unite! | University Network for Innovation, Technology and Engineering

Good Practices Handbook

Guidelines on contents and pedagogical approaches for online Teaching & Learning

JProVirtual: Joint programmes embedding virtual exchange

TECHNISCHE UNIVERSITÄT DARMSTADT | Grenoble INP | UGA | KTH | Politecnico di Torino | U LISBOA UNIVERSIDADE DE LISBOA | UPC UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

CONTENTS

WELCOME

Joint Programs: Embedding Virtual Exchange, JPROVirtual, is an Erasmus + Project, running from March 2021 until February 2023, which targets the development and use of tools and methods, standards and guidelines, with the explicit objective of embedding them in international joint and collaborative education programs. JPROVirtual is part of the Erasmus+ Knowledge Alliance Unite! – University Network for Innovation, Technology and Engineering.

Virtual mobility and virtual exchanges are currently high on the agenda of the European Commission and of most European Higher Education Institutions. The concept and format of the European Degrees, and the European Approach to Quality Assurance in Joint Programs and the post pandemic era challenges, frame the JPROVirtual project. More specific objectives of the project include raising awareness regarding embedded virtual exchange among academics, stakeholders and European Universities, as sharing of best practices. These activities lead to a set of guidelines for the developers and managers on all steps of the process, including curriculum development, joint teaching, online support services, accreditation, recognition and tools for blended mobility, to name just a few.

The present Handbook of Good Practices is the result of an extensive analysis of the state of the art, and constitutes a repository of practices identified in the JPROVirtual partner universities - Kungliga Tekniska Hoegskolan from Sweden, Aalto Korkeakoulusäätiö SR from Finland, Technische Universität Darmstadt from Germany and Universidade de Lisboa from Portugal. Associated JPROVirtual partners, Universitat Politècnica de Catalunya – Barcelona Tech from Spain, Politecnico di Torino from Italy and Grenoble INP-UGA from France also contributed to the repository. Produced tools, methods and processes were integrated in the JPROVirtual Online Teaching Digital Toolbox. This online repository contains the elements involved in creating Joint Online Courses, including a technology toolbox, online teaching practices, and a compilation of activities suitable for an online environment.

In the first part of the handbook, an overview of online teaching and learning will be presented, as well as a framework for the exploration of good practices, including recommendations on ethics, classes, assessment and supervision. In the second part, more specific teaching and learning methodologies will be explored and exemplified with real cases, including flipped classroom, problem-based learning, project-based learning, challenge-based learning and virtual labs. In the third part, engagement strategies, fundamental for XXIst century students, will be discussed with real case examples, including pitches, online discussion forums, seminar courses, webinar symposiums and online workshops, quizzes and polls, gamification and MOOCS. Finally, the fourth part will be dedicated to the presentation of useful digital tools.

To complement the present Handbook of Good Practices, a Glossary has been added, with the main concepts and terms relevant to Online Teaching and Learning.

We hope you find this Handbook useful and inspiring for your online teaching and learning!

Joint Programmes: Embedding virtual exchange

JProVirtual: Embedding virtual exchange

"European universities of excellence and inclusiveness are both a condition and a foundation for our European Way of Life. They support open, democratic and fair societies as well as sustained growth, entrepreneurship, integration and employment (…)."

Margarities Schinas, Vice-President for Promoting the European Way of Life quoted in the Press Release "Higher Education: making EU's universities ready for the future through deeper transnational cooperation" (Strasbourg, 18 January 2022)

In the beginning of 2022, the European Commission launched four flagship initiatives with the aim of extending and enriching the European Alliances (EA) pioneer efforts to "bring closer education, research and innovation in service to society":

- Expansion of the European Alliances to 60 European Universities with the aim of developing and sharing a long-term "structural, sustainable and systemic cooperation on education, research and innovation, creating European inter-university campuses students, staff and researchers from all parts of Europe can enjoy seamless mobility and create new knowledge together, across countries and disciplines"
- Creation of a legal statute for European Alliances of HEI's
- Scale-up of the European Student Card initiative by deploying a unique European student Identifier available to all mobile students
- To 'cut the red tape for delivering joint programmes', working towards a joint European Degree (ED) and recognizing the value of transnational experiences

The European Degree label generated an unprecedented collaboration between at least six University Alliances – Una Europa, 4EU+, CHARM-EU, EC2U, EU-CONEXUS and Unite! – in order to improve the process of developing Joint Degrees. The European Degree Label is regarded as a crucial means to the end of positively impacting the attractiveness and competitiveness of the European Higher Education sector on the world stage. On the 3rd February 2023, the ED-AFFICHE project, which unites 22 different countries, 51 HEI's and represent a combined student and staff body of nearly 2 million people, was approved for Erasmus+ funding.

Dr Joan Guàrdia Olmos, Rector of the University of Barcelona and a Member of CHARM-EU believes "this pilot will not only enable the European Universities Initiative to test the European Degree label, it will strengthen collaboration sought by the European Council: collaboration between European Universities, Member States and the European Commission in co-creating the European Education Area of the future."

ED-AFFICHE resulted from a joint position of the six University Alliances on the European Degree, where the ED is seen as an enabler for JP's, making them much simpler and less resource intensive to implement, as well as more attractive to students, academics, HEI's, employers and national authorities alike. The European Approach for the Quality Assurance of Joint Programmes (2015), accepted by all the Bologna countries, was a first step towards the implementation of JP's, but it still faced a whole array of bottlenecks (e.g. tuition fees, selection of students, curricula, use of foreign languages) between the different national HEIs. Therefore, an ED that guarantees the possibility of multilingual, intercultural, interdisciplinary, research-based and flexible learning paths might become a clear and attractive label and certificate for awarding a JP at European level, as proposed by the joint position of the six University Alliances previously mentioned.

Much of the work that supports, at least within Unite! European Alliance, the negotiation of a Joint Position regarding the ambitious European Degree comes from the 2015 and 2021 projects – Reforming Dual Degree Programmes for Employability and Enhanced Academic Cooperation (REDEEM) and Shaping the Next Generation of Joint Programmes in Science and Technology (REDEEM2), carried out under the Erasmus+ Strategic Partnerships framework and under the umbrella organization of CLUSTER (Consortium Linking Universities of Science and Technology for Education and Research).

REDEEM2 developed a set of guidelines and recommendations that might assist the reforming and creation of JP's. A Joint Programme (JP) is a Bachelor's, Master's or PhD programme offered jointly by two or more universities, located in different countries. A JP presents an integrated curriculum coordinated, managed, developed and offered jointly by different higher education institutions (HEI) leading to double/multiple or joint degrees, attested by one or more diplomas. The programme can be developed and managed jointly or it can be the result of an agreement between two independent programmes. Students receive multiple or joint degrees and a long mobility (typically one semester up to a year) is embedded.

A JP facilitates mobility and intercultural exchange among its intervenients (students, faculty and technical/administrative staff). Promoting international employability of its graduates, a JP allows students to gain diverse experiences, learn about different cultures while acquiring an international degree.

We present as example five possible scenarios in the Master's Joint Programme between two degree issuing universities (60 ECTS + 60 ECTS), ranging from the most traditional to completely virtual JP.

The traditional JP, where usually the students spend one year (2 semesters) in each partner university:

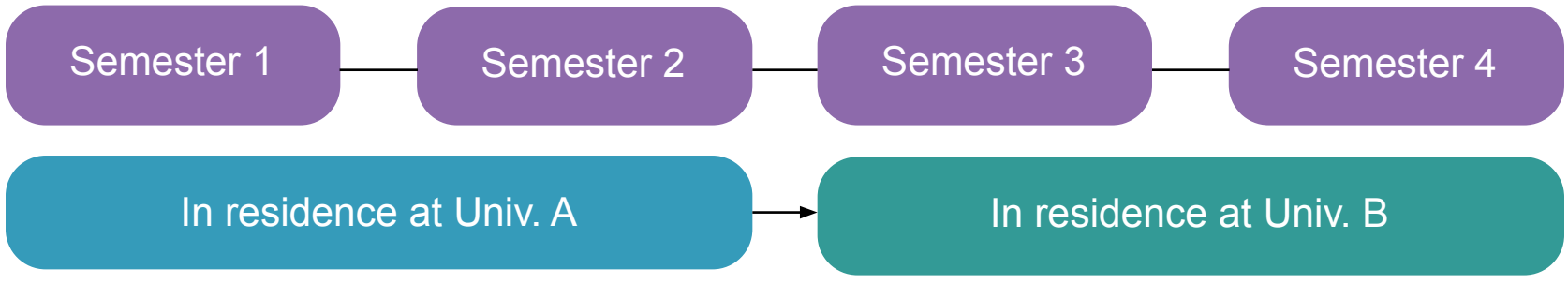

Fig.1 - Schematic representation of a traditional JP.

A JP with a longer stay at one of the universities (2 or 3 semesters) and a shorter physical mobility at another university (1 semester). One of the semesters at the longer staying university can already be a virtual exchange at the second university:

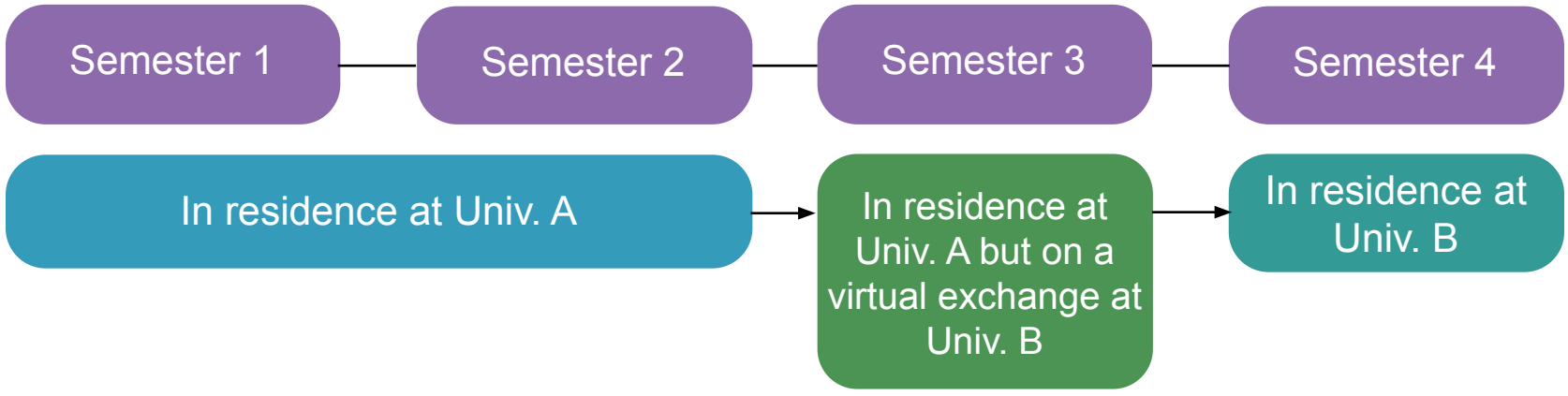

Fig.2 - Schematic representation of a JP with a longer stay at one of the universities and a shorter physical mobility at another university.

A JP with most of the time spent physically at one of the universities, and with a very short mobility in a second university (e.g. summer school, intensive programme, field visit, master thesis, short internship, project work) that can be integrated during any semester:

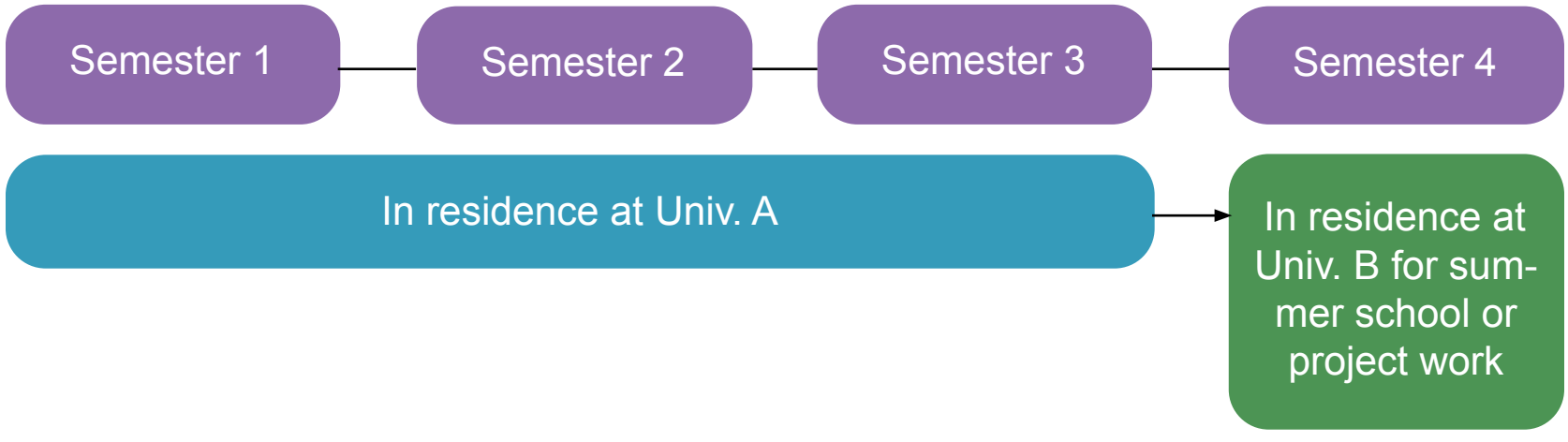

Fig.3 - Schematic representation of a JP with most of the time spent physically at one of the universities, and with a very short mobility in a second university in the last semester, as an example.

A JP where the whole of the programme is physically in one university (4 semesters), however, for the second year (2 semesters) the student is at a virtual exchange with another university:

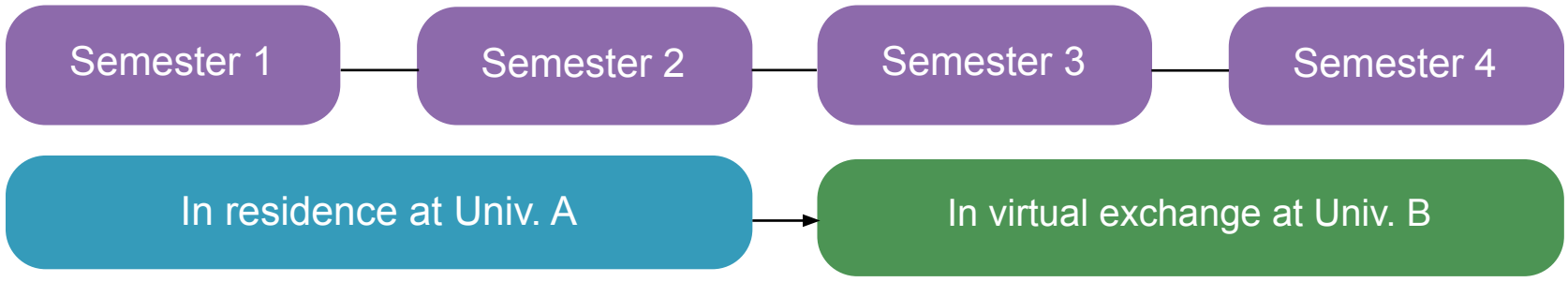

Fig.4 - Schematic representation of a JP where the whole of the programme is physically in University A but where the second year is spent virtually in University B.

A JP entirely online, where the student attends classes virtually, first in one of the universities (2 semesters) and then (2 semesters) in another university.

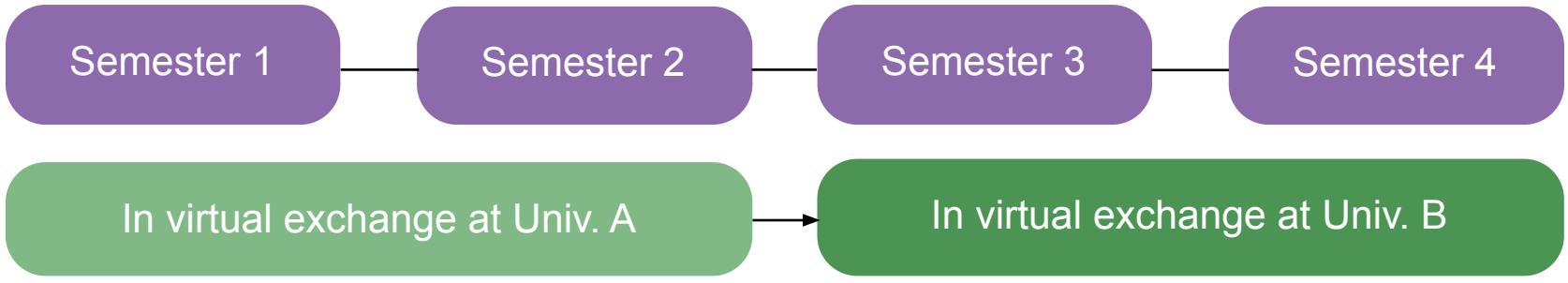

Fig.5 - Schematic representation of a JP taking place entirely online.

Students participating in traditional JP face the challenge of being away from home for a year, which can be a long time to be away from family, friends or even work. It can also be very expensive for those students coming from countries with lower living costs, as well as particularly challenging for students with education special needs. On the other hand, students have the opportunity to get used to a new culture and way of living. Complementarily, shorter mobilities are a lower cost alternative that may remove the need to apply for visas or residency permits.

Those aspects make JP with shorter or no mobilities more inclusive for working students, students with dependent family members and medical conditions that make longer stays difficult. Some drawbacks to these programmes include difficulties in planning a programme structure, less opportunities to get to know the culture and employers of the targeted country, and eventually higher costs due to extra trips between universities.

Finally, completely virtual JP allow greater time flexibility, reduced logistics, increased sustainability, and constitute a great opportunity for different audiences. At the same time students are offered the chance to work in virtual settings and with international teams. On the downsize, students have less socialization and engagement opportunities (with potential impact on their wellbeing), limited access to hands-on and lab activities, and reduced access to resources (computers and internet connection).

The guidelines and recommendations for reforming and creating JP's in HEI's in Europe, coming from the results obtained by REDEEM2 and developed according to the results of online surveys, focus group interviews and thematic workshops, include: organizational aspects, legal frameworks and inter-institutional agreements, management, support for double/joint degree for incoming and outgoing students, quality assurance, matching the curricula, personal development and employability, marketing on the academic value, assessment and selection of students and, of course, teaching methods. Five recommendations of the REDEEM2 project are relevant to JPROV:

- "Bring together all the professors involved in a workshop meeting in order to create a deeper understanding about the complementarities of the curricula and (innovative) teaching methods, as well as to clarify the motivations and vision of the JP"
- "Consider introducing mandatory staff mobility for teaching in the agreements in order to boost the jointness of the programme and increase the understanding of the teaching process at the partner universities"
- "If you have already experienced that your respective group of incoming double/joint degree students have problems adapting to another education system and other teaching methods, address these issues within preparatory cultural trainings, language courses or within student mentorships"
- "Create a transdisciplinary teaching environment"
- "Think about using e-platforms/MOOCS".

Additional challenges are the monitoring and assessment of student's performance, as well as feedback regarding their progress. Concerning the challenges of virtualization of the JPs, the "Joint Programmes: Embedding Virtual Exchange Project" (JPROV) developed the present handbook with guidelines on contents and pedagogical approaches for online teaching and learning and a glossary to support faculty ensure the quality of these programmes. Additionally, the JPROV project developed the online teaching digital toolbox which consists in a repository with the elements involved in creating joint online courses, including a technology toolbox, good online teaching practices and a compilation of activities suitable for an online environment.

Teaching & Learning in online context: Overview

What is Online Learning?

Online learning is a type of learning experience in an online environment through the use of the internet and digital tools and platforms. In this environment, students can be anywhere to learn and interact with instructors and other students. The teaching content is delivered online and the instructors develop teaching modules that enhance learning and interactivity in the synchronous or asynchronous environment (Singh and Thurman, 2019)

What are the advantages?

Student-Centred Learning

The variety of online tools helps students become more versatile learners, allowing more individual and group engagement options throughout the learning process. Online Learning is an excellent way to increase the student-teacher and student-student interaction and discussion, providing better feedback mechanisms and more effective tracking of students' progress and engagement. This continuous feedback can result in preventive and student-specific learning actions, leading to a more consolidated achievement of the learning outcomes.

Collaborative Learning and participation

Online teamwork allows students to become more active participants in the learning process. Besides, some students might feel more comfortable participating in classes if they engage virtually using digital mechanisms such as online quizzes, polls and mind maps.

Flexibility and self pacing

Depending on the type of online course, online learning allows students to work and learn at their pace without time restrictions. Recorded classes, MOOCs and Project-Based Learning can help students to better manage their time, allowing more students to engage in courses (student worker, for example). If students have continuous access to lectures, course materials, class discussions, rereading a lecture or taking more time to reflect on some material before moving on won't be a problem and can help better consolidate learning outcomes. It also allows to expand the course's outreach, reaching new audiences due to the elimination of the physical (and sometimes time) barrier.

