ***technology integration***: Substantial equipment and support for teachers and students is required
- ***participation***: Maintaining balanced participation between in-person and remote students
- ***engagement:*** Consistent engagement and active participation
- ***participation and engagement:*** Fostering effective collaboration between two groups,
- ***engagement:*** Implementation of practicals for both groups, simultaneously
- ***assessment:*** Maintaining assessment consistency across both groups



modified figure from https://www.habook.com/en/class.php?act=view&id=14

There are at least three modes of pedagogic interactivity that require different AV responses:

1. Lecture mode
2. Discussion mode
3. Group work mode

Example: *Hybrid teaching and learning with small groups within the physics and/or anatomy courses*

Simulation (e.g. standardized simulated patient model)

Simulation methodology: an interactive teaching methodology that replicates real-world scenarios in a controlled environment. It offers learners the opportunity to practice and refine skills, make decisions, and experience the consequences of their actions without the risk associated with actual patient care. Simulation engages students through hands-on experiences, enhancing critical thinking, communication, and problem-solving skills while bridging the gap between theoretical knowledge and practical application.

Simulated patient: structured educational methodology that utilizes standardized patients (SPs) played by a teacher in virtual environment to recreate authentic healthcare scenarios for training and assessment purposes

Example: *Online clinical exercises with simulated patient approach in the dermatology course.*

Key ingredients include:

- ***scenarios:*** Develop diverse scenarios mirroring real-life clinical situations to challenge learners' clinical reasoning and decision-making abilities
- ***interactivities:*** Incorporate interactive elements, such as dialogue options, assessments, and medical procedures, allowing students to engage with the simulated patient
- ***interaction:*** Guide the interaction with a clear structure, allowing students to take the lead in questioning, diagnosing, and providing care
- ***feedback:*** Integrate a feedback system that provides immediate guidance on students' actions, decisions, and communication skills during the simulation
- ***feedback:*** Post-simulation debriefing sessions where instructors facilitate discussions about the decisions made, the rationale behind them, and potential alternative approaches

Challenging aspects:

- Creating a virtual environment that authentically mimics real clinical settings
- Transitioning into the role of a simulated patient requires adopting a different mindset and accurately portraying the patient's emotions, concerns, and responses
- Ensuring that students are fully engaged in the virtual simulation
- Constructing scenarios that offer a range of decisions and consequences, mirroring the intricacies of actual clinical practice
- Striking the right balance between guiding the interaction and allowing students to take the lead
- Students' decisions during the simulation might lead to unexpected outcomes

Zizak, M. (2023). AI and Standardized Simulation Patient Model. MEF.hr. (42-1) (modified)

Inquiry-Based Learning

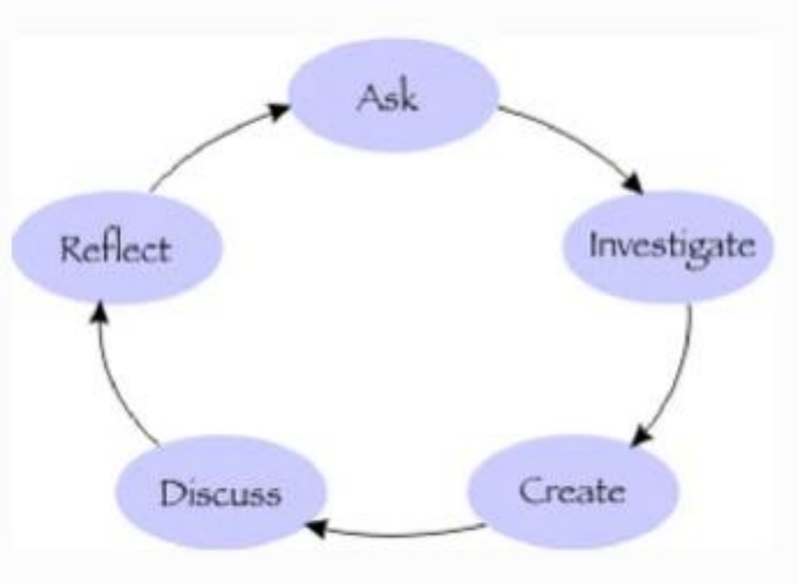
Inquiry based learning is an educational approach in which students follow strategies similar to professional scientist (e.g., formulating hypothesis, testing them with experiments, and/or observations) in order to build knowledge (Käseman, 2003; Pedaste, Mäeots, Leijen, & Sarapuu, 2012). It is an active, student-centered approach that is designed to stimulate students asking questions, investigating, creating knowledge, discussing and reflecting.