Promotes innovative pedagogical approaches

Offers the opportunity to think about teaching in new ways: Online teaching can allow you to experiment with techniques only available in online environments, such as threaded discussions and web bibliographies.

Provides ideas and techniques to implement in traditional courses: Online discussions, a frequently-used practice in online learning, can be incorporated to facilitate group work in conventional learning courses . Other techniques, such as web-based course calendars and sample papers posted on the Internet (with student permission), can easily be incorporated into a conventional learning course.

Effective management of physical and time resources

While lessening the demand on the limited campus infrastructure, it also allows for new possibilities. With digital tools, automatic grading and feedback are also possible, releasing teachers to more creative tasks.

(Feldman et al., 2003; Felder & Brent, 2017; Arora, 2019; Dhawan, 2020)

What are the challenges?

Becoming familiar with the technology used in your online course

There is the need to become familiar with the technology used in your online course, including hardware and software, and spend some time exploring their options. An online environment requires a high level of computing power and reliable telecommunications infrastructure. Make sure you have access to both.

Keeping connected with students

Use the technology of the online environment to help you keep in touch with students. Communicate frequently with students, both individually and as a group. While keeping connected with students can be a challenge, the online environment offers several pedagogical opportunities.

Ensuring digital equity

Not everyone has access to the same digital means and infrastructure. Unavailability of digital tools, such as a strong wifi connection and a proper device (computer, tablet, etc.) can cause many students to miss out on learning opportunities. Institutions should ensure that every student and faculty has access to the required resources.

Teaching & Learning in Online Context: Generic good practices

Classes

Write a “Greetings” post or prepare a self-introductory video before the start of the course

Alongside the usual background information, consider including something about your research interests to increase engagement and affinity with your students.

Use tools to regularly communicate with students

Frequent short posts and messages help to build a continuous sense of engagement with students. Announcement tools are available in most common course management systems, such as Moodle, A+LMS, Etherpad, Edmodo and others.

Give timely feedback

Providing feedback on whether or not (and how well) students have mastered the learning objectives is vital, particularly in an online learning setting. Studies show that students’ satisfaction and grades correlate significantly with how quickly they receive feedback on their work (Croxton, 2014).

Hold virtual office hours

Many students who are intimidated by the thought of going to a professor’s office find it much more comfortable to communicate electronically. Designate several hours each week when you will be online to respond to texts, e-mails, and possibly video chats.

Set up an open, online threaded forum

Threaded forums promote effective communication and motivate students to reflect critically on course content and increase the frequency and effectiveness of formative feedback from instructors and classmates. Whenever possible, it is advisable to centralise communication, course content and information on a single platform to avoid student dispersion. Try platforms such as Zulip, Slack, Piazza, Teams or Moodle.

(adapted from Felder, 2016)

Get students actively engaged with Learning throughout the whole course

Active learning is the hardest strategy to achieve in online courses, however, it is essential to provide an engaging and stimulating online learning environment. Besides the Active Learning Methodologies and Engagement Strategies described in the following sections, there are a few Active Learning Tasks that can be included in the course design in STEM (Felder, 2016):

- Recall prior material (e.g., what was covered in the previous class session)
- Answer a question
- Start a [problem solution, derivation] or take the next step
- Draw a [free-body diagram, circuit diagram, plot, flow chart, product life cycle]
- Think of a real-world application of [the material we just covered, the formula we just derived]
- Diagnose a [defective product, set of symptoms, computer error message]
- Predict [an experimental outcome, a system response to a change in input]
- Sketch the form of [a complex mathematical function, the solution of a differential equation] without doing any calculations
- Critique a [writing sample, oral presentation, data interpretation, computer code, clinical procedure, process design, product design]
- Figure out why a calculated quantity may be wrong or different from a measured value
- Brainstorm a list of ways to do something
- Think of a question about the material just covered in class
- Summarise a lecture or part of a lecture
- Promote small-group discussions
- Promote think-pair-share (Lyman, 1981)

Testimonial #1

Work Group Formation for a Teamwork based Project

This practice aims to create workgroups in a class by topic preference. This way of creating groups allows students to interact with students with the same motivation and with whom they would not choose initially. Forming workgroups like this allows students to get out of their comfort zone, and prepare them for the job market.

The practice is performed in the class where students are supposed to create a group for a work group or project and can be implemented following the steps below:

1. ***Explain the project details**, objectives and what is expected students to do*

2. ***Promote a brainstorm** for students to develop in their projects*

3. ***Students should identify the themes they would like to develop** in the project, write in a paper and give it to the teacher (could also be done online using digital communication tool)*

4. ***Organise students according to theme** they chose and create groups*

5. ***Students meet for the first time to define the title**/theme **of the project** (it can be adapted for the students' strengths if the objective is to create multidisciplinary groups)*

Testimonial #2

Choosing Your Own Computational Project

The goal of this practice is for students to be more motivated in doing a required piece of coursework - computational work - by choosing their own project, instead of choosing from a given list of projects, even if in the beginning they know little about the software or methods. Many students appreciate this 'freedom', both because it makes the task more motivating and easy and because of the added confidence of knowing that such a theme will lead to a project that can be completed.

An alternative is to leave the choice completely open to students. This is done in a course on Computational Methods in Engineering. First, the students must choose the method (usually they pick the Finite Element Method) and then the software (Abaqus, Siemens NX, Ansys, Comsol, etc). Finally, a relevant problem in engineering (something they covered in a course, something related to a personal interest, or a problem that they would like to address in their master's thesis, or at least a similar one) is proposed. Alternatively, it could be to follow and modify a number of tutorial problems.

Work on complex tutorial problems helps students become aware that the problem/approach might be too complicated, and that they might not succeed in completing the project in the allocated time, which could be discouraging. On the upside, the teacher can propose the necessary simplifications for the followthrough of the project, at the same time allowing for better training in computation work, with a better potential for a good grade.

Testimonial #2 (cont.)

Choosing Your Own Computational Project

(•••) *Basic tutorial problems are more of a sure bet, but the potential for a good grade still requires a lot of ingenuity from the students (e.g. by efficiently exploring parameter space, or by making good connections with real-life applications, results found in papers or analytical solutions).*

The computational project is, in itself, the main aspect of the course, but a good choice of theme is a crucial step for the success of the student in the curricular unit, therefore the selection of this aspect as the main focus of the Good Practice.

Students in groups of 2 (maximum 3) are encouraged to submit 1-3 possible themes. In rare cases, individual works can still be accommodated. Before the deadline, students meet with the teacher to better define the scope of the project and make a definitive choice of theme. If no theme is proposed by the students, a list of options can be offered, for the students to select one of their choice

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Testimonial #3

Send Additional Exercises Solved in a Video

This practice aims to provide additional course materials to students and to promote students to engage in problem-solving activities.

This practice involves the creation of videos covering the explanation of practical exercises. After a topic is covered, the teacher sends a video with additional exercises being solved. Recording platforms such as Loom can be used to produce audiovisual content.

Testimonial #4

Gathering Thoughts and Key Ideas After a Lesson

This practice aims to gather thoughts/information to systematise the lessons' content.

The teacher must create a Padlet in advance and ensure that its link can be easily shared in the middle of a lecture or lesson. The teacher instructs students on the assignment (e.g. "think together about what makes the text scientific"), divides the group of students into smaller groups, and urges groups to choose a scribbler who records the ideas that have arisen in the group to Padlet.

The teacher also explains how much time is available for group discussion and what the whole group will do with the output. The teacher can monitor student comments that appear on Padlet, for example by grouping them.

Finally, the task is dismantled by looking together at what kind of thoughts arose and how they are related. Padlet will be available for viewing later, so the output will not go away.

Assessment

Adapt the assessment practices to remote teaching and learning

Consider alternative assessment tools and deadlines for the delivery of assessment tasks. This information should be defined before the course starts and be made available to all students.

Try open tests and exams

Consider allowing consultation materials during evaluations. This possibility should be defined and indicated before the tests and exams.

Provide regular feedback using alternative strategies

Try online tests, written (individual/ group) homework (case studies, reports, projects), oral presentations or pre-recorded video submissions using video conference or video recording tools and oral assessments using video conference tools

Foster complementarity between online assessment strategies

Integrate different forms of evaluation into the global student assessment by resorting to online tests and exams and other tasks such as projects, exercises, oral presentations, group work and other ways to access intended learning objectives

Tips

Regarding multiple tests and exams, some general pedagogical recommendations are:

- Start with a question, followed by several answer options (typically, 3-5), with only one right option
- Be versatile and balanced, connected to the intended learning objectives
- Be tested for difficulty beforehand – the test/exam should take teachers 1/3 of the time to solve compared to the time students have available
- Have 70% of the questions with medium difficulty, 10-15% easy questions and 10-15% hard questions

Testimonial #1

Peer assessment

This practice aims to include peer assessment in the final course grade. This kind of practice allows for contact with partners' projects, enhances feedback opportunities and raises awareness of the evaluation process and constructive feedback mechanisms.

Students are required to individually read partners' group projects and provide structured feedback in an online discussion forum that will prompt discussion about the project.

They must also react to the feedback comments that their group projects received. To engage students to participate, peer assessment is graded and considered part of the final evaluation.

Testimonial #2

Automatically graded programming exercises

This practice aims to use automatic grading tools to help students to work independently with programming exercises by getting detailed feedback on their solutions 24/7.

There are many systems, some commercial (like CodeGrade), some open-source (like A+ LMS) or simply services (Web-CAT) which support giving automatic feedback on programming exercises.

Students code their solutions on their computers and submit the solutions to the platform/LMS which automatically tests the program and gives feedback on its correct functioning and possibly on many other aspects (code quality, testing quality, performance,...). After that students can revise the solution and resubmit it if needed. The tests are implemented by the teachers on the server-side.

Technical details of systems' and submissions processes' management vary from system to system. Typically, the learning curve for teachers to adopt the system is high but the advantages are significant in terms of saving grading time. For students, the possibility to get immediate feedback 24/7 is also a great advantage.

Testimonial #3

Open exams

Using a Learning Management System such as Moodle, the exam questions are published and available for the students at the beginning of the course, with a set of 10 possible essay questions. Classes along the semester focus on essay questions and exam questions alike, but also complementary contents.

The final exam has a choice of 2 out of the 10 questions published on Moodle, and 1 question that is from a broader topic area. The exam is an open book exam (3 hours) which has turned out to be an excellent choice of assessment method, as students have given great feedback that this has been very supportive of their learning.

The presentation of the exam questions on Moodle since the start, reduces the anxiety barrier of doing the exam, at the same time encouraging students from the very beginning to engage with the course topics. This practice aims to promote exams as learning events rather than merely summative events.

Supervision

Communicate

Online supervision poses communication challenges, from having a good internet connection to different time zones, or simply because candidates can struggle in virtual environments. Additionally, social and cultural differences might influence supervisors' and students' interactions.

Thus, working on a good communication strategy that can address these challenges is key to a successfull supervison.

Provide feedback

In the online environment, some students might perceive feedback as being personal, which can lead to demotivation and cutting off the communication with their supervisor.

Also, the lack of mastery over digital tools that are used as the means to provide feedback can lead to misinterpretations and misunderstandings.

It is important to clarify the purpose of feedback and how it should be received.

Understand expectations

Derived from the communication challenges, and since the student and the supervisor often do not know each other beforehand, it might be difficult to understand the expectations from both sides and consequently set coherent goals for the project, which can lead to misunderstandings.

The first step of the supervision should be, then, to set clear objectives and to align expectations.

Build a relationship

Building a bond of trust and establishing a personal connection with students can be difficult in the absence of non-verbal communication and informal interactions, posing a challenge to create new ways of engaging with students.

Thus, in online supervision, the opportunities to connect and engage have to be created and structured, requiring much more creativity, planning, intentionality and purpose (Kumar & Coe, 2017; Kumar & Johnson, 2019)

Supervision (cont.)

Tips

- Start by identifying the essential objectives of the MSc or PhD thesis, emphasising the most important elements that you want your students to learn
- Spend time at the start of the relationship with the candidate to develop a mutual understanding of your respective roles and responsibilities
- Schedule the first meeting in the online environment, even in the case of pre-existing relationships, and establish the meeting frequency in advance (weekly meetings, bi-weekly, etc)
- Make sure that you have a working channel for communicating and providing feedback (email, digital platforms such as Slack, etc)
- Establish a permanent virtual location for the online meetings that work for both the student and supervisor (video conferencing room, for example)
- Identify milestones for the research project and regularly review the progress considering them
- Take advantage of technology and use digital tools such as Notion and Trello to track progress and clear out the following steps
- Set deadlines for sharing drafts and giving feedback
- In the case of candidates from other countries, find out about social and cultural differences and take these into account when communicating with candidates

Supervision (cont.)

Tips

- In the case of candidates from other countries, find out about social and cultural differences and take these into account when communicating with candidates
- Encourage the use of bibliographic software (for example, EndNote, Refworks) for the use of in-text citations and references while writing
- Discuss the provision and reception of feedback with your candidate, and structure it accordingly
- Follow up asynchronous feedback with synchronous feedback
- Organise virtual group meetings of candidates at different stages of the thesis/ dissertation process to share their work
- Incorporate students into sharing communities to share progress, challenges, resources and experiences with peers and avoid isolation feellings, typical of the solitary effort of a dissertation experience

Testimonial #1

Teaching oriented to Scientific Products in MSc and PhD

The purpose of this practice is to go beyond classic knowledge transmission and assessment by teaching oriented to scientific products. The target group are MSc students, PhD students and postgraduate students, students that are highly interested in obtaining competencies, practising and having close support as they materialise scientific products.

The scientific product produced by students may be, for example:

- *A paper (narrative review, systematic review, scope review, bibliometric analysis, an original study, etc.)*
- *Data collection instruments (form, paper or online; a validation and/or study of the measurement properties of a built instrument)*
- *A database applied to a concrete study*
- *Data analysis (data cleaning, exploration of data, data analysis planning, data report and discussion)*
- *A research project (the identification of relevant and innovative research questions, literature retrieval and conceptual mapping, study design, study methods, budgeting, submission to the ethical committee)*

Testimonial #1 (cont.)

Teaching oriented to Scientific Products in MSc and PhD

(•••) *The followed methodology associated with the implemented strategy includes:*

A step-by-step map for conceiving, designing, developing and testing (e.g., the database) the scientific product. Students may be at different stages and have different challenges, and thus they must be aware of their status in each phase. These steps function as milestones.

These courses have a limited number of students (4-6), as they demand very personalised attention and assistance. In the beginning, each student must carefully reflect on and describe the research perspective and the nature of their scientific product.

For each milestone, a very detailed guide helps the student produce 'intermediate' products. These guides identify the competencies needed, quality criteria and provide examples. Students, completing the guides, achieve these intermediate products.

Classes provide the key concepts, present the guides and make demonstrations/exercises for competencies needed to achieve each milestone.

(•••)

Testimonial #1 (cont.)

Teaching oriented to Scientific Products in MSc and PhD

The course includes 'laboratory sessions' where students have blocked time for advancing their work with close support and supervision from teachers. Usually, these are sessions where students also provide support for each other.

Students have group sessions where they present their intermediate work, discuss options and provide each others feedback. Teachers provide final feedback. Critical thinking and discussion are promoted as well as sharing perspectives and experiences among students. Students can also provide formal feedback to their colleagues - for example, when writing a research protocol, each student may provide written comments and fill out a review form for projects from 2 colleagues (Peer Review).

Teachers should provide written and/or oral feedback and guidance in every intermediate product students develop.

The course assessment is based on the final product, but this can also include the completion of the intermediate 'guides' and assignments.

Testimonial #2

Using SCRUM for Supervising MSc Thesis

The aim of this practice is to implement a Scrum framework in order to improve the rate of Master Thesis success. Some methods in the Scrum framework can address existing problems in the development of theses with very positive results.

To implement the SCRUM methodology, applied to the development of a MSc Thesis, the following steps were followed:

1. ***Determine and define the research question(s):*** *Identification of the research question, determinate the purpose of the study and also the planning of it.*

2. ***Select the case(s) and determine data gathering and analyses techniques:*** *The researcher must determine the unit of analysis of the study, that is, selecting between single and multiple case studies. To select the unit of analysis, the researcher can review the purpose of the study, which cases can provide information to answer the research questions. Regarding the information, the research must choose in advance how this will be gathered and analysed.*

3. ***Prepare to collect data:*** *Develop interview guidelines to ensure that the questions asked are the same to all participants and make a template mail communication to invite the participants.*

4. ***Collect data in the field:*** *The researcher collects data from multiple sources to answer the research question(s).*

Testimonial #2 (cont.)

Using SCRUM for Supervising MSc Thesis

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5. ***Evaluate and analyse the data:*** *After finishing collecting the required information, depending on the type of data gathered and the techniques chosen previously, the researcher explores the data collected to find evidence to answer the original research question(s).*

5. ***Prepare the report:*** *Once the case study is completed, the researcher documents, shares and communicates his or her findings.*

This practice highlights the value of several Scrum events in the development of academic thesis: Sprint Planning meeting, Sprint Review meeting[c], frequent work deliveries, feedback and collaboration. Moreover, regarding the insufficient knowledge transmission, students pointed out that having group meetings was an opportunity to follow up on the work of other students, learn with their ideas and developments, and learn from their mistakes.

However, Scrum has specific roles, such as Product Owner, Scrum Master and Team Member, which have specific responsibilities that are not appropriate for an academic context such as thesis development. In essence, the adoption of Scrum may be a way to foster communication and organisation between students and supervisors, generating positive feedback, and improving the work in progress.

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Ethics

Ethics in Academia is an extensive topic, both in the context of **face-to-face learning** and in the **online setting**. Every University has a Code of Ethics/Conduct that everybody should comply with, whether Students, Teachers, Researchers, Teaching Staff, Academic and Administrative Staff, and others. These codes all vary, but the following examples of **academic misconduct** are very common:

- **Interfering** with course materials
- **Damaging** the University's infrastructure
- **Damaging** or theft of intellectual property
- **Providing false information** or representation, or fabricating or altering information
- **Altering** University documents
- **Cheating**
- **Plagiarism**

The last two, **cheating** and **plagiarism**, are among the most common types of academic misconduct. The high availability of references in electronic format (books, journals, wikis, websites, blogs) has made plagiarism more recurring than ever, particularly in the context of online settings - digital tools and online learning evironments provide the means for some sophisticated academic fraud (adapted from Harris, 2020).

Ethics (cont.)

Awareness Strategies

- Understand why students cheat
- Educate yourself about plagiarism and academic fraud
- Educate your students about plagiarism and academic fraud
- Explain/present the university code of conduct. Require that the students read it and follow it
- Discuss the benefits of citing sources
- Make the penalties clear

Prevention Strategies

- Make the assignments clear
- Assess students with an open exam methodology, projects, presentations, assignments, and similar strategies
- Require process steps for the papers/ assignments definition
- Require oral feedback on student papers
- Advise students to keep track of sources using a reference manager software like Mendeley or Zotero
- Require most references to be recent and/or relevant

Detection Strategies

- Look for fraud clues: mixed citation styles, lack of references, unusual formatting, anachronisms, etc
- Use Online Proctoring software while in traditional online tests and exams, such as ProctorExam, ProctorU or SpeedExam.
- Identify the reference sources provided by students

Mitigation Strategies

- Get to know your University's procedures
- Try to understand why the situation happened
- Report the situation
- Contact the University Pedagogical Services, which eventually will pass on the situation to the Legal Unit

Teaching & Learning in online context: Methodologies

Flipped Classrom

What is it?

Form of blended learning that integrates two components: interactive online presentation of information before class and well-implemented active learning in class - for example, problem-solving activities (Means et al., 2010).

How does it work?

The online materials might include short videos, lecture clips, and screencasts; hands-on experiences with virtual labs, control rooms, and plants; and quizzes on the presented material. The in-class sessions should consist almost entirely of activities designed to build on and reinforce the concepts and methods introduced in the pre-class preparation.

Step by step methodology

1. **Define content scope, learning objectives, & instructional strategies.**

   It is important to select a small number of sub-topics to focus the lesson - define the learning objectives and outcomes that align with the activities students will do before, during, and after the class. Also, describe the task that will demonstrate that the learning objective has been met.

2. **Plan and prepare the new instructional materials that students will engage with before class.**

   Ask yourself what are the best instructional materials to address the course content (e.g., video, text, animation, simulation, online multimedia module, or other) and facilitate learning.

3. **Share the instructional materials and motivate students to do pre-class work.**

   Refer to the learning objectives and tasks outlined in step 1 and incentivate students to engage and prepare the pre-class activities.

Step by step methodology (cont.)

Ask students to:

- Respond to open-ended questions online about the instructional material before class
- Prepare questions about the instructional materials
- Prepare a presentation about the topic
- Attempt to solve some problems
- Research examples to bring to class that illustrates a principle

4. Provide students opportunities to deepen understanding by developing in-class activities

Plan, prepare and develop in-class activities that focus on higher-level cognitive activities. The chosen activity will depend on the learning goals and objectives defined for the class. Common activities are:

- Reviewing pre-class activities to identify common questions or gaps
- Q&A session with students, reporting to the pre-class activities
- Quick review quiz (based on the basic learning objectives)
- Peer Collaboration
- Working on assignments
- Presenting student-created content
- Active discussion on a topic
- Solving a case study

5. Create post-class activities that extend student learning

Plan, prepare and develop the continuation of the learning experience from the in-class activity to an outside-of-class individual or collaborative practice. Determine what students should do after the in-class activity to continue learning or bridge to the next topic.

6. Continuously evaluate and assess

Plan for ongoing formative and summative ways to assess student understanding and mastery. Could students attain all the learning objectives? Self evaluate the Flipped Classroom implementation and ask for feedback from students on what worked well and what didn't - and update your practices accordingly (Felder, 2016).

Flipped Classroom

Type of class	Theoretical	○
	Problems	✓
	Laboratory	✓
Class size	Small	✓
	Medium	✓
	Large	○
Type of learning environment	Asynchronous	✗
	Synchronous	✓
	Mixed	✓
Type of activity	Individual	✓
	Group	✓
	Mixed	✓
Teaching and learning approach	Remote	✓
	In Person	✓
	Mixed	✓

Testimonial #1

Remote learning using a Flipped Classroom strategy

The activity intends to introduce new theoretical concepts in a remote environment to a population of students up to 280. The activity runs on a week-basis schedule, with new concepts growing from the previous ones. The first preparation step is to distribute the study material, e.g. PowerPoint presentations with audio descriptions 24 to 48h before the activity.

Monitoring runs in parallel with the activity development.

As a flipped classroom model, students are invited to participate in an online video meeting, where the previously acquired are discussed, and learning issues or difficulties are resolved.

The discussion is moderated by the teacher, who focuses on the key learning points of the new concepts. Students have also the possibility to introduce their doubts and queries. This activity is followed by a second one, with smaller groups of students, where the new concepts are again presented, now by the teacher, to reinforce the acquired knowledge and where the students have, again, the possibility to resolve their learning issues.

Assessment is conditioned by the established program rules and relies on a partial test of concept recognition and a final written test.

Testimonial #2

Flipped Classroom in Introductory Physics with Quizzes

The practice aims to implement a flipped classroom strategy to teach a course in Introductory Physics.

The flipped-classroom setting includes a pre-class preparation of online materials, seconded by a synchronous online session with quizzes, group and plenary discussions, and concept-focused problems to be solved in small groups.

While in class, students are encouraged to ask questions, many of them were submitted before the lecture; the lecture contains answers and discussion topics that were submitted, as well as the general concepts of the lecture's content. Quizzes and problem sets are discussed and solved in groups.

Testimonial #3

Flipped Classroom with a collaborative and dynamic bank of questions aiming to provide formative feedback during the course

For many courses, most feedback to students comes from assignments, quizzes and exams. Usually, this feedback, besides the grade, is general and addresses parts of the syllabus or the knowledge to be acquired.

Recently, several systems for providing feedback on study material are becoming popular. A well-known is the flashcard system, where students are invited to collaborate to build big amounts (hundreds to thousands) of 'flashcards' (short questions about a subject), along with the answers, covering all aspects of a certain course, book or knowledge domain. Then, students prepare for examinations by testing themselves to those questions, in rounds, and selecting the frequency they want the question to reappear in future rounds. The impact of this "spaced-repetition learning" on strengthening knowledge acquisition and academic performance has consistently been shown.

The current Flipped Classroom Strategy is based on a system in which (1) students, given concrete orientation and examples, create questions (quizzes) about topics from the course syllabus previously assigned to them, also including a detailed explanation for the correct and incorrect answers; (2) teachers validate the quizzes and the explanations; (3) The quizzes validated are made available online for all class during the course, allowing immediate feedback on quizzes which students must complete during the course. These quizzes, although mandatory, just inform the student about their quiz score and allow consulting the explanations. They do not enter the students' final grades.

Testimonial #3

Flipped Classroom with a collaborative and dynamic bank of questions aiming to provide formative feedback during the course

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To implemente the current Flipped Classroom Strategy, the steps are the following:

1. *Teachers will include an assignment for students to elaborate a set of questions for each lecture and relevant bibliographic material (e.g., mandatory readings). E.g: during a certain course, a student may be assigned to build 4 multiple choice questions for 4 lectures or chapters.*

2. *Students will be given guidelines, including examples and pedagogic best-practices orientations for proposing the multiple-choice questions. These guidelines will also assure that the type of questions is diverse, and includes memorization, concept explanation, concept discrimination, application, analogy, and critical thinking, among other cognitive operations, as adequate for the subjects of the lectures. Along with the questions, students will also propose the justifications for the correct and incorrect answers.*

3. *The teacher will review and validate the material proposed by students. Each lecture may have from 50-80 questions. Previous preparation work of identifying topics will assure that all relevant topics are included in the questions' set.*

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Testimonial #3

Flipped Classroom with a collaborative and dynamic bank of questions aiming to provide formative feedback during the course

4. *The validated questions set is uploaded in a platform for quizzes (moodle) allowing student registration and access to random sets of questions (e.g., 20 multiple-choice), with automatic grading, immediate review after the submission and access to the justifications. Each question will have a discussion forum, allowing the students-teacher to further clarify aspects of content and allow for feedback regarding the questions and explanations offered.*

5. *According to each student's profile of incorrect answers, an algorithm was created, assigning an individual probability for a specific type and domain of question - this probability will thus reappear in future rounds of exercises, facilitating progress monitoring for students.*

6. *Besides the feedback to each student test, a report (automatic email) will be sent to each registered student with the topics where he/she obtained better and worse grades, along with the general evolution from peers, from round to round.*

The collaboration of students and teachers throughout the learning process (e.g., flipped classroom strategy) truly strengthens the learning process. While the value of specific feedback during this learning process (the course duration) is unquestionable, the limited time, the number of students and the complexity of most subjects are obstacles to making the most of this crucial learning resource.

Testimonial #3

Flipped Classroom with a collaborative and dynamic bank of questions aiming to provide formative feedback during the course

Having this in mind, the current practice allows to:

- *Provide automatic, specific and personalised feedback to students during the course.Students will access a significant pool of questions, test their knowledge, access the justifications and, if needed, further engage in online forum conversations.*

- *Provide information for students to organise their study: which topics need to be better studied or how is the student progressing with time and in comparison with their peers. This will promote studying along the course, and not only near the examination's dates, or not only to focus on those topics needed for assignments.*

- *To allow teachers to understand which topics are more difficult, they need further/better teaching material or better explanations, or new teaching strategies. This fundamental feedback helps guide teachers in continuously improving their teachings.*

- *From the students' point of view, the exercise of building questions and answers, and ofcollaborating among themselves, is also a key learning experience, promoting their critical thinking and pedagogic interest and skills.*

Testimonial #4

Flipped Classroom in a Challenge Based Course with Breakout Pitches

This is an activity for student presentations/pitches in an online setting, in a challenge-based course. Students work on company projects as a team. Throughout the presentation, each team member gets to pitch to a small audience of other students, answer questions related to the presented project solution and get feedback from their peers. To implemente this strategy, the steps are the following:

1. ***Before class:*** *Students are asked to prepare a 5-10 minute pitch and a short, accompanying presentation. If the presentation is made as a part of a team, they need to make sure that all team members are comfortable giving the pitch and answering questions about it. In this project course, the teams are asked to cover the project context, talk about their key findings and introduce their initial solution.*

2. ***During class:*** *All team members are assigned to a different breakout room, where they take turns giving pitches. Each student is given 10 min. to pitch and 10 min. for questions and feedback from peers. Rooms of 4-5 students are ideal. The teacher (or other course staff) divides the students into the breakout rooms beforehand, making sure that the same pitch is not given twice in the same room (i.e. teammates are in different breakout rooms). The teacher can visit the students' pitches to give feedback, but the focus is on peer learning.*

3. ***After class****: Teams now have feedback on their project from 3-5 different groups of people (e.g. in a 4 person team, 4 students have each pitched the solution in a different breakout room). Students discuss the findings and feedback with their team and make a plan for incorporating them into the project before the final presentation and report.*

4. ***Assessment:*** *The assignment is peer-evaluated, and a link to a feedback/ evaluation form is shared with the students at the beginning of the class. The evaluation should be done in real-time, during the class hours, so it's good to reserve about 5 mins after each pitch for the students to give their written feedback and do the evaluation.*

Problem Based Learning

What is it?

Problem-based learning (PBL) is an instructional method that drives all learning via solving an authentic problem (Marra et al., 2014).

Learners begin learning by addressing simulations of an authentic, ill-structured problem. The content and skills to be learned are organised around problems rather than as a hierarchical list of topics. Thus, knowledge is learned in the context of the problem, and there is a reciprocal relationship between knowledge and the problem.

Knowledge building is stimulated by the problem and applied back to the problem. Instructors are facilitators (not lecturers) who support and model reasoning processes to facilitate group processes and interpersonal dynamics, probe students' knowledge deeply, but do not interject content or provide direct answers to questions (Marra et al., 2014).

How does it work?

Students usually work in teams to find the solution, and they have the primary responsibility for doing the work. They hypothesise solutions, test them, identify the need for information that the instructor may or may not provide, and try different solutions if they find previous ones unacceptable until they finally converge on a solution and write and turn in their final report. The instructor provides guidance and feedback as needed.

Problem based learning revolves around four learning principles: constructive education, learning in a relevant context, collective learning, and self-directed education.

Step by step methodology

1. Discuss the case and make sure everyone understands the problem
2. Identify the questions that need to be answered to solve the problem
3. Brainstorm what the group already knows and identify potential solutions
4. Analyse and structure the results of the brainstorming session
5. Formulate learning objectives for the knowledge that is still lacking
6. Do independent study, individually or in smaller groups: read articles or books, follow practicals or attend lectures to gain the required knowledge
7. Discuss the findings
8. Propose and validate a solution

Tips

The problems that are proposed in Problem based learning should:

- **Be authentic:** real-life and current practice related and with meaningful context
- **Activate prior knowledge:** problems within multidisciplinary contexts
- **Be sufficiently complex:** challenging should stimulate in-depth discussions and critical thinking, engaging but should be possible to solve
- **Stimulate group discussion:** should have triggers to start the discussion, induce debate and activate high-order thinking
- **Generate the appropriate learning outcomes:** facilitate the synthesis of the discussion
- **Stimulate self-directed learning:** engage students and promote the search for alternative bibliographic sources and references
- **Be optimally structured:** open problem, no simple solution, no prescriptive steps, not too many solutions

Problem Based Learning

Type of class	Theoretical	○
	Problems	✓
	Laboratory	✓
Class size	Small	✓
	Medium	✓
	Large	○
Type of learning environment	Asynchronous	✗
	Synchronous	✓
	Mixed	✓
Type of activity	Individual	✗
	Group	✓
	Mixed	✓
Teaching and learning approach	Remote	✓
	In Person	✓
	Mixed	✓

Project Based Learning

What is it?

Project-Based Learning is a type of student-centred learning characterised by student teams working on problems, but with the added component that they have to submit a project report (Kolmos & de Graaf, 2009)

How does it work?

By working in teams on a project, often multidisciplinary, Project based learning aims to create effective learning opportunities where learners can work collaboravely in groups to answer a driving question, solve a problem, or tackle a challenge with an aim of creating an end product (Bell, 2010).

Project based learning aims to provide students with content knowledge, but also developing skills, such as searching for information from different resources, critical thinking, problem-solving, self-evaluation, summarising and giving presentations which are highly recommended for long-life learning.

Step by step methodology

1. **Choose the topic** and driving question
2. **Form the team**
3. **Define the final product and learning objectives**
4. **Plan the tasks and organise time**
5. **Look for information and research**
6. **Analyse, synthetize, and discuss** possible problem solutions

Step by Step Methodology (cont.)

7. **Implement newly acquired knowledge**
8. **Develop and execute** the final product
9. **Present publicly** a project report, that will be posteriorly subject to expert review
10. **Gather feedback and arrive to a collective answer** to the initial question
11. **Reflect** on the experience
12. **Be evaluated and self-evaluate yourself** (adapted from Hernández-Barco et al., 2021)

Tips

- **Require and provide detailed feedback on intermediate submissions** such as a preliminary plan of work, periodic progress reports, and a rough draft of the final report
- **Provide only minimal feedback on the final report** because there will be no more opportunities for revision and resubmission, and so detailed feedback is likely to be ignored
- **Schedule one or two meetings with student teams during the semester** to hear and comment on how their projects are going (Felder, 2016)

Project Based Learning

Type of class	Theoretical	○
	Problems	✓
	Laboratory	✓
Class size	Small	✓
	Medium	✓
	Large	○
Type of learning environment	Asynchronous	✗
	Synchronous	✓
	Mixed	✓
Type of activity	Individual	✗
	Group	✓
	Mixed	✓
Teaching and learning approach	Remote	✓
	In Person	✓
	Mixed	✓

Testimonial #1

Project-Based Learning with Virtual Reality

The current practice aims to engage students in a project where students implement the theory in a context they can relate to making a more equitable and inclusive learning experience. To implement this practice, the following steps were followed:

1. *Students get access to content modules around the topic in question (planning)*

2. *Students get access to the VR case, which contains an engagement letter with deliverables and 3 deadlines (this letter can be individualised)*

3. *Students start exploring the case company by themselves, gather data within the environment and out in real life to deliver on the deliverables*

4. *On a weekly basis, students present the work to each other in small groups and give each other feedback. The instructor can be called into the sessions to provide feedback as well*

5. *Students deliver the final report, which is then assessed by the teacher on logic, reasonability and execution*

Testimonial #2

Multidisciplinary Integrated Project

The Integrated Project can be anything from small-scale but fundamental innovations to studies of regional or even global systems.

The students from their multi-national team of 6 to 8 students, assign specific roles and work on creating a proposal for a viable new product or service in one of the following fields: energy efficiency, renewable energy, energy in transport and energy storage. By engaging in the integrated project, students:

- *Advance in technical, engineering and scientific knowledge in a specific area of sustainable energy*
- *Build experience of working effectively in large project teams and getting the best out of each team member's skills, experiences and resources*
- *Enhance their ability to communicate results in writing and verbally to a range of stakeholders in the project*
- *Boost project management and project reporting skills in line with EU standards*
- *Increase the understanding of the process of developing project proposals*
- *Further the experience of combining engineering analysis of product or service design with business feasibility*

Virtual Labs

What is it?

A virtual laboratory is a type of hands-on learning methodology where students do not interact with real equipment to obtain data, but rather with computer simulations of laboratory or industrial process equipment (Koretsy, Kelly & Gummer, 2011).

A Virtual Laboratory is an interactive environment in which simulated experiments can be carried out. A laboratory can be characterised as “a playground for experimentation” (Mercer et al., 1990) providing tools that can be used to manipulate objects relevant to a specific scientific domain (Wastberg et al. 2019).

How does it work?

Virtual labs enable the exploration of systems that cannot be directly, safely, or economically studied in physical labs, and can also enable further exploration of hands-on experiments (Felder 2016).

There are two types of virtual laboratories (Wastberg et al. 2019): a Cloned Virtual Laboratory, which is a representation of a real-world hands-on laboratory, cloned in digital format; or an Enhanced Virtual Laboratory, that can be defined as a cloned virtual laboratory with extra features that could not be part of a real-world laboratory.

Step by step methodology

1. **Guide the design work** with a clear understanding of purpose and context
2. **Select appropriate technology** to ensure efficient design and media usage
3. **Select level of realism** considering purpose and end-users
4. **Provide learning guides** before and after the virtual lab session (Wastberg et al. 2019)

Tips

- **Be very clear about the purpose of the virtual laboratory, and in what context you intend it to be used**

  Consider which type of media you intend to build - simulation, laboratory, demonstration, and so on. Indicate clearly to the user what they are interacting with.

- **Strive to use the simplest possible design and technology, still meeting the demands efficiently.**

  In some cases, advanced technology such as virtual environments or even virtual reality might be needed, but a technology-minimalistic strive will lower the risk that too advanced technology is used for its own sake

- **Adapt levels of realism and accuracy to the intended target group as well as to the intended learning outcome**

- **Continuously consider enhancements of the virtual laboratory to increase the learning outcome.**

  It can be profitable to provide help when needed and visualise things that are not possible in a real laboratory. Balance this potential against the possible advantages of having a virtual laboratory that closely mimics real-life laboratory exercises

- **Regard a virtual laboratory as an illustrative playground that requires external support in the form of guiding, explanatory texts or teacher debriefing.**

  The virtual laboratory provides the students with experience and observations but does not always necessarily provide understanding on its own. Guidance is often necessary to help the students to understand the illustrated scientific phenomena

Virtual Labs

Type of class	Theoretical	✗
	Problems	✗
	Laboratory	✓
Class size	Small	✓
	Medium	✓
	Large	✓
Type of learning environment	Asynchronous	✓
	Synchronous	✓
	Mixed	✓
Type of activity	Individual	✓
	Group	✓
	Mixed	✓
Teaching and learning approach	Remote	✓
	In Person	✗
	Mixed	○

Testimonial #1

Digital laboratory safety training: the AALTOLAB

Laboratory working skills are crucial for a successful transition to working life as professionals in chemistry, chemical engineering, and many other fields of science. In laboratories, students develop their practical skills and gain a deeper, hands-on understanding of the concepts discussed in lectures and textbooks. At the same time, traditional laboratory education faces severe threats in many universities in Europe and worldwide. Laboratory education is relatively expensive compared to for example lectures and whenever universities face budget cuts, the quality and extent of laboratory education may be in danger.

We promote high-quality laboratory education by providing digital solutions that increase the resilience, quality, and financial sustainability of laboratory education. We have developed open, accessible, and scalable virtual online laboratories for training students. The virtual laboratories do not replace real laboratory education but complement and support it by reducing teacher workload and increasing student engagement and motivation.

Our virtual laboratories are created with 3DVista (actively developed state-of-the-art software for 360 panorama tours). The virtual laboratories are integrated with H5P content elements hosted in Moodle. This concept enables flexible creation and updating of online text elements, games, and interactive videos. Digital exams related to the virtual laboratories are implemented in Moodle.

Testimonial #2

Virtual Labs for molecular visualisation using Virtual Reality

This activity aims to create an immersive virtual laboratory using Virtual Reality (VR) technology. The game "Touch on Chemistry" was adapted to be explored in the classroom, in theoretical-practical or laboratory, or at home, to improve the comprehension of the basic principles of chemical bonding and stereochemistry using the visualisation of molecules in a 3D virtual space as a problem-based learning and active learning.

Using VR glasses, the student is placed in a virtual laboratory, where he can hold atoms with his own hands and join them to build up molecules. The student is challenged to build these molecules in different ways: through their name, schematic representation or through a given fragment (incomplete molecule). The student can also construct a molecule and its stereoisomer (mirror molecule) and then determine whether they are superposable. In this context the understanding of stereochemistry, the chemistry in three-dimensional space, that is, the spatial arrangement of atoms is much facilitated. Thus, the manipulation of molecules in a 3D environment generates an extremely useful visual memory for a later representation on paper (2D) following adopted conventions. The structuring of the game at various levels allows not only a gradual learning process but also a better validation of knowledge, motivating students by combining knowledge with a challenge (gamification). The immersive VR system perceived by a user can be accompanied by the remaining students by the real-time projection of the virtual experience on a screen. The evaluation of the effectiveness of this teaching methodology is measured by comparison with classical teaching. Diagnostic exercises are elaborated, and students must respond with and without the help of VR glasses. Exercises using VR-assisted methodology are monitored by the teacher using a performance grid.

Testimonial #3

World Pendulum - A remote experimental Physics experiment

Laboratory working skills are crucial for a successful transition to The remote laboratories (elab) are used in the context of LIFE (course in experimental physics) curricular unit. It is employed as a component in a MOOC (feX); as such offered to a vast community involving other agents beyond IST. The remote experiment used is the "World Pendulum" which allows not only the regular use of a pendulum as a basic experiment but to measure in several latitudes the gravity and, in doing so, understand some concepts of geophysics.

This activity is included in a MOOC. Besides the fundamentals involved, comprises (i) a first "hands-on" approach to the pendulum's experiment conducted at home followed by (ii) a report (iii) peer review activity and then (iv) a remote experiment execution thought elab and the (v) corresponding data analysis and interpretation done on several on-line exercises. The activity itself (remote laboratories) requires access to the elab infrastructure, in particular the present development of the "World Pendulum Alliance", which allows the executions of similar experiments based on a high precision physics pendulum. This constellation of pendulums ranges from Punta Arenas in southern Chile to Prague, crossing the Equator in São Tomé e Príncipe and covering more than 15 places at different latitudes.

Students are very motivated by doing remote experiments as they "feel the power" in controlling a remote device as far as Punta Arenas or Panama City and they stand the curiosity to see "if it is true" or a "fake experiment". Moreover, they are not aware of the slight change in gravity on Earth and this establishes a research interactive learning space to look for a scientific explanation. So, the inquiry-based process is very demanding on scientific thinking and discussion among the students.