Key ingredients include:

- Active student participation and responsibility
- Oriented to solving meaningful problems
- Discovery of knowledge that is new to student
- Scientific process is divided into logically sequential phases

Challenging aspects:

- Students' motivation
- Students need skills to manage their work and extended activities
- Students need sufficient previous knowledge to engage in data gathering, analysis, interpretation
- Constraints of learning environments e.g., restricted resources and timelines



From: Friedman et al., 2010.

Example 1: Multidisciplinary examples from natural and social sciences on implementing inquiry based learning. Friedman, D.B., Crews, T.B., Caicedo, J.M. et al. An exploration into inquiry-based learning by a multidisciplinary group of higher education faculty. High Educ 59, 765–783 (2010). https://doi.org/10.1007/s10734-009-9279-9

Example 2: Implementing Inquiry-based learning (physics) in an online environment while considering no immediate teacher or peer support. Abdullah Al Mamun, A., Lawrie, G., Wright, T. (2020). Instructional design of scaffolded online learning modules for self-directed and inquiry-based learning environments. Computers & Education, 144, 103695. https://doi.org/10.1016/j.compedu.2019.103695.

Pedaste, M., Mäeots, M., Siiman, A. L., de Jong, T., A.N. van Riesen, A.N.S, Kamp, T. E., Manoli, C.C., Zacharia C. Z., Tsourlidaki, E., (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. Educational Research Review, 14, 47-61. https://doi.org/10.1016/j.edurev.2015.02.003.
Daniel C. Edelson , Douglas N. Gordin & Roy D. Pea (1999) Addressing the Challenges of Inquiry-Based Learning Through Technology and Curriculum Design, Journal of the Learning Sciences, 8:3-4, 391-450, DOI: 10.1080/10508406.1999.9672075
Keselman A. (2003). Supporting inquiry learning by promoting normative understanding of multivariable causality. Journal of Research in Science Teaching, 40, 898-921, 10.1002/tea.10115
Pedaste M., Mäeots M., Leijen Ä., Sarapuu S.. Improving students' inquiry skills through reflection and self-regulation scaffolds. Technology, Instruction, Cognition and Learning, 9 (2012), pp. 81-95

Game-based learning

Game-based learning is a type of game with defined learning outcomes (Shaffer, Halverson, Squire, & Gee, 2005). It usually presents learners/players with a challenge/conflict, certains set of rules and quantifiable outcome (Salen & Zimmerman, 2004).

Game based learning ≠ gamified learning. The latter usually adds game elements to usual learning scenario.

Key ingredients include:

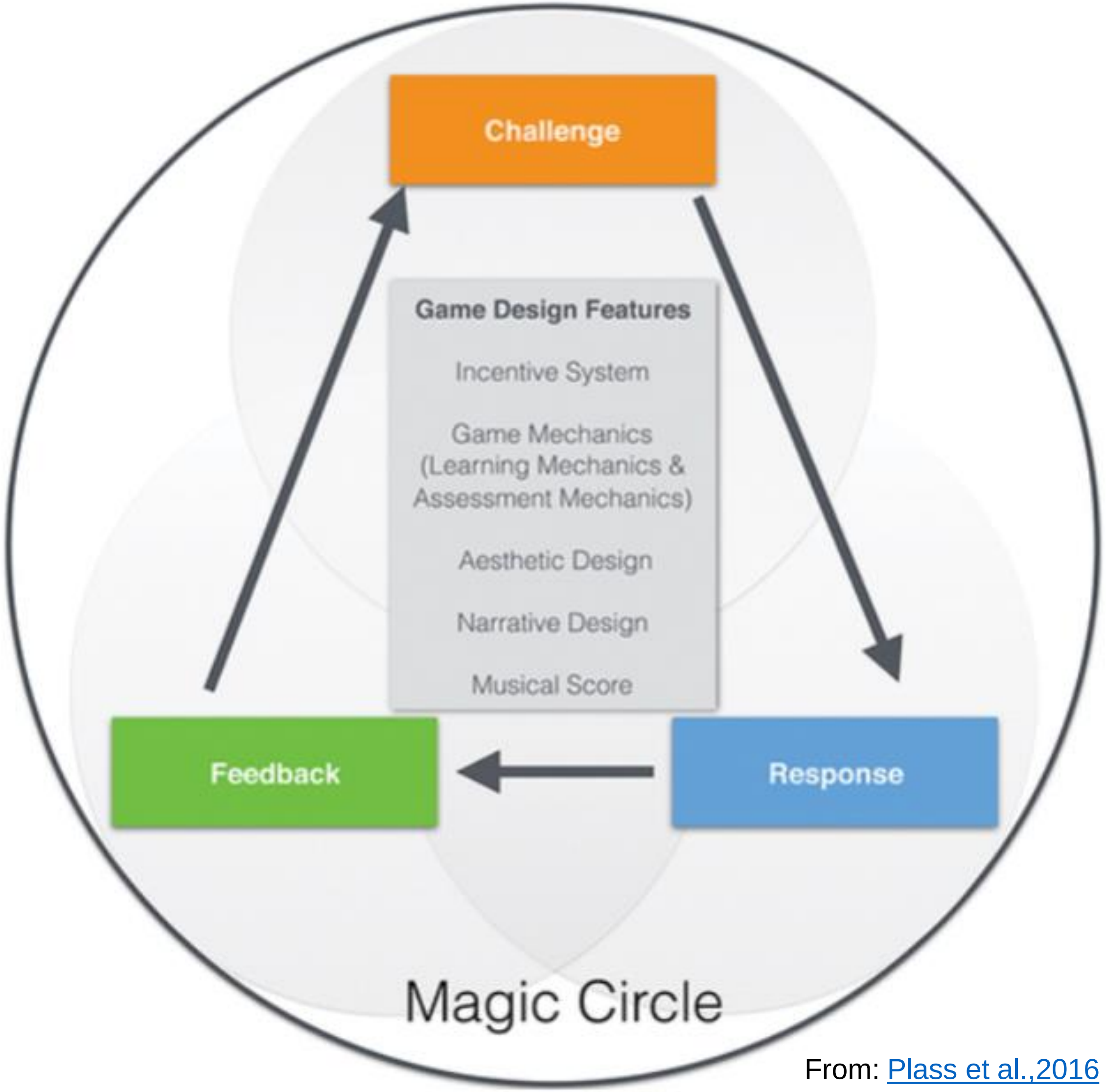
- Actions learners have to do and repeat through the game
- Incentive systems (stars, badges) - encourage to continue the game
- Narrative of the game - connects characters, actions and tasks into the story
- Visual design & music - in line with narrative, informative
- Content & skills to be taught/learned

Challenging aspects:

- Students might be motivated to play but not to learn
- Gaming the game
- Creation requires extensive resources
- Good educational games are hard to find and they might be pricy

Example: Duolingo

FIGURE 1 Model of game-based learning.



From: Plass et al.,2016

Shaffer, D. W., Halverson, R., Squire, K. R., & Gee, J. P. (2005). *Video games and the future of learning* (WCER Working Paper No. 2005-4). Madison: University of Wisconsin–Madison, Wisconsin Center for Education Research (NJ1).

Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. Cambridge, MA: MIT Press.

Plass, J. L., Homer, B. D., , & Kinzer, K. Ch. (2015). Foundations of Game-Based Learning, Educational Psychologist, 50:4, 258-283, DOI: 10.1080/00461520.2015.1122533

Problem-Based Learning (with the support of AI)

Problem-Based Learning (PrBL) is an approach to learning and teaching focused on a student, which encourages inquiry, linking theory and practice and applying knowledge and skills in order to reach a practical solution to a defined problem. (E-Desk)

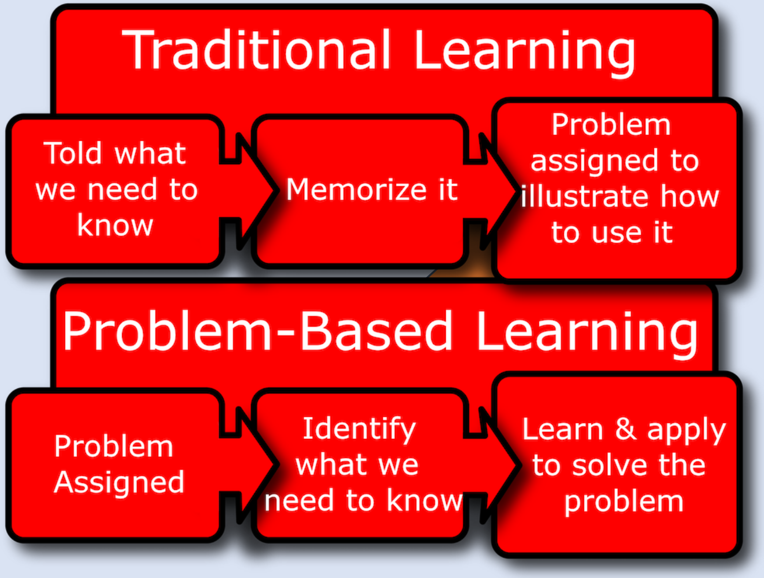
Key ingredients include:

- Type 1. Starting with finding authentic and engaging problem (compex just enough), introduce it to the class, organize students in groups
- Type 2. Online collaborative student activities using trained virtual agents to support students
- Teachers need to facilitate students how to to attack it and articulate the process of solving the problem
- Transition to PrBL can be made in stages changing course learning design, over a couple of semesters
- Virtual agents (AI) can support collaborative learning activities, asynchronously and using multimedia

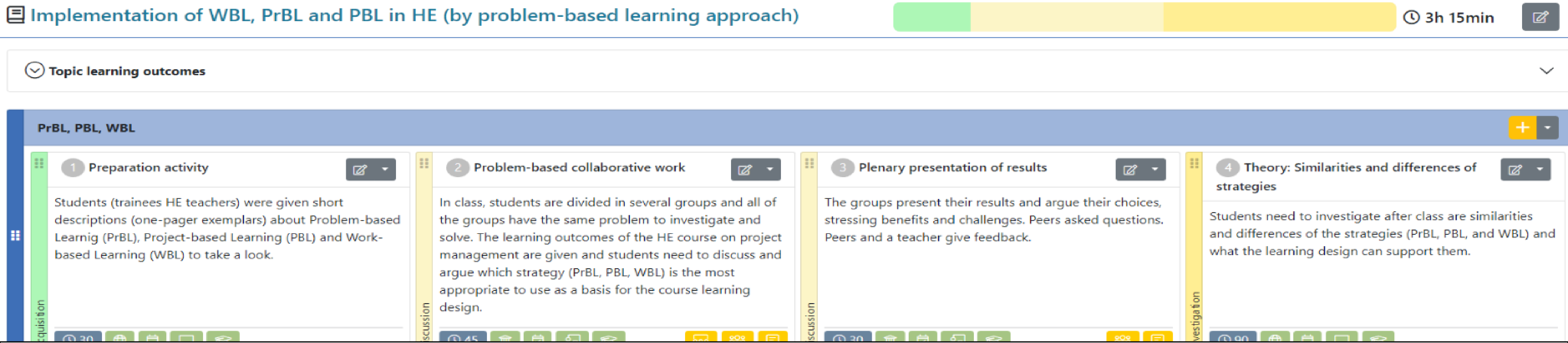
Challenging aspects:

- Class size, student resistance to group work (specially smart ones), teachers losing control over teaching process
- Coverage of "material" - when using PrBL in class extend duration is needed; time-consuming for teacher to prepare problems (students can also take part in its development)
- Some topics lack of applicability, acceptability from conservative colleagues
- Assessment of procedural knowledge and metacognition can be challenging

Example: Teaching in Higher Education



Source: educationaltechnology.net



Amador, J.A., Miles, L., Peters, C.B. (2006). The Practice of Problem-based Learning, A Guide to Implementing PBL in the College Classroom. Anker Pub. Comp. Inc. Bolton.
E-Desk: Digital and Entrepreneurial Teachers for a Fast-Changing World (2023) https://learn.foi.hr/course/view.php?id=30
Problem-Based Learning and AI (2021) http://projectalien.eu/wp-content/uploads/2021/03/D4.1-PBL-and-AI-community-document.pdf

Project-Based Learning in a Virtual Environment

Project-Based Learning (PBL) is a student-centred pedagogical approach that involves real-world challenges and problems and supports a deeper approach to learning. PBL is based on active learning, inquiry-based learning and problem solving. Students achieve higher level learning outcomes by working for a longer period to investigate and respond to complex questions, challenges, or problems. (E-Desk)