Testimonial #4

Remote biomedical engineering experiments supported by mobile devices, Cloud and IoT

Mobile devices such as smartphones or tablets are widespread within the student community. However, their potential to be used in classrooms is yet to be fully explored. This practice explores an approach that benefits from the ease of access to mobile devices and combines it with state-of-the-art software and hardware. This approach builds upon previous developments from our team on biosignal acquisition and analysis and is designed towards the enrichment of the teaching experience for students, namely in what concerns laboratory activities, in our case applied to the field of biomedical engineering.

The implementation of such methodology aims at involving students more actively in the learning process, using case studies and emerging educational approaches such as project-based, active and research-based learning. It also provides an effective option for remote teaching, as recently required by the COVID-19 outbreak. In this approach (ScientISST) we developed low-cost hardware for prototyping Internet of Things (IoT) applications, the Arduino Science Journal (ASJ), a digital notebook originally created by Google, to support laboratory activities using mobile devices, and Jupyter Notebooks to share interactive tutorials and pedagogical materials online.

This approach has shown promising results in three case studies, namely: 1) Documenting a Histology laboratory class; 2) A Photoplethysmography (PPG) data acquisition and processing experiment, and 3) Supporting remote teaching of a laboratory-intensive course. The System Usability Scale (SUS) was used in the evaluation of the students' experience, revealing an overall score of 78.68% for the case studies.

Challenge Based Learning

What is it?

Challenge based learning (CBL) is an educational approach that frames learning around global, real-world, authentic challenges. These challenges are co-developed, investigated and acted upon by students and multidisciplinary stakeholders, including academic, enterprise and community participants.

How does it work?

Throughout the CBL process, creative, problem solving, and innovative thinking is encouraged to broaden perspectives, create new processes, ideas and solutions, and stimulate motivation. Although there are many different ways CBL can be implemented in teaching, the key features of all CBL approaches usually include an engagement stage, an investigation stage and an action stage.

Step by step methodology

1. ***Engage:*** **Through a process of essential questioning, learners move from an abstract general idea to a concrete and actionable challenge:**

    - **General idea:** It's a broad concept that can be explored in multiple ways; it is attractive, and relevant to students and society. It is often a topic of global significance, such as biodiversity, health, war, sustainability, democracy or resilience
    - **Essential question:** By design, the general idea allows for the generation of a wide variety of questions. A delimitation process yields an essential question, which reflects the interests of the students and the community's needs. It creates a more specific focus for the general idea and guides students toward more manageable aspects of the global concept
    - **Challenge:** It arises from the essential question when stated it involves students in the creation of a specific solution that will result in a concrete and meaningful action. The challenge is designed to address the general idea and the essential questions using local actions

Step by Step Methodology (cont.)

2. ***Investigate:*** **All learners plan and participate in a journey that builds the foundation for solutions and addresses academic requirements throughout the experience:**

    - **Guiding questions, activities and resources:** They are generated by the students, they represent the necessary knowledge to develop a successful solution, and they provide a roadmap for the learning process. Students identify lessons, simulations, activities, and content resources to answer the guiding questions and thus establish a foundation to develop innovative, deep and realistic solutions

3. ***Act:*** **Evidence-based solutions are developed, tested with an authentic audience, and then evaluated based on the results:**

    - **Solution:** Each established challenge is broad enough to allow for a variety of solutions. The solution must be thoughtful, concrete, clearly stated and feasible in its implementation in the local community

    - **Implementation:** Students try the efficacy of their implementation in a realistic environment. Its reach can vary greatly depending on the time and resources available, but even the smallest amount of effort in carrying out the plan in a real setting is valuable

    - **Evaluation:** It can and must be conducted through the challenge process. The results of the formal and informal evaluation validate the learning process and support the decision making as we advance in the implementation of the solution. Both the process and the product may be evaluated by the teacher

    - **Validation:** Students judge the success of their solution by using various quantitative and qualitative methods, including surveys, interviews and videos. Teachers and experts in the field play a vital role in this stage. Iterate, if necessary. Never fall in love with your solution

    - **Documentation and publication:** These resources can be used as the basis for a learning portfolio and as a forum to communicate their solution to the world. Blogs, videos and other tools can be used

    - **Reflection and discussion:** Much of the deeper learning takes place during this stage, as students reflect on their learning, their relationship with the content, concepts and experience, and their interaction with other people (adapted from CBL Guide - Apple; Edu Trends from the Observatory of Educational Innovation Tecnológico de Monterrey)

Tips

- **Propose the theme of the challenge** or the challenge itself **together with the students, other teachers or external experts**
- Make sure there is a **clear relationship between the learning objectives, the challenge's general idea and all its stages**
- **Integrate the key competences** that the students will develop by taking on the challenges
- **Encourage students to be responsible for their learning**, and to be involved in the development of the challenges
- **Be a facilitator** during the development of the challenges by supervising the activities, reviewing teams' progress, and guiding the students by using trigger questions, but without spelling out the answer or solution
- **Encourage critical thinking** that includes risk-taking and experimentation
- **Give up having the usual amount of control of the class** in order to guide students throughout the entire process
- **Allow students to make mistakes** so that later on, they can realise their error and correct it themselves
- **Work collaboratively with other colleagues from different areas**, since challenges are often multidisciplinary

Challenge Based Learning

Type of class	Theoretical	○
	Problems	✓
	Laboratory	✓
Class size	Small	✓
	Medium	✓
	Large	✓
Type of learning environment	Asynchronous	✗
	Synchronous	✓
	Mixed	✓
Type of activity	Individual	✗
	Group	✓
	Mixed	✓
Teaching and learning approach	Remote	✓
	In Person	✓
	Mixed	✓

Testimonial #1

Challenge-Based Learning with NGO problems

In this practice, students implement theory by working on a real problem with an NGO, in this case improving stakeholder communication using the balanced scorecard.

To implement this practice in the course context, the following steps were followed:

1. *The NGO presented itself and stated the existing challenge (implementing and communicating strategy);*

2. *Students formed groups and learned the theory on the subject (the content was prepared in modules and consisted on lectures, articles and company information);*

3. *Students presented ideas in subgroups to each other to improve each other's solutions;*

4. *Students delivered the final solution and the top 3 were forwarded for the NGO to use (conditional on student approval).*

Teaching & Learning in an online context: Engagement Strategies

Pitches

What is it and why should we use it?

One of the most common approaches to developing independent learning skills is to flip the role of teacher and student and let the students present independently acquired knowledge to the class, breaking the typical dynamic of a classic lecture. Small presentations/pitches are an excellent way to create student engagement in online settings.

In a common Flipped Classroom model, for example, students are asked to familiarise themselves with new content at their own pace, individually and collaboratively, by formulating and answering critical thinking or problem-solving questions, or by engaging in classroom preparation tasks. Short presentation/pitches are among the possible preparation tasks, combining the prior preparation of the classroom's contents and their consolidation provided by the presentation itself. In-class presentations can be performed individually or in a small group and are generally followed by a brief question and answer session to debate the topic.

Tips

Depending on the task set, oral presentations can be particularly useful to consolidate and assess (adapted from Warwick University's recommendations):

- Knowledge skills and critical analysis
- Applied problem-solving abilities
- Ability to research and prepare persuasive arguments
- Ability to generate and synthesise ideas
- Ability to communicate effectively
- Ability to present information clearly and concisely
- Ability to present information to an audience with appropriate use of visual support
- Time management
- Interpersonal and group skills.

Online Discussion Forums

What is it and why should we use it?

Online forums can be used to promote discussion among students, acting as a pre or post class preparation and helping them to review material before an assignment or exam. This strategy can also foster student reflection on topics that they have read or worked with outside of class. Some common alternatives can be online polls, discussion breakout rooms and chats.

Tips

- **Think through your student learning goals.** Before opting for a discussion forum, double-check if the online forum is the most appropriate tool to help your students attaining the pre-established learning goals
- **Built-in motivation for students to participate.** Simply setting up a forum is not enough to promote engagement. To get your students to participate, set specific goals or targets like preparing a specific assignment or exam
- **Choose a specific task and give explicit instructions.** To take full advantage of this strategy, assign specific tasks to students to complete within the forum's environment, along with explicit instructions about your expectations for completion. Do not simply ask them to "discuss" a topic
- **Share the learning goals with your students**. Continuously communicate your expectations to students and explain them why the forum is the best tool to help them accomplish the course goals
- **Set up an online discussion that incorporates reciprocation.** For a discussion forum to be successful, it must generate communication. Require students to not only post, but also respond to other students' posts to keep the conversation going. Students will benefit from this dialogue and from teaching each other course material
- **Bring the forum into the classroom.** Always keep the forum connected to the work you are doing in the classroom (Macdonald, 2021)

Testimonial #1

Integrate online discussion forums with a learning management systems (LMS)

This practice allows students to ask questions about course exercises and get answers and hints from course assistants/ teachers.

Many LMSs have functionalities for discussion forums, but there are also separate services for this, like Zulip or Piazza. The teacher can set up separate channels for different topics, such as the weekly exercises. Students can access the forum, present their questions, search for answers for other similar questions, and get answers/hints either from their peer students, teaching assistants or teachers.

Seminar Courses

What is it and why should we use it?

Seminars can be defined as small, discussion-based courses. Typically, students complete readings and assignments pre class and discuss major themes or topics during class. This kind of semi-public dialogue, sometimes facilitated by a moderator, is a great way to enable speaking skills and human reasoning (Hollander, 2002), as well as to help students build upon existing knowledge.

Tips

- To keep seminar discussions dynamic in online settings, promote **real-time interactions** by scheduling synchronous online sessions that invite dialogue between instructor and students, as well as among students
- To encourage students to ask questions freely and to express new ideas and thoughts, **do not record student discussions in the seminar**
- Consider digital tools to encourage participation and **supplement live discussion** with asynchronous modes of participation
- Assign students to pairs or small groups to **discuss the assigned topic after the seminar**
- Use a series of **short reflection assignments** to help students think through readings
- Research papers and final projects are important features of many seminars. Consider whether students will have **remote access to the materials** needed for their final projects

Testimonial #1

Creativity seminar to raise awareness in the context of a management course for engineering students

As part of a management course for engineers in their final year, a creativity workshop was proposed. The objective was to teach students the Creative Problem Solving approach.

In this workshop, questions and materials for the divergence stage are prepared by the teacher, and students engage in the convergence stage of the discussion, with graded pitch. The role of the teacher is to facilitate the discussion and provide feedback. The session lasts about three hours, with a long divergence time, as it is not usually practised by engineering students. This is followed by a convergence session, preparation of the pitch, and then the oral pitch with questions without answers.

The students have to invest a lot of time building content based on theoretical courses, as well as research and expert interviews. An oral update is given at each session for feedback and guidance. In addition, the teacher is available to answer their questions.

Webinars, Symposiums & Online Workshops

What is it and why should we use it?

Ranging from online workshops to webinars and symposiums, online talks are a great way to **engage students in a classroom environment**, while at the same time providing close contact with experts with diverse backgrounds from Industry and Companies, bridging the gap between the Academy and Society.

These engagement strategies promote **specific** (and sometimes, new) **knowledge acquisition, discussion and interaction, career path and vocation reflection, and network growth**, all this in a rather different learning environment, unique and stimulating. Inviting guest speakers also **exposes students to other insights and perspectives** and, thanks to videoconferencing, location and cost barriers associated with travelling are no longer a concern, expanding the options when it concerns the invitees.

It is possible to **integrate this type of learning in both theoretical and practical class environments**: while webinars and symposiums are typically more explanatory and academic, with a Q&A session afterwards, workshops are very hands-on and applied.

Tips

- **Identify Your Purpose:** It is important to consider the course objectives when planning for virtual guest speakers, so they add meaningfully to the students' learning. With careful planning, we can select a guest and facilitate an experience that aligns with and meets our academic standards. By inviting virtual guest speakers from our global community, we also have an opportunity to support students' social and emotional learning. By hearing varied experiences and stories, our students can gain greater and broader perspectives about the people, places, and things in the world around them. This broader perspective can help foster greater understanding and empathy

Webinars, Symposiums & Online Workshops (cont.)

Tips (cont.)

- **Identify Your Speaker:** Once you have identified your purpose and outcomes, the next step is to identify a guest speaker. You can do a web search, reach out to your professional learning network and look into your University's Alumni Network, for example
- **Prepare for Virtual Guest Speakers:** Once you have selected your guest speaker, connect with them to find out their needs and to share your instructional purpose and expectations for the experience. Here are some topics that should be arranged previously with the speaker: Date and Time; Talk Length and Format; Tech needs and requirements
- Rather than telling students what they should learn and expecting them to be passive listeners during the visit, it is more effective to s**park their curiosity and encourage them to ask questions to the guest**
- It is also important to **establish the expectations for how your students will engage with the guest**. Setting protocols is another opportunity to empower your students. Rather than giving them a set of expectations, guide your class to work collaboratively to generate the protocols that will ensure a welcoming, engaging, and successful visit.
- **After the experience, ask for feedback from both the speaker and your students** and continuously improve your approach

Quizzes & Polls

What is it and why should we use it?

Inside the online classroom environments, students can respond to multiple-choice questions in the format of quizzes and can provide feedback by answering polls. Besides being an effective engagement strategy to keep the students' attention, they are also important tools to track, report, and evaluate learning progress and outcomes.

Tips

- Quizzes should be fun and entertaining - you can **include graphics or videos** for a more graphic appeal
- **Include timed answering** to increase the sense of game
- **Keep things simple and don't ask too many questions**: a 2-3 minute quiz including 6-10 questions is good to go
- Make mini-quizzes a routine to **measure retention in real-time and identify gaps** in knowledge. That way, learners can recognize if they have not retained what they've just learned. For example, **use quizzes at the beginning of the class to recap** the previous lessons' contents
- Tie your quizzes to the real world: **use real-case scenarios** to involve learners in solving real-life problems

Testimonial #1

Creating an engaging class atmosphere

The purpose of this activity is to break the ice, create a class atmosphere and create teacher/student points of contact. Another objective is to see if the lecture's concepts are being grasped.

The teacher has some predefined questions to check if the class is monotonous, challenging, or interesting. Depending on the answers, the teacher changes the lesson plan - uses a video, tells a story, asks questions, divides the class into small groups and creates discussion, etc. The results are word clouds, and bar graphs, which allow a discussion phase after the presentation of the results.

Gamification

What is it and why should we use it?

Gamification is a learning strategy that includes the process of game-thinking and game mechanics to engage users and solve problems (Zichermann and Cunningham, 2011). Gamification in education incorporates game design elements but in an educational context. This means that it is not about using games as such, but rather taking some of their principles and mechanics, such as points or incentives, narrative, immediate feedback, recognition, the freedom to make mistakes, etc., in order to enrich learning (Deterding et al., 2011; Kim, 2015).

Gamification functions as a motivational didactic strategy in the teaching-learning process, fomenting specific behaviours in students within an appealing environment that generates commitment to the activity, and helps produce positive experiences, therefore achieving meaningful learning.

Tips

To implement a Gamification strategy, the following elements should be considered: goals and objectives; rules; storyline; freedom to choose between different possibilities; freedoom to make mistakes; rewards; feedback; visible status; cooperation and competition; time restriction; progress and surprise elements.

These should have a correspondent game element, as suggested in the following table (adapted from the EduTrends on Gamification from the Observatory of Educational Innovation Tecnológico de Monterrey, 2016):

Game Elements

Goals & Objectives	Generate motivation by setting a challenge or an issue for the player to resolve. These help students understand the purpose of the activity and guide their efforts. This is useful to demonstrate the capacity to apply knowledge and perform specific tasks.	**Challenges, missions, epic quests**
Rules	Designed specifically to limit the players' actions and keep the game manageable. They are simple, clear, and very often intuitive.	**Game restrictions, how to win/loose points, maintain lives, complete a mission or achieve an objective**
Storyline	Places participants in a realistic context in which actions and tasks can be practised. They are inspired to identify with a character, situation or cause.	**Narratives, plots, characters, avatars, 3D scenarios.**
Freedom to choose	Offers players different possibilities for exploring and advancing in the game, as well as different ways of attaining goals. Fosters the demonstration of skills such as decision making, problem solving and creativity.	**Different routes or squares to reach the end, options for using powers or resources.**
Freedom to make mistakes	Goods received in the game to get closer to its objective; make it possible to access a new area, acquire new skills or enjoy better resources. They foster competition and a feeling of achievement.	**Multiple lives, restore or restart points, endless possibilities.**
Rewards	Generate motivation by setting a challenge or an issue for the player to resolve. These help students understand the purpose of the activity and guide their efforts. This is useful to demonstrate the capacity to apply knowledge and perform specific tasks.	**Virtual coins or resources, badges, lives, equipment, access items, limited powers.**

Game Elements (cont.)

Feedback	Tracks users' progress based on their behaviour. It is usually immediate, indicating whether the player is acting correctly or how far he/she has progressed toward the goal. It is sometimes provided at the end of an episode to show statistics or an analysis of the player's performance.	**Visual clues, right or wrong , behaviour signs, progress bars, warnings, player performance statistics.**
Visible status	Allows all the participants to view their own and the other players' progress, what they have completed or what remains to be completed. This can build reputation, credibility and recognition. Helpful to demonstrate the acquisition of skills and knowledge mastery.	**Levels, points, achievements, results obtained, leaderboard.**
Cooperation & Competition	Encourages students to become allies to achieve a common goal, and to confront other participants to reach the goal before or better than them. This dynamic generates greater participant motivation since it challenges them to do better than their opponents. Promotes collaborative work, problem solving, leadership and decision making.	**Teams, guilds, social interaction, communication channels, transactions, battles, combats, leaderboard.**
Time restriction	Creates an extra sense of pressure that can help to consolidate players' efforts to solve a task within a specific period of time. Useful for assessing process efficiency, resource optimisation, decision making and problem-solving.	**Countdown, time bonus.**
Progress	Based on scaffolding, i.e. it guides and supports students by organising levels or categories, in order to track progress. It enables players, as they progress in the game, to develop increasingly complex or difficult skills.	**Tutorials for developing initial skills, experience points, levels, progress bars and access to blocked content.**
Surprise	Including unexpected elements in the game can help to motivate players and keep them engaged in the game.	**Random rewards, Easter eggs (hidden features), special events.**

MOOCs

What is it and why should we use it?

Massive open online courses (MOOC) are courses that may be taken at little or no cost by an unlimited number of people. The courses consist of a series of online lessons that may include full lectures, lecture clips, screencasts, slides, videos, discussion forums, and quizzes (Felder, 2016)

MOOCs are online courses designed for large numbers of participants, can be accessed by anyone anywhere as long as they have an Internet connection, are open to everyone withoutentry qualifications and offer a full/complete course experience online for free (adapted from Mulder & Jansen, 2015)

Tips

- **Clearly define what content** you want to include in your course
- **Determine the way you like to use the online materials:** it is important to think the integration model through carefully, as it determines which kind of materials you need and how to align them with the classroom activities
- If you are going to develop the MOOC yourself, **ensure the MOOC provider you choose is aligned** with your course requirements and educational vision
- **Determine if the MOOC contains the desired teaching modes** by simply enrolling in the course as a student to find out what options are available
- **Make sure you align the goals, the teaching activities, and the assessments:** the challenge is to develop an integral concept in which the students will show to have mastered the learning goals
- **Provide clear instructions to students on how to enroll into the MOOC:** teaching guides, announcements, and institutional emails, will usually suffice, but it is important to get the specifics correct
- **Provide clear instructions to students on how to utilize the MOOC and its resources:** clearly communicate the rationale for including this content, how you intend to use the resources, and what you expect the students to achieve
- **Measure the success of the MOOC integration**

Testimonial #1

Online course in Experimental Physics - feX

feX is a MOOC serving as an introduction to experimental physics and is taught as part of the IST curricular unit LIFE. This course includes the usage of e-labs (remote laboratories). It comprises the (i) fundamentals in experimental physics, (ii) a hands-on experiment, (iii) peer-review encasement by the trainees (iv), and usage of the World Pendulum Alliance infrastructure.

The MOOC is conducted in the open edX platform with IST students auto-included in a proper cohort, but following the same syllabus as external participants. The activity's monitoring is done mostly in forums. The first part is assessed with small tests (some being multiple choice).

The hands-on experiment uses a peer-review process considering the report done by the trainee, and the world pendulum experiment is executed through a step-by-step questionnaire based on an inquiry approach.

Teaching & Learning in online context: Summary of Good Practices

Open Exam

The exam questions are published at the beginning of the course. The final exam has 2 of the 10 questions plus 1 question from a broader topic area. The exam is open book (3hr), reducing the barrier of doing the exam, and encouraging students to engage with the course topics from the very beginning.

Group Size: 50-100

Time Frame: 3 hours

Facilitation Level: Intermediate

Contributes to: Evaluate, Analyze, Understand, Remember, & Activate

Resources: Computer/Tablet, Apps/Online Platform

Individual Work

Mode: Online & Offline

Aim: The aim of this activity is to have the exam as a learning event

Note: The only minor challenge is to set the grading scale to allow for personalized approaches to answer essay questions. The teacher must provide clear grading guidelines.

Credit: Laura Kitinoja, Aalto University

Practical Group Exercises

At the beginning of the class students are divided into teams and a list of exercises is distributed to the groups. Each group will solve one in breakout rooms. The teacher will go around along the groups (tutoring still). If one group has one student that easily solved it, that student will tutor the rest. At the end, one student per group will write the resolution in the whiteboard in zoom. While this happens, the teacher continues, always, to go around (tutoring style).

Group Size: 20-50

Time Frame: <60 minutes

Facilitation Level: Intermediate

Contributes to: Apply, Understand, Remember, & Activate

Resources: Zoom

Teamwork: Yes

Mode: Online & Offline

Aim: To increase the number of exercises made in class, increase the capacity to work in group, use the collaboration of good students, increase the proximity (tutoring)

Note: The teacher must not be apart from the work. They have to go around all the time and interact with the groups according to their ability to solve the exercise.

Credit: Joana Amaral Paulo, University of Lisbon.

Online Group Discussion

The educator creates a Padlet or Flinga platform in advance, and instructs students on an assigned team discussion (e.g. “think together about what makes the text scientific”). The educator explains how much time is available for the group discussion and what the whole group will do with the output. The teams choose a scribbler who records the ideas that have risen in the group into the platform. The teacher can monitor student comments that appear on online, for example by grouping them. Finally, the task is dismantled by looking together at what kind of thoughts arose and how they are related. The discussion will be available for viewing later, so the output will not go away.

Group Size: 50-100 students

Time Frame: 5-30 minutes

Facilitation Level: Intermediate

Contributes to: Understand, Remember & Activate

Resources: Smartphone/Computer/Tablet/Apps/ Online Platform e.g. Padlet, Flinga

Individual and Team Work

Mode: Online

Aim: Gathering thoughts/information as a part of lesson using Padlet or Flinga platforms**.**

Note: The teacher must ensure that its link can be easily shared in the middle of a lecture or lesson.

Playable Concepts

Tiny, educational games that can be embedded within written text, just like videos or images. The games can be modified to suit one's needs. These embeddable mini-games can be used for teaching and meaning-making.

Group Size: Unlimited

Time Frame: <60 minutes

Facilitation Level: High

Contributes to: Analyze, Apply, Understand, Remember & Activate

Resources: https://playableconcepts.aalto.fi/

Individual Work

Mode: Online

Credits: Anna Kaisa Kultimaa, Christina Lassheikki, Solip Park and Tomi Kauppinen. Designing Games as Playable Concepts: Five Design Values for Tiny Embedded Educational Games. In Proceedings of DiGRA 2020 conference, the Digital Games Research Association, Tampere, Finland, June 2020.

Hackathon

A hackathon is an event in which a large number of people meet to engage in collaborative computer programming to complete one or several programming challenges. Usually, the task is to develop an application, software, code, prototype, etc. Teams might be located in different countries, timezones, etc. The activity is suitable for students in Bachelor's and Master's programmes.

Group Size: 20-100

Time Frame: 48 hours

Facilitation Level: Beginner

Contributes to: Create

Resources: Computer/tablet/apps/online platforms such as Zoom/Teams Discord, GitHub, Google Suite, IDE of choice

Teamwork: Yes

Mode: Online & Offline

Aim: To collaborate with other programmers to improve development skills in a fun, educational challenge.

(cont.)

Hackathon (cont.)

Instructions for teams:

Encourage teams to:

1. Establish roles within the team based on skills (technical skills, project management, etc.)
2. Establish a mode of online communication (What channels? What platforms? How often to communicate?)
3. Divide tasks and create a timeline for completion
4. Submit

As teams working remotely might be on different schedules, it is important for them to divide tasks efficiently, and to remain in communication. Failing to plan is planning to fail.

Credit: Brianna Swan – Erasmus Mundus Joint Master Degree student in Green Networking and Cloud Computing – GENIAL. https://amplifier.w.uib.no/2022/10/26/digital-and-tangible-connections/

“Culture Clash” on Virtual Mobilities

Students from different countries could hold culture clash events, for example, virtual cooking events where students show how to prepare some foods from their country. People could follow the instructions at home.

Group Size: 20-50 students

Time Frame: 1.5 hours

Facilitation Level: Intermediate

Contributes to: Activate

Resources: Zoom, Teams

Individual Work and Teamwork

Mode: Online

Virtual Social Activities

The facilitator arranges for social gatherings online before the course begins so students can meet each other. In an intercultural setting, students can share something about their country, such as a tradition, or music. Ice breakers can also be done in breakout rooms, or a Padlet can be used for students to introduce themselves. The Mentimeter can be used for polls or pub quizzes.

Group Size: Unlimited

Time Frame: 30-60 minutes

Facilitation Level: Intermediate

Contributes to: Activate

Teamwork

Mode: Online

Aim: To activate and promote interaction between the students.

Credits: A challenging transformation: from face-to-face courses to a digital distance learning – AMPLIFIER Platform (uib.no)

Digital Thematic Networks

Creating collaboration networks revolving around a theme creates the framework to share knowledge and resources around a specific topic. This can take the form of online videos, data, papers, synchronous lessons, access to researchers, etc.

Group Size: unlimited

Time Frame: Duration distributed along the semester

Facilitation Level: High

Contributes to: Apply, Understand, Remember & Activate Individual and Teamwork

Mode: Online

Aim: The aim is to create added value for students focusing on a specialized topic.

Credit: Mario Gaitan, Project Officer and PhD student at Ghent University, OceanTraining.eu: a toolbox for digital ocean education – AMPLIFIER Platform (uib.no)

Gamified Virtual Reality Exercises

Utilizing virtual reality to teach different skills. Virtual reality can be utilized for teaching different skills before trying them in real life.

COVE – Conceptual Orienteering in Virtual Education teaches students rock fracture mapping by utilizing standalone VR-headsets and photogrammetry. It also gives students instant feedback about their performance.

Group Size: 0-20

Time Frame: <60 minutes

Facilitation Level: High

Contributes to: Apply, Understand & Activate

Resources: https://www.youtube.com/watch?v=Zd6WNybU8ZQ

Individual Work

Mode: Online

Credit: Lauri Uotinen, Mateusz Janiszewski, Xiaoyun Zhang, Jussi Leveinen, Mikael Rinne https://onlinelearning.aalto.fi/aol/pilot/cove-conceptual-orienteering-in-virtual-education

“I like I wish”

Innovative projects call for individual and collective creativity. This requires an atmosphere where team members feel safe to share their ideas, thoughts and doubts. Open communication is crucial in interdisciplinary teams, where differing and competing viewpoints are at the same time essential and yet can spark conflict. Team members should have the ability to provide feedback to each other. Without feedback people might not know whether they are doing things right or doing the right things. The risk is that the team’s behaviour starts to build on assumptions. If assumptions are never spoken aloud, efforts may be focused and energy spent on things that never existed in the first place. I like I wish is a facilitated team feedback activity where team members of a team engaged in a creative project get to provide and receive both positive and constructive feedback in written as well as in spoken format. Sessions are processed in a safe and systematic way. Follow the detailed instructions for running a session in ilikeiwish.org.

Group Size: 4-10

Time Frame: 3 hours

Facilitation Level: Intermediate

Contributes to: Activate

Resources: ilikeiwish.org

Individual Work and Teamwork

Mode: Online & Offline

Credits: The I like I wish feedback format was developed by Satu Rekonen through dozens of sessions organized since 2011 on several different interdisciplinary courses taking place mainly in Aalto Design Factory.

Multi-step exercises on a video

After a topic is covered, the teacher uploads a video in which more difficult exercises are solved. That way it's easy for students to go back and watch parts of the solving procedure to understand it better and be able to solve the exercises by following the video and pausing it when needed.

Group Size: Unlimited

Time Frame: <60 minutes

Facilitation Level: Beginner

Contributes to: Understand & Remember

Resources: YouTube, Loom, Panopto

Individual Work and Teamwork

Mode: Online

Note: The video needs to be of high enough quality both technologically as well as pedagogically. A short and up to the point video is better than a longer one with more unnecessary content.

Credit: Joana Amaral Paulo, University of Lisbon, Joona Huikuri, Aalto University

SCRUM for thesis supervision

SCRUM methods can be used for master's thesis management to increase the number of completed master's theses. The success rate of a master program on Information Systems and Computer Engineering (MEIC) in a Portuguese university is very unsatisfactory, showing that less than half of the students complete the assigned work in their first term. However, the success rate of a group of students that were supervised based on the Scrum framework was much higher. So, in this study we assess the current situation and identify the benefits of using Scrum to manage master's theses. Evidence suggests that this approach increases the number of students successfully completing their projects. So, this paper discusses the issues at stake and reports on a qualitative study with focus on the actual practices and benefits reported by students in the master program. We found that some methods in the Scrum framework can address existing problems in the development of theses with very positive results..

Facilitation Level: Intermediate

Resources: https://doi.org/10.1007/s10639-021-10433-2

Individual Work

Mode: Online & Offline

Credits: Tomás, G., Mira da Silva, M. & Bidarra, J. Supervision of master theses based on Scrum: A case study. Educ Inf Technol 26, 3721–3741 (2021). https://doi.org/10.1007/s10639-021-10433-2

Shared Cloud Folder and Website

Shared cloud folder and website to exchange course materials in a structured manner..

Facilitation Level: Intermediate

Contributes to: Create, Evaluate, Understand & Remember

Individual Work and Teamwork

Implementation: In courses were there is the need to share different types of contents with students (not only texts), the creation of a shared drive and an associated website with contents are well organized and presented can help significantly to increase the students productivity. It can be also used to share with the class the works developed by different student groups. This can thus be turned to a interactive website that can grow with the contributions of the students.

The preparation involves the setup of a shared folder. I have been using google drive. Some folders of the parts of the drive are restricted to visualization of the contents. Other folders can be used for students to upload their works and share with the classmates.

A google site is then developed to organize the contents to be shared with students. This website link to the shared drive and to other many other relevant contents that may be available on the internet (PDFs, other websites, videos, etc). The advantage is that we are presenting the contents in a much more organized way, and this helps students to develop their work faster, in project-based learning works that the students need to develop over the period. In the end, the students upload their works to the shared folders and become part of the website to be seen by other classmates.

(cont.)

Shared Cloud Folder and Website (cont.)

This content is then presented and discussed in presentation sessions and is part of the student's assessment. This material is also to be used by everyone to study other subjects that were not part of their project but that may be asked in the final exam.

As in other project-based learning, the students are not so comfortable when they are developing this type of work. They are very focused on the grade, and it is good to do some tutorial sessions with students to give some guidance on the work they are doing and decrease also their anxiety. They report that this approach is much more effective to make them think on the challenges of developing new processes.

Challenges

- Initial difficulties from the students to use the platform and giving access to it. The access is limited only to students that are participating in the course.
- You need to have access and know how to manage google drives and google websites.
- The same challenges as in other project-based learning (this depends on the actual area and scope of the projects). I have been using this strategy in the Chemical Process and there are some specific challenges to this implementation.
- Students should be directed to search also beyond the contents provided on the website. This should be clearly communicated to the students.

Credit: Moisés Pinto, University of Lisbon

Course discussion forums

The educator can set up separate channels for different topical areas, for example for exercises on a given week. Students can access the forum, present their questions, search answers for other similar questions, and get answers/hints either from their peer students, teaching assistants, or their professor. Many Learning Management systems have the functionality for discussion forums, but there are also separate services such as Zulip or Piazza.

Group Size: Unlimited

Time Frame: 5-30

Facilitation Level: Beginner

Contributes to: Understand & Activate

Resources: LMS, Zulip, Piazza or Slack

Individual Work and Teamwork

Mode: Online

Aim: To allow students to ask questions either with their name or anonymously about course exercises and get answers and hints from course assistants / teachers.

Note: Teacher or local IT support needs to set up the service and prepare instructions for students.

Credit: Sofia Sevon, Aalto University

Local customs and manners

Online collaboration and group discussion about local customs based on reading material. Collaboration & group discussion for theoretical material. Students are divided into four groups, and each group reads part of a long article about local customs before class. The students add one comment about the text in the discussion forum before the lesson. Online, students are divided into mixed breakout groups to share the information.

Group Size: 100

Time Frame: 60-120 minutes

Facilitation Level: Beginner

Contributes to: Activate

Resources: Computer/Tablet/zoom/Flinga/LMS

Individual Work and Teamwork

Mode: Online

Aim: The aim is for new students to familiarize themselves with the local culture.

Notes: The challenge is to get everyone to read their share of the article. If the student has not read his/her share, he or she cannot contribute in the group. The teacher needs to explain the task precisely so that the students come to class prepared. The teacher can also make sure in advance that everyone has read by asking students to write one comment about the text on a discussion forum.

Credit: Aija Elg, Aalto University

Short video recording

Using a self video recording platform like Zoom, Loom or Teams, the teacher can record a short video in advance for explaining a concept or a process (no more than 5 minutes). The video can then be uploaded into an LMS, a private YouTube channel, or Panopto.

Group Size: unlimited

Time Frame: 5-30 minutes

Facilitation Level: Intermediate

Contributes to: Understand

Resources needed: Computer/camera/teleprompter/recording platforms/video platforms

Individual Work

Mode: Online

Recommendations: Use live lectures for discussion-based teaching, and use pre-recorded for theoretical material

More details

https://youtu.be/zCSQWocXM-g

Read how video recordings have been used distance learning programmes A Crisis Can Fuel Innovation – AMPLIFIER Platform (uib.no)

Credits: Brame 2016; Tavaila 2022; Guseva 2021

Online group discussion

The teacher creates a Padlet or Flinga platform in advance and instructs students on an assigned team discussion (e.g., “think together about what makes the text scientific”). The teams choose a scribbler who records the ideas that have risen in the group into the platform. Once the platform is created, the teacher explains how much time is available for the group discussion and what the whole group will do with the output. The teacher can monitor student comments that appear online, for example by grouping them. Finally, the task is dismantled by looking together at what kind of thoughts arose and how they are related. The discussion will be available for viewing later, so the output will not go away.

Group Size: 50-100 students

Time Frame: 5-30 minutes

Facilitation Level: Intermediate

Contributes to: Understand & Remember & Activate

Resources: Smartphone/Computer/Tablet/Apps/ Online Platform e.g. Padlet, Flinga

Individual Work and Teamwork

Mode: Online

Aim: Gathering thoughts/information as a part of lesson using Padlet or Flinga platforms.

Note: The teacher must ensure that its link can be easily shared in the middle of a lecture or lesson

Flipped Classroom

Students are given the material in advance, and they produce an outcome to share with their peers.

Group Size: 50-100 students

Time Frame: Varies

Facilitation Level: Intermediate

Contributes to: Create, Evaluate, Analyze, Apply, Understand, Remember & Activate

Resources: Computer / Tablet, Apps / Online Platforms, YouTube, Kahoot, Pingo

Individual Work and Teamwork

Mode: Online & Offline

Implementation: This setting allows for three types of online activities:

1. Create slides and video with theoretical content and challenges. After viewing the video the student has 1 week to respond to the challenge and submit it on the platform. In the following synchronous class, there is group discussion about the topic. Feedback is given in the classroom. We give the opportunity to re-submit a new version of the work.

(cont.)

Flipped Classroom (cont.)

2. The educator writes instructions for the homework to be completed before class. This homework typically includes watching 2-3 videos (10 minutes each) and answering/thinking about related questions. It might also include other material such as news or scientific papers. In class, the topics and questions are discussed with the students, and the more difficult concepts are explained. At the end of the theoretical class, everyone plays a 5 minute Kahoot.

Send the material in advance and create quizzes in Pingo

Aim: The aims of flipped classrooms are to maintain the motivation of students in theoretical classes, to monitor the students' learning process, to identify problems and misconceptions, and to allow them to learn at their own pace.

Note: If making a video, it needs to be designed very well and the synchronous activity needs to be interactive. The feedback process needs to be carefully designed. For the lecturer, challenges include time management, fostering a good learning environment, maintain student motivation, and supporting the learning process without merely giving the solution.

Credits: Joana Marto and Tânia Sousa, University of Lisbon ; Joachim Enders, TUDarmstadt

Additional Resources: Read how the flipped classroom method has been used in a blended joint programme, Digital Communication Leadership: A Student's Experience – AMPLIFIER Platform (uib.no)

Appreciation Circle

The day before an important deadline/presentation, do an “appreciation circle” where everyone takes turns appreciating their classmates. Some examples can be the things that they liked while working with them, or things they learned from them. It can also be, what’s something they’re proud of about their team, or sharing how a problem was resolved. The appreciation can also be to other members of the class.

Group Size: Unlimited

Time Frame: 5-30 minutes

Facilitation Level: Beginner

Contributes to: Activate

Resources: Computer/tablet

Individual Work and Teamwork

Mode: Online & Offline

Aim: Energize the class and finish the course in good spirits**.**

Credit: Seeds for change in 350.org

Touch Blue

In this icebreaker, the teacher calls out, for example: “Touch something blue!” Each student then goes to touch something with that colour. The teacher continues with different descriptions of colours or textures. Things can get more complex with specific instructions, for example, to touch something soft with the foot.

Group Size: Unlimited

Time Frame: 5-30 minutes

Facilitation Level: Beginner

Contributes to: Activate

Resources: Computer/Tablet

Individual Work

Mode: Online & Offline

Aim: Get people to move

Credit: Sarah Gough, Play for Peace (playforpeace.org) in 350.org

Further resources: If you are looking for more ideas for ice breakers, check out this post How to improve students engagement in virtual settings: PETaL experience – AMPLIFIER Platform (uib.no)

Breakout Pitches

Students prepare short pitches with their group, all team members are assigned to different rooms and pitch their solution. This is followed by Q&A in each breakout room (all team members pitch).

Group Size: 20-50 students

Time Frame: 120-240 min

Facilitation Level: Intermediate

Contributes to: Create, Apply, Understand, Remember & Activate

Resources: Computer/Tablet

Teamwork

Mode: Online & Offline

Aim: This is an activity for student presentations / pitches in an online setting, in a challenge-based course (although it could be used for other types of courses as well). In my course, students work on company projects as a team. In this pitch, each team member gets to present to a small audience of other students, answer questions related to the presented project solution and get feedback from their peers.

Consider: Time management with the students can be a challenge. The teacher should emphasise the need to stick to the allocated time so that everyone has a chance to give their pitch. The students should also be given clear instructions for the activity beforehand so they can prepare adequately. Peer evaluation needs to be made simple and clear.

Credit: Laura Kitinoja, Aalto University

Focus SOS Mentimeter

Ask topic questions in a collaborative platform to evaluate the class mood. Use the activity to break the ice, create class atmosphere and teacher/student points of contact, and to see if the concepts are being grasped.

Group Size: 20-50 students

Time Frame: 5-30 minute

Facilitation Level: Beginner

Contributes to: Activate

Resources: Smartphone/Computer/Tablet/ Projector, Mentimeter

Individual Work and Teamwork

Mode: Online

Aim: Check that the lesson purpose is being achieved and concepts are being understood. Create “moments” in which the whole group is involved.

Notes

- Answers are anonymous. The biggest challenge is to get everyone to participate.
- Put the questions/challenges in a few words, without making the sentences/requests too “childish”.
- The free version of the app has limitations on the number of words and options.

Credit: Paula Soares, University of Lisboa

Free Component

Students deliver content on a topic of choice; on any format they choose.

Group Size: More than 100 students

Time Frame: Duration distributed along the semester

Facilitation Level: Intermediate

Contributes to: Create, Evaluate, Analyze, Apply, Understand, Remember & Activate

Individual Work and Teamwork

Mode: Online

Aim: The aim of the activity is to stimulate out-of-the-box thinking in the context of academic work. This activity can be combined with other standard academic practices such as student evaluation.

Note: A significant percentage of students tend to be suspicious about what is to be gained with this kind of activity. This often leads students to present works aiming at causing discomfort to teachers. Once duly assessed and graded, such works tend to be very effective in demonstrating the objectives of the activity. Often students want a detailed report on their grades. This must be provided with as much detail as possible. In addition, illustrating how the strong and weak points of the work can affect the academic performance is appreciated by the students.

Credit: João Silva Sequeira, University of Lisbon

Peer Assessment

Students give feedback to their peers in an individual or team basis.

Group Size: Unlimited

Time Frame: 30-60 minutes

Facilitation Level: Intermediate

Contributes to: Evaluate, Analyze, Apply, Understand, Remember & Activate

Resources: Computer/Tablet

Individual Work and Teamwork

Mode: Online & Offline

Implementation

1. The students perform final team presentations to the class (usually 4 students/team). After the presentation, another group (chosen by the teacher) asks questions to the presenting team.
2. Students individually read each other's group projects and provide structured feedback in an online discussion forum. Students also react to the feedback comments that their own group projects received. This will prompt a discussion about the project.

Aim: The aim is to have contact with other student projects, and enhance feedback opportunities.

Note: The challenge with this activity is keeping with a rigid timeline, supporting quality feedback, and manage expectations.