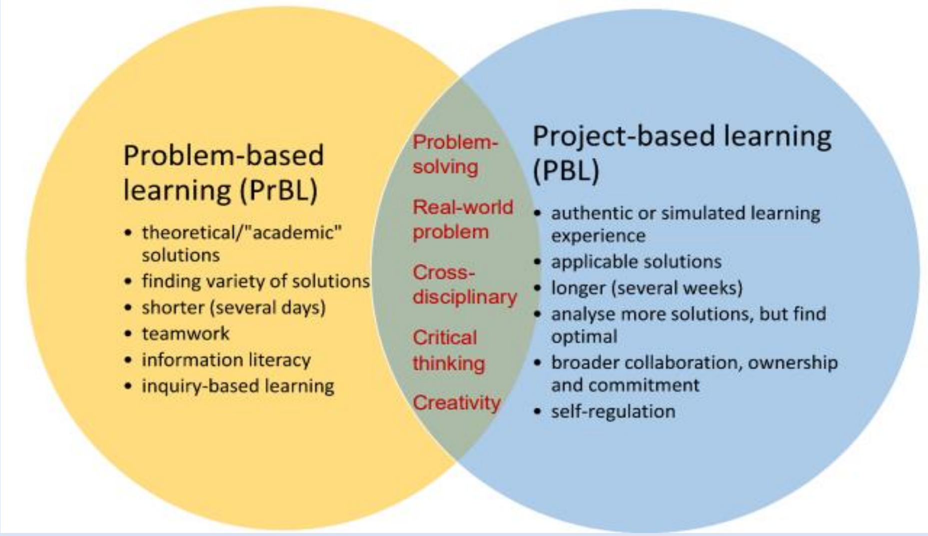
Key ingredients include:

- PBL and Problem-Based Learning (PrBL) are both organized around real-world problems and challenges and use interdisciplinary and cross-disciplinary knowledge and skills
- Project work is based on authentic or simulated learning contexts
- Students achieve higher level learning outcomes by working for a longer period to investigate and respond to complex questions, challenges, or problems
- Students often work in teams in virtual environment and self-/ peer-assessment is used

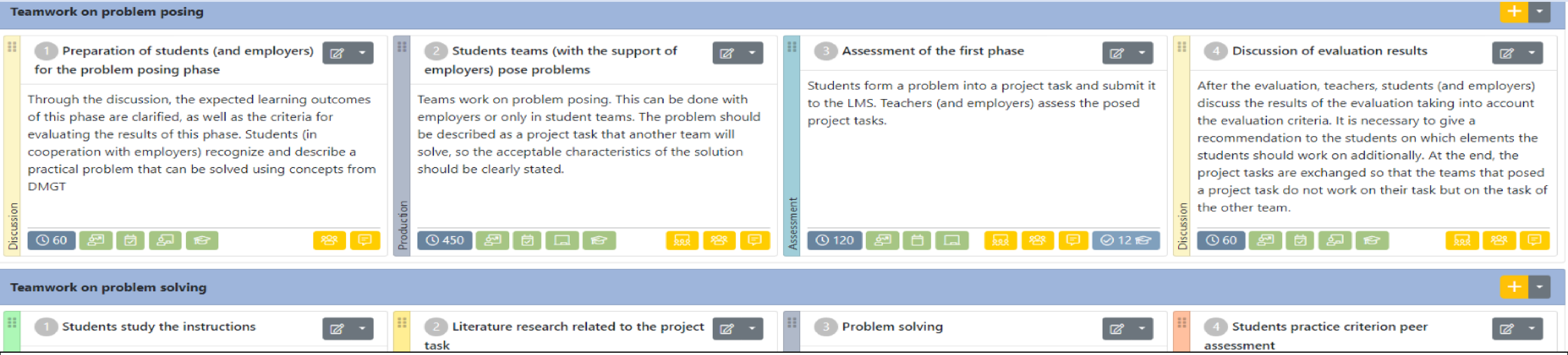
Challenging aspects:

- In team work - social loafing (insufficient performance by some team members)
- Virtual environment to enable team work need to be created
- Assessment of complex tasks by using comprehensive assessment criteria (rubric) and meaningful feedback
- If peer-assessment contribute to the final grade, the assessment reliability issue should be addressed

Example: [Discrete Mathematics with Graph Theory]



Source: [E-Desk]



Helle, L., Tynjälä, P., & Olkinuora, E. (2006). Project-based learning in post-secondary education – theory, practice, and rubber sling shots. Higher Education, 51(2), 287-314.

E-Desk: Digital and Entrepreneurial Teachers for a Fast-Changing World https://learn.foi.hr/course/view.php?id=30 ; https://learn.foi.hr/pluginfile.php/7441/mod_resource/content/2/eDesk_PBL_PrBL_reading_BD.pdf

iLed
Innovating Learning Design in Higher Education

For more information about the project, visit the project website:

https://iled-project.eu/

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