Credit: Luís Tinoca, University of Lisbon

Group Formation

This practice helps create groups according to student interests

Group Size: Unlimited

Time Frame: 5-30 minutes

Facilitation Level: Beginner

Contributes to: Understand & Remember & Activate

Resources: Computer/Tablet

Individual Work and Teamwork

Mode: Online & Offline

Implementation

1. Explain the project details, objectives and what is expected for students to do
2. Provide ideas for students to develop in their project are brainstormed
3. Students should identify the themes they would like to develop in the project, write in a paper and give to the teacher
4. The teacher organizes the students by theme and creates the groups
5. Students make the first meeting of the group to define the title/theme of the project (it can be adapted for the students strengths if the objective is to create multidisciplinary groups)

(cont.)

Group Formation (cont.)

Aim: The aim is to create work groupss by topic preference. This method allows students to interact with those with the same motivation and with whom they normally would not, getting them out of their comfort zone.

Note: Students may try to be in the same group has their friends, and write the same topics/themes.

Credit: Beatriz Silva, University of Lisbon

Video Analysis

The video is shown to the students before, or at the beginning of the class. It is interrupted frequently to highlight aspects and details. A discussion follows. Three or four quizzes are given to help understand how students are progressing in their understanding of the subject.

Group Size: Unlimited

Time Frame: 30-60 minutes

Facilitation Level: Beginner

Contributes to: Analyze & Understand & Remember

Resources: Computer/Tablet/YouTube/loom

Individual Work and Teamwork

Mode: Online & Offline

Aim: The aim is to provide additional material

Notes: Choose a good video. Today's students are quite demanding and critical due to social media impact. A short, up to the point, and "empathic film " is necessary.

Credit: Joana Amaral Paulo, University of Lisbon

Student-led questionnaire

Students create questions and answers. Educators validate them and make them available throughout the course.

Group Size: Unlimited

Time Frame: 120-240 minutes

Facilitation Level: High

Contributes to: Create, Evaluate, Analyze, Understand, Remember & Activate

Resources: Computer/Tablet, LMS or online platform like Piazza, Slack or Zulip.

Individual Work

Mode: Online & Offline

Implementation:

1. Students receive concrete orientation and examples and create questions (quizzes) about topics from the course syllabus previously assigned to them (also including a detailed explanation for the correct and incorrect answers).
2. Teachers validate the quizzes and the explanations.
3. The teacher publishes the validated quizzes online for the whole class during the course, allowing immediate feedback on quizzes, which students must complete during the course. These quizzes, although mandatory, just inform the student on their quiz score and allow consulting the explanations. They do not enter the students' final grade.

(cont.)

Student-led questionnaire (cont.)

Aim: Several pedagogic systems have proposed the advantages of strengthening the collaboration of students and teacher in the learning process (e.g., flipped classroom strategy). While the value of specific feedback during the learning process (the course duration) is unquestionable, the limited time, number of students and the complexity of most subjects are obstacles for making the most of this crucial learning resource. This system aims to:

- Provide automatic, specific and personalized feedback to students during the course. Students will access a significant pool of questions, test their knowledge, access the justifications and, if needed, further engage on forum conversations.
- Provide information for students to organize their study – which topics require further studies, or how the student is progressing in comparison with their peers. This will promote studying throughout the course, and not only near the examination's dates, or only to focus on the topics needed for assignments.

Notes: The educator must allocate time to provide explanations, guidance, and answer questions. A LMS is recommended to handle the data.

Credit: Paulo Jorge Nicola, University of Lisbon

Teaching & Learning in online context: Summary of Digital Tools

	Assessment	Brainstorming	Classroom management	Code grading	Diagramming/Mind mapping/workflows/ taking notes	Discussion Forums	Feedback & Polls	File storage	Gamification	MOOCs	Productivity management	Quizzes/ Surveys/Q&A	Teamwork & Collaboration	Video-conference	Virtual Reality
3D Vista[1]	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓
A+ LMS	✓	✗	✓	✓	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	✗
AnswerGarden	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗
ChimeraX[2]	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓
Cisco Webex	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗
Classcraft	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗
CodeGrade	✓	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
CodeWorkout	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗
Edmodo	✗	✗	✓	✗	✗	✓	✓	✓	✗	✗	✗	✗	✓	✗	✗
edX	✓	✗	✓	✗	✗	✓	✓	✗	✗	✗	✓	✗	✓	✗	✗
eLabFTW	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗
Etherpad	✗	✗	✗	✗	✓	✗	✗	✓	✗	✗	✓	✗	✓	✗	✗

	Assessment	Brainstorming	Classroom management	Code grading	Diagramming/Mind mapping/workflows/ taking notes	Discussion Forums	Feedback & Polls	File storage	Gamification	MOOCs	Productivity management	Quizzes/ Surveys/Q&A	Teamwork & Collaboration	Videoconference/ Screen Recording	Virtual Reality
Flinga	✓	✓	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✓	✗	✓
Google Classroom	✓	✗	✓	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	✗	✗
Kahoot	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗
Klaxoon	✗	✗	✗	✗	✓	✗	✓	✓	✗	✗	✓	✓	✓	✗	✗
Loom	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗
MathCad[3]	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Mentimeter	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗
Microsoft Teams	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✓	✗
Mindmeister	✗	✓	✗	✗	✓	✗	✓	✗	✗	✗	✗	✗	✓	✗	✗
Miro	✗	✓	✗	✗	✓	✗	✓	✗	✗	✗	✗	✗	✓	✗	✗
Moodle	✓	✗	✓	✗	✗	✓	✗	✓	✗	✗	✗	✓	✓	✗	✗
Notion	✗	✗	✗	✗	✓	✗	✗	✓	✗	✗	✓	✗	✓	✗	✗

	Assessment	Brainstorming	Classroom management	Code grading	Diagramming/Mind mapping/workflows/ taking notes	Discussion Forums	Feedback & Polls	File storage	Gamification	MOOCs	Productivity management	Quizzes/ Surveys/Q&A	Teamwork & Collaboration	Videoconference/ Screen Recording	Virtual Reality
Padlet	✗	✗	✗	✗	✓	✗	✓	✗	✗	✗	✓	✗	✓	✗	✗
Piazza	✓	✗	✓	✗	✗	✓	✓	✓	✗	✗	✗	✗	✓	✗	✗
QGis[4]	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓
Quizlet	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗
Schoology	✓	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗
Slack	✗	✓	✗	✗	✗	✓	✓	✗	✗	✗	✓	✗	✓	✗	✗
Socrative	✓	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗
Stella[5]	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Trello	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗
WebCat	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗		✗	✗
Zoom	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗
Zulip	✗	✓	✗	✗	✗	✓	✓	✗	✗	✗	✓	✗	✓	✗	✗

Digital Tools

Footnotes

[1] 3D Vista: Dedicated software for conducting 3D Imersive Simulations using Virtual Reality

[2] ChimeraX: Dedicated software for molecule visualization and manipulation

[3] MathCad: Dedicated software for producing spreadsheets, engineering calculations, solving equations, making plots and taking electronic engineering notes

[4] QGis: Dedicated software for geographic systems analysis

[5] Stella: Dedicated software for computer-based model building, simulation and analysis

Glossary

A

Active Learning

[CA] Aprenentatge actiu
[FI] Aktiivinen oppiminen
[DE] Aktivierendes Lernen
[IT] Apprendimento attivo
[PT] Aprendizagem activa
[ES] Aprendizaje activo
[SV] Aktivt lärande

A teaching and learning approach that engages students in the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert. It emphasizes higher-order thinking and often involves group work (Freeman et al. 2014).

Artificial Intelligence

[CA] Intelligència artificial
[FI] Tekoäly
[DE] Künstliche Intelligenz
[IT] Intelligenza artificiale
[PT] Inteligência Artificial
[ES] Inteligencia artificial
[SV] Artificiell intelligens

The ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings, such as visual perception, speech recognition, decision-making, and translation between language (Copeland, 2022).

Asynchronous Learning

[CA] Aprenentatge asíncron
[FI] Asynkroninen oppiminen, Eriaikainen oppiminen
[DE] Asynchrones Lernen
[IT] Apprendimento asincrono
[PT] Aprendizagem Assíncrona
[ES] Aprendizaje asíncrono
[SV] Asynkront lärande

Asynchronous learning is a type of online learning that happens at different time and/or place using an online learning platform. Type of learning that does not engage everyone at once, where there is no real-time interaction between people; the resources and study material are shared through online means such as recorded lectures, emails, etc. and there is no constraint of place or time for the students or teachers (Commonwealth of Learning, 2020; Wilson, 2022)

Augmented reality

[CA] Realitat augmentada
[FI] Lisätty todellisuus
[DE] Augmentierte Realität
[IT] Realtà aumentata
[PT] Realidade Virtual
[ES] Realidad aumentada
[SV] Förstärkt verklighet, AR

Type of environment that involves the addition of computer-generated information to a real-world environment with a view to creating a more interactive learning experience enhanced using multiple sensory modalities such as sound, touch, movement or smell (Commonwealth of Learning, 2020).

Automated assessment

[FI] Automoitu arvostelu
[DE] Automatisierte Prüfung/ Auswertung
[IT] Valutazione automatizzata
[PT] Avaliação automatizada
[ES] Evaluación automatizada
[SV] Automatiserad (bedömning) utvärdering

Type of assessment characterized by the ability of evaluating students performance without human intervention using digital tools or softwares. Typically, this software implements an assessment model based on a rubric containing the characteristics to be analyzed (Cutrone & Chang, 2010).

Automatic assessment

[FI] Automaattinen arvostelu
[DE] Automatisierte Prüfung/ Auswertung
[PT] Avaliação automática
[ES] Evaluación automática
[SV] Automatisk (bedömning) utvärdering

see *Automated assessment*

B

Backwards design

[PT] Projecto invertido
[ES] Diseño al revés
[SV] Backwards Design

A course design process that starts with instructors identifying student learning goals and then designing course content and assessments to help students achieve these goals. Rather than starting with exams or set textbooks, backwards design argues that “one starts with the end—the desired results (goals or standards) and then derives the curriculum from the evidence of learning (performances) called for by the standard and the teaching needed to equip students to perform (Wiggins, G. & McTighe, J., 1998)

Big Data

[CA] Dades massives
[FI] Big data, massadata
[DE] Big data, riesige daten-mengen
[IT] Megadati
[PT] Big Data, Macrodados, megadados, grandes dados
[ES] Macrodatos
[SV] Big data

Information asset characterized by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods (the requirements needed to make proper use of such Information) for its transformation into Value -- the transformation of information into insights that may create economic value for companies and society; Extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions (De Mauro, Greco & Grimaldi, 2016); McAfee & Brynjolfsson, 2012).

Blended Learning

[CA] Aprenentatge mixt
[FI] Sulautuva oppiminen
[DE] Blended Learning
[IT] Apprendimento misto
[PT] Aprendizagem Híbrida
[ES] Aprendizaje combinado
[SV] Blandade lärmiljöer

Blended learning is an educational approach that combines both traditional ways of teaching (e.g., inside the classroom) and online ways of teaching, through a series of online educational materials and interactive activities (Commonwealth of Learning, 2020)..

Blockchain

[CA] Cadena de blocs
[FI] Lohkoketju
[DE] Blockchain
[PT] Cadeia de blocos, protocolo de confiança, Blockchain
[ES] Cadena de bloques
[SV] Blockkedja, blockchain

Cumulative list of digital records that are linked together and where each successive entry links to the complete record of what has gone before as verified by transaction data and a time stamp. This makes data in a blockchain resistant to historical modification. In education, blockchain technologies can be used primarily for student records and credentials (Commonwealth of Learning, 2020).

Blog

[CA] Blog
[FI] Blogi
[DE] Blog
[IT] Blog
[PT] Blog
[ES] Blog
[SV] Blogg

Online web page or informational website displaying information in reverse chronological order, with the latest posts appearing first, at the top. It is a platform where a writer or a group of writers share their views on an individual subject. A regularly updated website or web page, typically one run by an individual or small group, that is written in an informal or conversational style (Minaev, 2022).

Bloom's Taxonomy

[FI] Bloomin taksonomia
[DE] Bloom's Taxonomie
[IT] Tassonomia di Bloom
[PT] Taxonomia de Bloom
[ES] Taxonomía de Bloom
[SV] Blooms taxonomi

Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. It is a cognitive framework of learning behaviors organized hierarchically in six categories: remembering, understanding, applying, analyzing, evaluating, creating. Bloom's taxonomy is often used as a helpful tool to create learning objectives that help define and measure the learning experience for both student and instructor (Anderson, 2001).

Brainstorming

[CA] Pluja d'idees
[FI] Aivoriihi, Brainstorming
[Brainstorming]
[DE] Brainstorming
[PT] Chuva de ideias
[ES] Lluvia de ideas
[SV] Brainstorming

Brainstorming is a group discussion to produce ideas or solve problems, allowing participants to establish connections between ideas by analyzing, synthesizing, and evaluating (Gogus, 2013).

C

Chunked Learning

[FI] Ryhmitelty oppiminen
[IT] lezione segmentata
[PT] Aprendizagem Fragmentada
[ES] Aprendizaje fragmentado
[SV] Uppdelat lärande, chunked learning

Active learning strategy characterized by chunking, which is defined as cognitive processing that recodes information into meaningful groups, called chunks, to increase learning efficiency or capacity. Chunks of information are generally composed of familiar or meaningful sets of information that are recalled together (Fountain & Doyle, 2012).

Client Based Learning

[FI] Asiakaslähtöistä oppimista
[PT] Aprendizagem baseada no cliente
[ES] Aprendizaje basado en el cliente
[SV] Klientbaserat lärande

A client-based course emphasizes a pedagogical orientation to gain real-word experience through meeting the “expressed needs” from the outside of the classroom. Within this context, students create impactful work, collaborate with clients, and sense professional culture (Xiaopeng, 2018).

Co-creation

[CA] Cocreació
[FI] Yhteiskehittely, yhteiskehittäminen
[DE] Co-Creation
[IT] Co-creazione
[PT] Co-criação
[ES] Co-creación
[SV] Samskapande, Skapande-tillsammans

Co-creation can be defined as the collaborative development of new value (concepts, solutions, products and services) together with experts and/or stakeholders (such as customers, suppliers etc.). Co-creation is a form of collaborative innovation: ideas are shared and improved together, rather than kept to oneself. It is closely connected to – and mentioned alongside – two other buzz-words: ‘open source’ and ‘mass-customisation’ (Veenhoff, & Pater, 2021).

Co-learning

[FI] Yhteisoppiminen, yhteisöllinen oppiminen
[DE] Kollaboratives Lernen
[IT] apprendimento cooperativo
[PT] Co-aprendizagem
[ES] Co-aprendizaje
[SV] Medlärande, Lärande tillsammans

Co-learning is a manner of group learning that enhances communication skills, cultural awareness, thinking skills and so much more. Working in a group also allows students to provide checks and balances of their work on the spot, rather than finding out later, to make the workflow more efficient (Invention Land Education, 2018).

Co-working

[CA] Cotreball
[FI] Yhdessä työskentely, tiimityö
[DE] Kollaboratives Arbeiten
[IT] Colavoro, lavoro in condivisione
[PT] Trabalho colaborativo
[ES] Trabajo colaborativo
[SV] Co-working, arbete tillsammans

The use of an office or other working environment by people who are self-employed or working for different employers, typically so as to share equipment, ideas, and knowledge (Oxford Language Dictionary, n.d.).

Coaching

[CA] Entrenament
[FI] Valmennus
[DE] Coaching
[IT] Mentoraggio
[PT] Mentoria
[ES] Entrenamiento
[SV] Coaching / träning

ICF defines coaching as partnering with clients in a thought-provoking and creative process that inspires them to maximize their personal and professional potential. The process of coaching often unlocks previously untapped sources of imagination, productivity and leadership. Coaching is a type of developmental interaction that involves the provision of guidance by an expert to a novice who is seeking to acquire specific skills or knowledge. Guidance from a coach or mentor is delivered in goal-directed ways, such as to help the learner complete a task or gain understanding about a specific concept or perspective. Mentoring is generally understood as a relationship-oriented activity that occurs over longer periods of time and includes career- and psychosocial-related support for the learner (International Coaching Federation, n.d.).

Coaching Network

[FI] Valmennusverkosto
[IT] Rete di mentoraggio
[PT] Rede de mentoria
[ES] Red de entrenadores
[SV] Coachande nätverk, träningsnätverk

Organised community with the purpose of supporting those who are engaging in coaching (Centre for Faculty Development - Unity Health Toronto & University of Toronto's Temerty Faculty of Medicine., 2022).

Cognition

[CA] Cognició
[FI] Kognitio
[DE] Kognition
[IT] Cognizione
[PT] Cognição
[ES] Cognición
[SV] Kognition

The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses. Cognition can be charaterized as the function of intelligence that is responsible for acquiring and processing knowledge or information, either generated from an external or internal environment. Cognition can refer to memory, attention, emotion, perception, and other similar processes that involve knowledge and understanding of the world (Seel, 2012; Dhakal & Bobrin, 2022).

Cognitive learning

[CA] Aprenentatge cognitiu
[FI] Kognitiivinen oppiminen
[IT] Apprendimento cognitivo
[PT] Aprendizagem cognitiva
[ES] Aprendizaje cognitivo
[SV] Kognitivt lärande

Cognitive learning is a change in knowledge attributable to experience. This definition has three components: (1) learning involves a change, (2) the change is in the learner's knowledge, and (3) the cause of the change is the learner's experience (Mayer, 2010).

Collaboration

[CA] Col·laboració
[FI] Yhteistyö
[DE] Kollaboration
[IT] Collaborazione
[PT] Colaboração
[ES] Colaboración
[SV] Samarbete

A synergic relationship among participants sharing their knowledge or skills, engaged in a specific context using implicit or explicit interaction rules to achieve one or more valuable and situated outcomes (Seel, 2012).

Collaborative assessment

[IT] Assessment terapeutico
[PT] Avaliação colaborativa
[ES] Evaluación colaborativa
[SV] Samarbetsbedömning

The process that involves students and instructors in providing feedback and evaluating student coursework. Collaborative assessments, in which pairs or small groups of students work together, allow learners to benefit from their peers' knowledge and teacher feedback in the same activity (Diamadis & Polyzos, 2009; Center for Instructional Technology and Training - University of Florida, n.d.)).

Collaborative Learning

[FI] Yhteisöllinen oppiminen
[DE] Kollaboratives Lernen
[IT] Apprendimento collaborativo
[PT] Aprendizagem colaborativa
[ES] Aprendizaje colaborativo
[SV] Kollaborativt lärande

Collaborative learning is a process by which students interact in dyads or small groups of no more than six members with intent to solicit and respect the abilities and contributions of individual members. Typically, authority and responsibility are shared for group actions and outcomes. Interdependence among group members is promoted and engineered. Collaborative learning changes the dynamics of the classroom by requiring discussion among learners. Students are encouraged to question the curriculum and attempt to create personal meaning before the teacher interprets what is important to learn. Opportunities to organize, clarify, elaborate, or practice information are engineered, and listening, disagreeing, and expressing ideas are as important as the "right answers." In classrooms that support this type of ideology, the student is an active participant in learning rather than a passive recipient of education from an expert source (Udvari-Solner, 2012).

Collaborative writing

[FI] Yhteiskirjoittaminen
[DE] Kollaboratives Schreiben
[IT] Scrittura collaborativa
[PT] Escrita colaborativa
[ES]Escritura colaborativa
[SV] Skrivande tillsammans

Collaborative writing involves two or more persons working together to produce a written document (Nordquist, 2019).

Computer literacy

[CA] Alfabetisme digital, literacitat digital
[FI] Tietokoneen käyttötaito
[DE] Digitalkompetenz
[IT] Alfabetizzazione informatica
[PT] Literacia digital
[ES] Alfabetismo digital
[SV] Datorkunnighet

Basic, nontechnical knowledge about computers and how to use them; familiarity and experience with computers, software, and computer systems (Dictionary.com, n.d.).

Continuous assessment

[CA] Avaluació contínua, avaluació continuada
[FI] Jatkuva arviointi
[DE] Kontinuierliches Prüfen
[IT] Valutazione continua
[PT] Avaliação continua
[ES] Evaluación continua
[SV] Kontinuerlig bedömning

Type of assessment that occurs during the classes involving regular observations, rather than only one exam at the end of the semester or curricular unit. Normally it can involve several summative tests, but also other components (daily observations, attitudes, projects, collaborations skills, interactions, etc.). Usually, formative assessment is largely used in the context of continuous assessment. Continuous assessment means assessing aspects of learners' language throughout their course and then producing a final evaluation result from these assessments. It can be compared with a final or summative assessment, which only assesses the learner at the end of the course (Azevedo, 2019).

Critical thinking

[CA] Pensament crític
[FI] Kriittinen ajattelu
[DE] Kritisches Denken
[IT] Pensiero critico
[PT] Pensamento crítico
[ES] Pensamiento crítico
[SV] Kritiskt tänkande

The objective analysis and evaluation of an issue in order to form a judgement. Process of evaluating the accuracy, credibility, and worth of information arguments individual differences in the disposition to think critically have been observed. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness. It also entails the examination of those structures or elements of thought implicit in all reasoning: purpose, problem, or question-at-issue; assumptions; concepts; empirical grounding; reasoning leading to conclusions; implications and consequences; objections from alternative viewpoints; and frame of reference (Seel, 2012; Scriven & Paul, 1987).

D

Deep learning

[CA] Aprenentatge profund
[FI] Syväoppiminen
[DE] Tiefgehendes Lernen, Deep Learning
[IT] Apprendimento approfondi-to
[PT] Aprendizagem profunda
[ES] Aprendizaje profundo
[SV] Djupt lärande

Deep learning is a type of machine learning and artificial intelligence (AI) that imitates the way humans gain certain types of knowledge. Deep learning is an important element of data science, which includes statistics and predictive modeling. It is extremely beneficial to data scientists who are tasked with collecting, analyzing and interpreting large amounts of data; deep learning makes this process faster and easier. At its simplest, deep learning can be thought of as a way to automate predictive analytics. While traditional machine learning algorithms are linear, deep learning algorithms are stacked in a hierarchy of increasing complexity and abstraction. Analogously, in an educational context, deep learning can be described as learning that involves more higher level thinking skills, including the ability to analyze and synthesize information, solve problems, and think outside the box. In the process of Deep Learning, students are able to link information they already know with new principles so that their understandings can be used to problem solve when presented with new tasks. Once learners master Deep Learning, their learning process can be more autonomous as they understand how to reflect on their own learning and to make new connections on their own (IBM Cloud Education, 2021; Nelson-Danley, 2021).

Digital collection

[FI] Digitaalinen kokoelma
[DE] Digitale Sammlung
[PT] Colecção digital
[ES] Colección digital
[SV] Digital samling

A digital collection, also known as a digital library, is any collection of files that has been digitally preserved and is accessible on the internet or through software. A digital library may contain manuscripts, newspapers, books, journals, images, audio, and video (Archival, n.d.).

Digital skill

[FI] Digitaaliset taidot
[DE] Digitalkompetenz
[IT] Competenze digitali
[PT] Competência digitall
[ES] Habilidad digital
[SV] Digital skicklighet, digitala färdigheter

Range of abilities to use digital devices, communication applications, and networks to access and manage information that enable people to create and share digital content, communicate and collaborate, and solve problems for effective and creative self-fulfillment in life, learning, work, and social activities at large (UNESCO, 2018).

Digital Fatigue

[FI] Digitaalinen väsymys, digiähky
[DE] Digital Fatigue, Digitalmüdigkeit
[IT] Fatica digitale
[PT] Fadiga digital
[ES] Fatiga digital
[SV] Digital fatigue

State of exhaustion, tiredeness, anxiety, worry and disengagement that occurs among people that overuse numerous digital tools and apps concurrently and systematically (Wiederhold, 2020).

Digital gap

[CA] Bretxa digital
[FI] Digitaalinen kahtiajako, digitaalinen kuilu
[DE] Digitale Kluft
[IT] Divario digitale
[PT] Lacuna digital
[ES] Brecha digital
[SV] Digital klyfta

Within populations, the gap between those who can access and use information and communication technologies (ICT) effectively, and those who cannot (CEDEFOP, 2008).

Digital learning design

[FI] Digitaalisen oppimisen muotoilu
[DE] Digitales Lern-Design
[IT] Progettazione dell'apprendimento digitale"
[PT] projecto de aprendizagem digital
[ES] Diseño de aprendizaje digital
[SV] Digital inlärningsdesign, utformning av digitalt lärande

Digital learning design is the framework that supports digital learning experiences. It refers to deliberate choices about what, when, where and how to teach digitally. Decisions need to be made about the content, structure, timing, pedagogical strategies, sequence of learning activities, and the type and frequency of assessment in the course, as well as the nature of technology used to support learning (Smart Sparrow, n.d.).

Digital library

[CA] Biblioteca electrònica, biblioteca digital
[FI] Verkkokirjasto
[DE] Digitale Bücherei
[IT] Biblioteca digitale
[PT] Biblioteca digital
[ES] Libreria digital
[SV] Digitalt bibliotek

Internet sites consecrated to the creation and preservation of electronic book collections and holdings of other kinds of materials, without the need for end users to purchase the materials they want to consult and read (Gaona-Garcia et al., 2017).

Digital literacy

[CA] Alfabetisme digital, literacitat digital
[FI] Digitaalinen lukutaito
[DE] Digitalkompetenz
[IT] Alfabetizzazione digitale
[PT] Literacia digital
[ES] Alfabetización digital
[SV] Digitalt kunnande

Digital literacy is characterized by the skills that enable a critical integration, analysis, and evaluation of information to interact with data and digital information and to critically interpret and participate in a digitalized world. The ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes competences that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy (Kienhues & Bromme, 2012; UNESCO, 2018).

Digital platforms

[CA] Plataforma digital
[FI] Digitaaliset alustat
[DE] Digitale Plattformen/Lernplattformen
[IT] Piattaforme digitali
[PT] Plataformas digitais
[ES] Plataformas Digitales
[SV] Digitala plattformar

An integrated set of interactive online services that provides the teachers and learners information, tools, and resources to support and enhance educational delivery and management (Cornali & Cavaletto, 2021).

Digital reading room

[IT]Ssala di lettura digitale
[PT] Sala de Leitura Digital
[ES] Sala de lectura digital
[SV] Digitalt läsrum

An online environment in which digital materials are made freely available, providing research support and guidance. It is a service, not a place, that allows users to find relevant material, examine it, and access (or request) new material based on their search (The National Archives, 2021).

Digital repository

[CA] Repositori digital
[IT] Archivio digitale
[PT] Repositório digital
[ES] Repositorio digital
[SV] Digitalt förråd

A digital repository is an online archive for the storage of digital objects; these can range from digital archives, moving or still image galleries, manuscripts, anything that is in electronic format and needs a place to be stored either in the short or longer term. Its purpose is to store information, digital academic repositories allow researchers, students and academic staff to preserve their documents in an easily manageable cloud-based system. Teaching materials, papers, student projects MSc and PhD thesis, computer softwares and recorded classes are often made available through digital repositories (Luarte, 2006).

Digital Transformation

[CA] Transformació digital
[DE] Digitale Transformation
[IT] Trasformazione digitale
[PT] Transformação digital
[ES] Transformación digital
[SV] Digital transformation

A series of deep and coordinated culture, workforce, and technology shifts that enable new educational and operating models and transform an institution's operations, strategic directions, and value proposition (Grajek & Reinitz, 2019);.

Digitalization

[CA] Digitalització
[FI] Digitalisaatio
[DE] Digitalisierung
[IT] Digitalizzazione
[PT] Digitalização
[ES] Digitalización
[SV] Digitalisering

see also **Digital Transformation**

Digitally signed credentials

[FI] Digitaalisesti allekirjoitetut todistukset
[DE] Digitale Unterschrift
[IT] Credenziali firmate digitalmente
[PT] Credenciais assinadas digitalmente
[ES] Credenciales firmadas digitalmente
[SV] Digitalt signerade inloggningsuppgifter

An electronic document (generally referred to as 'digital certificates') which is issued by awarding bodies to individuals to confirm and provide proof of their learning outcomes (Gaebel et al., 2021).

Discussion Boards

[FI] Keskustelupalsta
[DE] Diskussionsforum
[IT] Forum di discussione
[PT] Fóruns de Discussão
[ES] Foros de discusión
[SV] Diskussionsforum

A discussion board, commonly known as an Internet forum or message board, is a type of website that allows users to communicate with one another. Discussion takes place through the use of posts, which are messages posted by users and displayed in order of the date and time they were entered. Each post is part of a thread, which is usually focused on a specific subject or question. This allows members of the discussion board to have conversations, without having to physically be online at the same time. There are thousands of discussion boards on the Internet, with many catering to specific subjects, although some are general in nature (Paul, 2022).

Discussion Forums

[CA] Grup de discussió, fòrum
[FI] Keskustelufoorumi
[IT] Forum di discussione
[PT] Fóruns de Discussão
[ES] Foros de discusión
[SV] Diskussionsforum

see ***Discussion Boards*** and ***Online Forums***

Discussion Logs

[FI] Keskusteluloki
[IT] Log di discussione
[PT] Registo de Discussão
[ES] Registros de discusión
[SV] Diskussionsloggar

see ***Discussion Boards*** and ***Online Forums***

Discussion Threads

[CA] Fil de discussió
[FI] Keskusteluketju, viestiketju
[DE] Diskussionsthread
[IT] Thread di discussione
[ES] Hilos de discusión
[SV] Diskussionstrådar

see ***Discussion Boards*** and ***Online Forums***

Distance Learning

[CA] Aprenentatge a distància
[FI] Etäoppiminen
[DE] Distanzlernen
[IT] Formazione a distanza
[PT] Educação a distância
[ES] Educación a distancia
[SV] Distansutbildning

Process of teaching and learning characterised by the separation of teacher and learner in time and/or place for most of the educational transaction, mediated by technology for delivery of learning content but with possibility of face-to-face interaction for learner-teacher and learner-learner interaction, and provision of two-way didactic communication. Distance is about the transactional distance and not the physical distance. It is a conceptual construct with two key dimensions: structure and dialogue. Programmes with more structure and less dialogue are considered to have more distance (Commonwealth of Learning, 2015).

E

e-databases

[FI] Sähköinen tietokanta
[DE] Elektronische Datenbanken
[IT] Banca dati elettronica
[PT] Bases de dados electrónica
[ES] Bases de datos electrónica
[SV] e-databas

An e-database, or an electronic database, is a searchable electronic collection of resources. There are two basic types of databases: Indexes or bibliographic databases; Full-text databases. Indexes or bibliographic databases, also known as indexing and abstracting services, provide: Indexing information for topical searching across resources in multiple formats (including multidisciplinary searches); Abstracts (short descriptions) of the contents (eg. articles), to help you decide if it is relevant to your research. Full-text databases provide the same services as above, but also include the full text of articles, allowing you to read it online, or download it for offline reading (Nearn, A., 2022).

e-journals

[IT] Riviste elettroniche
[DE] Elektronische Journale
[PT] Revistas electrónicas
[ES] Revistas electrónicas
[SV] e-tidskrifter

An e-journal, or electronic journal, is a periodical publication which is published in electronic format, usually on the Internet (SOAS: University of London, n.d.).

e-learner

[FI] e-oppija
[DE] e-lerner
[PT] Aluno digital
[ES] Estudiante digital
[SV] e-student

Students who take advantage of learning that is usually Internet-based learning, but could be any electronically enhanced learning; e-learners are technology savvy, motivated, and self-directed (Langer, 2009).

e-learning

[CA] Aprenentatge en línia
[FI] E-oppiminen, verkko-oppiminen
[DE] Elektronisch-gestütztes Lernen
[IT] Apprendimento online
[PT] Aprendizagem digital
[ES] Aprendizaje digital
[SV] e-lärande

A learning system based on formalised teaching but with the help of electronic resources is known as E-learning. While teaching can be based in or out of the classrooms, the use of computers and the Internet forms the major component of E-learning. E-learning can also be termed as a network enabled transfer of skills and knowledge, and the delivery of education is made to a large number of recipients at the same or different times (Commonwealth of Learning, 2020; The Economic Times of India, n.d.).

e-resources

[CA] Recursos electrònics
[FI] E-aineistot
[DE]
[IT] Risorse elettroniche
[PT] Recursos electrónicos
[ES] Recursos electrónicos
[SV] e-resurser

E-resources means materials in a digital format that are accessible electronically. E-resources may be created or acquired for providing library services. Examples include, but are not limited to, e-journals, e-books, electronic database collections, and downloadable audio or video files (Law Insider, n.d.).

Edtech

[CA] Tecnologia educativa
[FI] Oppimis- ja koulutusteknologia
[DE] Bildungstechnologie
[IT] Tecnologie didattiche
[PT] Tecnologia educacional
[ES] Tecnología educacional
[SV] Undervisningsteknik, undervisningsutrustning

Edtech, or Educational Technology, refers to hardware and software designed to enhance teacher-led learning in classrooms and improve students' education outcomes. EdTech facilitates learning and improves performance by creating, using and managing appropriate technological processes and resources. When referred to with its abbreviation, edtech, it is often referring to the industry of companies that create educational technology (Januszewski & Molenda, 2008; Frankenfield, 2022).

Educational games

[CA] Jocs educatius
[FI] Oppimispeli / opetuspel
[DE] Lernspiele i
[IT] Giochi educativi
[PT] Jogos educacionais
[ES] Juegos educacionales
[SV] Pedagogiska spel

Educational games are those intentionally designed for the purpose of education, or those entertainment games that have incidental or educational values. Educational games are designed to help people understand concepts, learn domain knowledge, and develop problem solving skills as they play games (Ge & Ifenthaler, 2017).

Embodied learning

[FI] Kehollinen oppiminen
[PT] Aprendizagem incorporada
[ES] Aprendizaje incorporado
[SV] Förkroppsligat lärande

Embodied learning refers to pedagogical approaches that focus on the non-mental factors involved in learning, and that signal the importance of the body and feelings. In embodied learning, the main idea is that students who consciously use their bodies to learn are more engaged than those who are at a desk or a computer. The brain, while important, is not the only source of behaviour and cognition: situated cognition highlights the need to include the physical, the emotional and the social in the learning environment (Paniagua, & Istance, 2018).

Emergency remote education

[IT] Didattica di emergenza
[PT] Ensino remoto de emergência
[ES] Enseñanza remota de emergencia
[SV] Akut distansundervisning

Temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated. The primary objective in these circumstances is not to re-create a robust educational ecosystem but rather to provide temporary access to instruction and instructional supports in a manner that is quick to set up and is reliably available during an emergency or crisis (Hodges & Fowler, 2021).

Engaged learning

[DE] Aktives Lernen/Aktivierendes Lernen
[IT] Apprendimento impegnato
[PT] Aprendizagem Activa
[ES] Aprendizaje activo
[SV] Engagerat lärande

An active process in which knowledge and understanding are acquired through participation, inquiry, involvement and direct experience. This type of learning promotes the development of a deep, purposeful and reflective learning, through classroom, campus, and community experiences in the pursuit, creation, application and dissemination of knowledge (Lewittes, 2009).

Extended Reality

[CA] Realitat estesa
[DE] Erweiterte Realität
[IT] Realtà estesa
[PT] Realidade extendida
[SV] Utökad verklighet

Term that encompasses augmented reality, virtual reality and mixed reality (Milgram, 1995).

F

Face-to-face learning (F2F)

[CA] Aprenentatge presencial
[FI] Kasvotusten tapahtuva oppiminen
[IT] Apprendimento presenziali
[PT] Aprendizagem presencial
[ES] Aprendizaje presencial
[SV] Face to face learning, lärande ansikte mot ansikte

Instructional method where course content and learning material are taught in person to a group of students. This allows for a live interaction between a learner and an instructor. It is the most traditional type of learning instruction. Learners benefit from a greater level of interaction with their fellow students as well. In face-to-face learning, students are held accountable for their progress at the class's specific meeting date and time. Face-to-face learning ensures a better understanding and recollection of lesson content and gives class members a chance to bond with one another (Top Hat, n.d.).

Flexible Study Pathways

[FI] Joustava oppimisväylä
[DE] Flexible Lernwege
[IT] Percorsi di apprendimento flessibili
[PT] Percursos de Aprendizagem Flexível
[ES] Vía de aprendizaje flexible
[SV] Flexibla inlärningsvägar

Flexible and permeable education systems enable learners to move within and across education, training and employment. Flexibility means that young people can adapt their learning pathway as they go along, to suit their interests and abilities. Entry points and re-entry points at all ages and all educational levels, strengthened links between formal and non-formal structures, and recognition, validation and accreditation of the knowledge, skills and competencies acquired through non-formal and informal education. In the context of higher education, flexible educational pathways are measures to implement flexible regimes for study programmes and to enable the previous educational achievements of students to be more widely recognized within the higher education system. This allows students to transfer more easily between institutions and study programmes as prior achievements can be utilised (WEF, 2015; Martin & Godonoga, 2020).

Flipped Classroom

[CA] Classe inversa
[FI] Flipped classroom, Käänteinen opetus, Käänteinen luokkahuone
[DE] Invertierte Lehre
[IT] classe capovolta
[PT] Sala de Aula Invertida
[ES] Aula invertida
[SV] Flipped Classroom, omvänt klassrum

Form of blended learning that integrates two components: interactive online presentation of information before class and well-implemented active learning in class - for example, problem-solving activities. A flipped classroom is a type of blended learning where students are introduced to content at home and practice working through it at school. This is the reverse of the more common practice of introducing new content at school, then assigning homework and projects to completed by the students independently at home (Means et al. 2010).

Formal learning

[CA] Aprenentatge formal
[FI] Formaali oppiminen, muodollinen oppiminen
[DE] Formelles Lernen
[IT] Apprendimento formale
[PT] Aprendizagem formal
[ES] Aprendizaje formal
[SV] Formellt lärande

Type of learning that takes place as intended within formally constituted educational institutions such as schools, colleges universities, training centres and so on. Typically it follows a prescribed framework whether or not actual attendance at the institution is necessary. Sometimes there are quite specific outcomes. On other occasions there is more of a kind of broad direction or aim. In all cases however those partaking of courses of formal learning have an idea of what they are likely to learn and they accept that that learning will to some extent be under the control of the institution (Hager & Halliday, 2006).

Formative assessment

[CA] Avaluació formativa
[FI] Formatiivinen arvionti, opetuksenaikainen palaute
[DE] Formative Prüfung
[IT] Valutazione formativa
[PT] Avaliação Formativa
[ES] Evaluación formativa
[SV] Formativ bedömning

Formative assessment is the process of providing feedback to students during the learning process. These are often low stakes activities that allow the instructor to check student work and provide feedback. It refers to a wide variety of methods that teachers use to conduct in-process evaluations of student comprehension, learning needs, and academic progress during a lesson, unit, or course. Formative assessments help teachers identify concepts that students are struggling to understand, skills they are having difficulty acquiring, or learning standards they have not yet achieved so that adjustments can be made to lessons, instructional techniques, and academic support. The general goal of formative assessment is to collect detailed information that can be used to improve instruction and student learning while it's happening. What makes an assessment "formative" is not the design of a test, technique, or self-evaluation, per se, but the way it is used—i.e., to inform in-process teaching and learning modifications (Weimer, 2013; Great Schools Partnership, 2014).

G

Game based learning (GBL)

[CA] Aprenentatge basat en jocs
[DE] Spielerisches Lernen
[PT] Aprendizagem baseada em jogos
[ES] Aprendizaje basado en juegos
[SV] Spelbaserat lärande

Type of learning that is facilitated by the use of a game or recurrenring to game-related strategies, such as Competition, Challenge, Exploration, Fantasy, Goals, Interaction, Outcomes, People, Rules, Safety and Progress. It is a learning strategy that includes the process of game-thinking and game mechanics to engage users and solve problems. GBL is a teaching method that uses the power of games to define and support learning outcomes. A GBL environment achieves this through educational games that have elements such as engagement, immediate rewards and healthy competition. All so that while students play, they stay motivated to learn (Whitton, 2012; Zichermann & Cunningham, 2011).

Gamification

[CA] Ludificació
[FI] Pelillistäminen
[DE] Gamification
[IT] Ludicizzazione
[PT] Gamificação
[ES] Ludificación
[SV] Gamification, utformning som spel

Gamification is about taking something that is not a game and applying game mechanics to increase user engagement, happiness and loyalty. It is the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals (Growth Engineering, 2021).

Group dynamics

[CA] Dinàmica de grup
[FI] Ryhmädynamiikka
[DE] Gruppendynamik
[IT] Dinamiche di gruppo
[PT] Dinâmica de Grupo
[ES] Dinámica de grupo
[SV] Gruppdynamik

Interplays of people's social cognitions and behaviors operating within a group or between groups. Group dynamics deals with the attitudes and behavioral patterns of a group. It can be used as a means for problem-solving, teamwork, and to become more innovative and productive as an organization (Kameda et al., 2015).

H

Hands On Learning

[FI] Käytännönläheinen
[IT] Apprendimento empirico
[PT] Aprendizagem prática
[ES] En la práctica
[SV] Praktisk, handgriplig

Hands-on learning is where instructors engage with students in direct experience and focused reflection to enhance students' knowledge, skillset and values. Hands-on learning allows students to learn through experiencing something and can give them an opportunity to immerse themselves in a learning environment, while putting their acquired skills to use and building new skills (Top Hat, n.d.).

Hybrid learning

[CA] Aprenenentatge mixt, aprenentatge bimodal, aprenentatge semipresencial
[FI] Hybridioppiminen
[DE] Hybrides Lernen
[IT] Apprendimento ibrido
[PT] Aprendizagem híbrida
[ES] Aprendizaje híbrido
[SV] Hybridinlärning, hybridlärande

Hybrid learning is an educational model where some students attend class in-person, while others join the class virtually from home. Educators teach remote and in-person students at the same time using tools like video conferencing hardware and software. In some cases, hybrid classes include asynchronous learning elements, like online exercises and pre-recorded video instruction, to support face-to-face classroom sessions. When planned well, hybrid courses combine the best aspects of in-person and online learning while making education more attainable for many students (Boyarsky, 2020).

Informal learning

[CA] Aprenentatge informal
[FI] Informaali oppiminen, arki-oppiminen
[DE] Informelles Lernen
[IT] Apprendimento informale
[PT] Aprendizagem informall
[ES] Aprendizaje informal
[SV] Informellt lärande

Forms of learning that are intentional or deliberate but are not institutionalized. They are less organized and structured than either formal or non-formal education. Informal learning may include learning activities that occur in the family, in the work place, in the local community, and in daily life, on a self-directed, family-directed or socially-directed basis (UNESCO, 2011).

Information literacy

[CA] Alfabetització informacional
[FI] Informaatiolukutatio
[IT] Competenza informativa
[PT] Literacia da informação
[ES] Alfabetización informacional
[SV] Informationskompetens

Set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in learning communities. Information literacy is a set of abilities requiring individuals to 'recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information (Association of College and Research Libraries, 2016).

Inquiry based learning

[CA] Repositori digital
[FI] Kyselyyn pohjautuva oppiminen
[IT] Apprendimento basato sull'indagine
[PT] Aprendizagem baseada na investigação
[ES] Aprendizaje basado en la investigación
[SV] Frågebaserat lärande

Umbrella term that includes pedagogical strategies such as problem-based learning and case-based learning that prioritize students exploring, thinking, asking, and answering content questions with peers to acquire new knowledge through a carefully designed activity. Such activities build in opportunities for students to authentically engage in and apply the scientific process as scientists rather than following a predetermined protocol. Inquiry-based learning is more than asking a student what he or she wants to know. It's about triggering curiosity. And activating a student's curiosity is, I would argue, a far more important and complex goal than mere information delivery. Despite its complexity, inquiry-based learning can be easier on teachers, partly because it transfers some responsibilities from teachers to students, but mostly because releasing authority engages students (LaForce et.al., 2017; Yew & Goh, 2016).

Interactive learning

[CA] Aprenentatge interactiu
[FI] Interaktiivinen oppiminen
[DE] Interaktives Lernen
[IT] Apprendimento interattivo
[PT] Aprendizagem interactiva
[ES] Aprendizaje interactivo
[SV] Interaktivt lärande

Interactive learning is a hands-on/real life approach to education founded upon building student engagement through guided social interaction. Carefully designed and structured activities facilitate learning in groups, fostering a challenging but encouraging space for students to wrestle with novel concepts and develop practical skills. Typical "homework" activities like applying course topics, solving problems, working through issues, are done together in class, while the classic "classroom" activities, such as hearing course topics explained, are done at home by watching videos, reading and using online resources (Tojiboyqizi, 2022).

Interactive storytelling

[CA] Narrativa interactiva
[FI] Interaktiivinen tarinankerronta
[IT] Narrazione interattiva
[PT] Narração interactiva
[ES] Narración interactiva
[SV] Interaktivt berättande

Interactive Storytelling is a computer-based interactive entertainment media that allow users to intentionally influence a non-linear narrative, mediated by a storytelling engine (Roth, 2015).

Internet library

[CA] Biblioteca d'internet
[FI] Verkkokirjasto
[IT]Bbiblioteca digitale
[PT] Biblioteca online
[ES] Biblioteca de internet
[SV] Internetbibliotek

see **Digital library** and **Online library**

Internet of Things (IoT)

[CA] Internet de les coses
[FI] Esineiden internet
[DE] Internet der Dinge
[IT] Internet delle cose
[PT] Biblioteca online
[ES] Internet das coisas
[SV] Internet de las cosas

Paradigm where everyday objects can be equipped with identifying, sensing, networking and processing capabilities that will allow them to communicate with one another and with other devices and services over the Internet to achieve some objectiv. IoT in schools means a better-connected and more collaborative future for education. IoT devices give students better access to everything from learning materials to communication channels, and they give teachers the ability to measure student learning progress in real-time. The rise of mobile technology and the IoT allows schools to improve the safety of their campuses, keep track of key resources, and enhancing access to information in the learning environment (Whitmore et al., 2015).

K

Knowledge integration

[CA] Integració del coneixement
[IT] Integrazione della conos-cenza
[PT] Integração de conhecimen-to
[ES] Integración del cono-cimiento
[SV] Integración del cono-cimiento

The process of merging two or more originally unrelated knowledge structures into a single structure. In the learning sciences, this term usually refers to knowledge integration within persons' memory: first, learners pick up pieces of knowledge (e.g., experiences, observations, ideas, hypotheses, explanations) in many different situations, for example, everyday life observations, the Internet, school instruction, etc; then, knowledge integration takes place whenever learners connect previously unrelated pieces of knowledge together in their memory, often as a result of instruction (Schneider, 2012).

L

Learning analytics

[CA] Anàlisi d'aprenentatge
[FI] Oppimisanalytiikka
[DE] Learning Analytics
[IT] analisi dei dati dell'apprendimento
[PT] Analítica da aprendizagem
[ES] Análisis de aprendizaje
[SV] Lärandeanalys

Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs (Siemens & Gašević, 2012; Gašević et al., 2015).

Learning by doing

[CA] Aprenentatge basat en la pràctica
[FI] Tekemällä oppiminen, toiminnallinen oppiminen
[IT] Imparare facendo
[PT] Aprender fazendo
[ES] Aprender haciendo
[SV] Lära genom att göra

The process whereby people make sense of their experiences, especially those experiences in which they actively engage in making things and exploring the world. It is both a conceptual designation applied to a wide variety of learning situations (in fact, as some would argue, to all learning), and a pedagogical approach in which teachers seek to engage learners in more hands-on, creative modes of learning (Bruce & Bloch, 2012).

Learning community

[CA] Comunitat d'aprenentatge
[FI] Oppimisyhteisö
[DE] Lernendengemeinschaft
[IT] Comunità di apprendimento
[PT] Comunidade de aprendizagem
[ES] Comunidad de aprendizaje
[SV] Lärande gemenskap

Learning communities provide a space and a structure for people to align around a shared goal. Effective communities are both aspirational and practical. They connect people, organizations, and systems that are eager to learn and work across boundaries, all the while holding members accountable to a common agenda, metrics, and outcomes. These communities enable participants to share results and learn from each other, thereby improving their ability to achieve rapid yet significant progress (CEDEFOP, 2014).

Learning Environment

[CA] Entorn d'aprenentatge
[FI] Oppimisympäristö
[DE] Lernumgebung
[IT] Ambiente di apprendimento
[PT] Ambiente de aprendizagem
[ES] Ambiente de aprendizaje
[SV] Lärandemiljö

Learning environment refers to the diverse physical locations, contexts, and cultures in which students learn. Since students may learn in a wide variety of settings, such as outside-of-school locations and outdoor environments, the term is often used as a more accurate or preferred alternative to classroom, which has more limited and traditional connotations—a room with rows of desks and a chalkboard, for example. The term also encompasses the culture of a school or class—its presiding ethos and characteristics, including how individuals interact with and treat one another—as well as the ways in which teachers may organize an educational setting to facilitate learning—e.g., by conducting classes in relevant natural ecosystems, grouping desks in specific ways, decorating the walls with learning materials, or utilizing audio, visual, and digital technologies. And because the qualities and characteristics of a learning environment are determined by a wide variety of factors, school policies, governance structures, and other features may also be considered elements of a learning environment (Great Schools Partnership, 2014).

Learning Management Systems (LMS)

[CA] Sistema de gestió de l'aprenentatge
[FI] Verkko-oppimisympäristö
[DE] Lernplattformen
[IT]Sistema di gestione dell'apprendimento
[PT] Sistema de gestão de Aprendizagem (LMS)
[ES] Sistemas de gestión del aprendizaje (LMS)
[SV] Learning Management System, system för hantering av lärande

Web-based software system that assists teachers to manage courses and deliver lessons online. It helps in administration, tracking and reporting of the learning process. An LMS usually has the following constituent components: content creation, organisation, delivery, learner support interactions, assessment and grading, and management of the learning process (Commonwealth of Learning, 2020).

Learning Objectives

[CA] Objectius d'aprenentatge
[FI] Oppimistavoitteet
[IT] Obiettivi formativi"
[PT] Objectivos da aprendizagem
[ES] Objetivos de aprendizaje
[SV] Lärandemål

Specification of learning outcomes to be achieved upon completion of an educational or learning activity. These encompass improving knowledge, skills and competencies within any personal, civic, social or employment related context. Learning objectives are typically linked to the purpose of preparing for more advanced studies and/or for an occupation or trade or class of occupations or trades (UNESCO, 2011).

Learning outcomes

[CA] Resultats d'aprenentatge
[FI] Oppimistulokset, saavutetut oppimistavoitteet
[IT] Risultati di apprendimento
[PT] Resultados da Aprendizagem
[ES] Resultados del aprendizaje
[SV] Läranderesultatet

Type of learning that takes place as intended within formally constituted educational institutions such as schools, colleges universities, training centres and so on. Typically it follows a prescribed framework whether or not actual attendance at the institution is necessary. Sometimes there are quite specific outcomes. On other occasions there is more of a kind of broad direction or aim. In all cases however those partaking of courses of formal learning have an idea of what they are likely to learn and they accept that that learning will to some extent be under the control of the institution (CEDEFOP, 2008).

Learning principles

[CA] Principis de l'aprenentatge
[IT] Principi dell'apprendimento
[PT] Princípios de Aprendizagem
[ES] Principio de aprendizaje
[SV] Inlärningsprinciper, läranderprinciper

Set of ideas that underlie effective learning and that seem to generally apply to the learning process. Examples of these learning principles are: "Students' prior knowledge can help or hinder learning.", "How students organize knowledge influences how they learn and apply what they know.", "To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned." and "To become self-directed learners, students must learn to monitor and adjust their approaches to learning (Eberly Center, n.d.).

Learning software (Educational Software)

[CA] Programari d'aprenentatge
[FI] Oppimisohjelmisto
[IT] Software didattico
[PT] Software de Aprendizagem
[ES] Software de aprendizaje
[SV] Inlärningsprogram mjuk-vara för lärande

The concept learning software, or educational software, covers computer programs designed specifically to support user achievement of given objectives within a learning path (Dostal, 2009).

Learning taxonomy

[CA] Taxonomia d'aprenentatge
[FI] Oppimisen taksonomia
[IT] Tassonomia degli obiettivi educativi
[PT] Taxonomia de aprendizagem
[ES] Taxonomía de aprendizaje
[SV] Lärandetaxonomi

Framework for describing different kinds of learning behaviours and characteristics that we wish our students to develop. It is often used to identify different stages of learning development and thus provide a useful tool in distinguishing the appropriateness of particular learning outcomes for particular module levels within our Programmes. The most common and earliest of these is Bloom's Taxonomy (1956), adapted more recently by Anderson et al (2001) (O'Neill & Murphy, 2010).

Learning theories

[CA] Teories d'aprenentatge
[FI] Oppimisteoriat
[DE] Lerntheorien
[IT] Teorie dell'apprendimento
[PT] Teorias de aprendizagem
[ES] Teorías de aprendizaje
[SV] Lärandeteorier

Set of theories that aim to explain how knowledge is created and how humans acquire it, while simultaneously systematising and organising what is known about human learning (Harasim, 2017).

Lifelong learning

[CA] Aprenentatge permanent
[FI] Elinikäinen oppiminen
[DE] Lebenslanges Lernen
[IT] Formazione permanente
[PT] Educação ao Longo da Vida
[ES] Educación permanente
[SV] Livslångt lärande

Learning in all its forms, whether formal, non-formal or informal, taking place at all stages in life and resulting in an improvement or update in knowledge, skills, competences and attitudes or participation in society from a personal, civic, cultural, social or employment-related perspective, including the provision of counselling and guidance services; it includes early childhood education and care, general education, vocational education and training, higher education, adult education, youth work and other learning settings outside formal education and training and it typically promotes cross-sectoral cooperation and flexible learning pathways (European Comission, 2022).

M

Machine learning

[CA] Aprenentatge automàtic
[FI] Koneoppiminen
[IT] Apprendimento automatico
[PT] Aprendizagem automática
[ES] Aprendizaje de máquinas
[SV] Maskininlärning maskin-lärande

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy. In general, machine learning algorithms are used to make a prediction or classification. Based on some input data, which can be labelled or unlabeled, your algorithm will produce an estimate about a pattern in the data. An error function serves to evaluate the prediction of the model. If there are known examples, an error function can make a comparison to assess the accuracy of the model. If the model can fit better to the data points in the training set, then weights are adjusted to reduce the discrepancy between the known example and the model estimate. The algorithm will repeat this evaluate and optimize process, updating weights autonomously until a threshold of accuracy has been met. Regarding the Education context, current Machine Learning trends include: predicting student performance, testing & grading students fairly, improving students retention and supporting teachers and staff (IBM Cloud Education, 2020).

Massive Open Online Course (MOOC)

[CA] Cursos en línia obert i massiu
[FI] MOOCit
[IT] MOOCs, corsi online aperti su larga scala
[PT] MOOCs
[ES] Cursos en línea masivos y abiertos
[SV] MOOCs

Online course available for large enrolment on the open web, where 'open' largely refers to open registration, and not necessarily courses that are openly licensed (Commonwealth of Learning, 2020).

Mentoring

[CA] Mentoria
[FI] Mentorointi
[IT] Mentoraggio
[PT] Mentoria
[ES] Tutoría
[SV] Mentorskap

Mentoring is a process of using specially selected and trained individuals to provide guidance, pragmatic advice, and continuing support that will help the people in their learning and development process. Mentoring is sharing knowledge, skills, and life experience to guide another towards reaching their full potential; it is a journey of shared discovery (Chand, n.d.).

Mentoring network

[CA] Xarxa de mentors
[FI] Mentorointiverkosto
[IT] Rete di mentoring
[PT] Rede de mentoria
[ES] Red de mentores
[SV] Mentorsnätverk

Mentoring networks are groups or systems of interconnected people with the purpose of mentoring. Mentoring networks are multilevel, intra- and extraorganizational, career/person-related, and based upon mutuality and reciprocity. Mentoring networks are characterised by the diversity and the strength of the relationship among the network members (Higgins & Kram, 2001; Christou et al. 2017).

Metaliteracy

[PT] Metaliteracia
[SV] Meta-läskunnighet

Metaliteracy is a pedagogical model that empowers learners to be reflective and informed producers of information both individually and in collaboration with others. Unified understanding of literacies to support the acquisition, production, and sharing of knowledge in collaborative online communities. Like the more skills-based approaches of information literacy, metaliteracy encourages the use of a variety of new and emerging technologies. It also incorporates related literacies such as visual literacy, digital literacy, media literacy, and transliteracy, and promotes metacognitive reflection as an empowering practice for learners. Metaliteracy supports effective participation in social media and online communities, with a comprehensive approach to learning that encourages the production and sharing of original and repurposed information in participatory environments (Mackey & Jacobson, 2011).

Metaverse

[CA] Metavers
[IT] Metaverso
[PT] Metaverso
[SV] Metaversum

Virtual environment blending physical and digital, facilitated by the convergence between the Internet and Web technologies, and Extended Reality. The metaverse is a collection of every virtual world built using blockchain technology. They can be gaming planets or NFT galleries, curated lands or digital streets. The metaverse is not one place but the aggregate of the new digital spaces in what seems to be the next iteration of the internet (Lee et al., 2021).

Micro-credentials

[CA] Microcredencials
[FI] Mikrokredentiaalit
[IT] Microcredenziali
[PT] Microcredenciais
[ES] Micro-credenciales
[SV] Micro-credentials

Digital certification such as a “digital badge” that provides valid evidence of achievement of specific knowledge, skills or competences after going through a structured learning experience. Micro-credentials can be shared on social media and verified by others, including employers (Commonwealth of Learning, 2020).

Mixed-mode learning

[CA] Aprenentatge mixt
[IT] Apprendimento misto
[PT] Aprendizagem mista
[ES] Aprendizaje en modo mixto
[SV] Blandad inlärning

see **Blended learning**

Mobile Learning

[CA] Aprenenentatge mòbil
[DE] Mobiles Lernen
[FI] Mobiilioppiminen
[IT] Apprendimento mobile
[PT] Aprendizagem móvel
[ES] Aprendizaje móvil
[SV] Mobilt lärande

Type of learning that involves the use of mobile technology, either alone or in combination with other information and communication technology (ICT), to enable learning anytime and anywhere. Learning can unfold in a variety of ways: people can use mobile devices to access educational resources, connect with others, or create content, both inside and outside classrooms. Mobile learning also encompasses efforts to support broad educational goals such as the effective administration of school systems and improved communication between schools and families (UNESCO, 2013).

Mobility

[CA] Mobilitat
[FI] Liikkuvuus
[IT] Mobilità
[PT] Mobilidade
[ES] Movilidad
[SV] Mobilitet

Ability of an individual to move and adapt to a new occupational or educational environment. In the academic context, mobility implies a period of study, teaching and/or research in another institution inside or outside the country of residence. This period is of limited duration, and it is envisaged that the student or staff member return to his or her home institution upon completion of the designated period and work plan (CEFEDOP, 2014).

Mock tests

[CA] Proves simulades
[FI] Valetestit
[IT] classe capovolta
[PT] Simulazione d'esame
[ES] Pruebas simuladas
[SV] Låtsasprov

Online mock tests are similar to actual examinations in terms of paper form and marking method, allowing you to analyze your genuine capabilities and find areas for improvement. A mock test is an examination that is identical to your real exam but with different facts. The questions are in the same structure, and you get the same amount of time to answer them all. Mock tests are simulations of genuine exams that match the exam design but contain different facts (Teach Mint, 2021).

N

Non-formal learning

[CA] Aprenentatge informal
[FI] Non-formaali oppiminen, tutkintoon johtamaton oppiminen
[IT] Apprendimento non formale
[PT] Aprendizagem não formal
[ES] Aprendizaje informal
[SV] Non-formal learning, informellt lärande

Non-formal learning takes place outside formal learning environments but within some kind of organisational framework. It arises from the learner's conscious decision to master a particular activity, skill or area of knowledge and is thus the result of intentional effort. But it need not follow a formal syllabus or be governed by external accreditation and assessment (Council of Europe, 2006).

O

Online classroom

[CA] Aula virtual
[FI] Online-luokkahuone
[DE] Online-Lehrraum
[IT] Aula virtuale
[PT] Sala de aula online
[ES] Aula en línea
[SV] Onlineklassrum, digitalt klassrum

Online teaching and learning environment where teachers and students can present course materials, engage and interact with other members of the virtual class, and work in groups together. In this type of learning environment, teacher and students are generally separated by location and classes occur in a live, synchronous setting. Online coursework can involve the viewing of pre-recorded, asynchronous material, but virtual classroom settings involve live interaction between instructors and participants (Barron, 2020).

Online forums

[CA] Fòrums en línia
[FI] Online-foorumi
[IT] Forum digitali
[PT] Fóruns online
[ES] Foros en línea
[SV] Onlineforum, digitalt forum

Asynchronous communication tools, widely used in Learning Management Systems, that foster interaction and engagement between teachers and learners. These discussion boards enable instructors to understand and intervene in learning activities and let students have time to think and formulate answers, leading to a collaborative and asynchronous knowledge building (de Lima et al., 2019).

Online learner

[CA] Estudiant en línia
[FI] Online-oppija, verkko-oppija
[PT] Aluno digital
[ES] Estudiante en línea
[SV] Onlinestudent

see **e-learner**.

Online Learning Environment

[CA] Entorn d'aprenentatge en línia
[FI] Verkko-oppimisympäristö
[IT] Ambienti digitali di apprendimento
[PT] Ambiente de aprendizagem online
[ES] Entorno de aprendizaje en línea
[SV] Digital lärandemiljö

A learning environment with no physical location and in which the instructors and students are separated by space; This type of environment normally is housed within a learning management system (LMS) framework, that includes not only areas of information deposit for the learner's engagement, but also the additional instructional tools such as assignment submission and evaluation areas, grade interface, bulletin board discussions, chat sessions, small group areas, in-course private mail, and many online learning environments offer additional plug-in social learning resources such as video conferencing. This environment may be synchronous, asynchronous, or a mix of both synchronous and asynchronous experiences and engagements (Moore, 2016; Kureethara Manuel, 2021).

Online learning platforms

[CA] Plataformes d'aprenentatge en línia
[FI] Verkko-oppimisalusta
[IT]Piattaforme digitali di apprendimento
[PT] Plataformas de aprendizagem online
[ES] Plataformas de aprendizaje en línea
[SV] Digitala utbildningsplattformar

see **Learning Management Systems (LMS)**

Online library

[FI] Online-kirjasto, verkkokirjasto
[IT] Biblioteca digitale
[PT] Biblioteca online
[ES] Biblioteca en línea
[SV] Digitalt bibliotek

see **Digital library**

Online seminars

[CA] Seminarisen línia
[FI] Online-seminaari, verk-koseminaari
[DE] Online-Lehrraum
[IT] Seminari online
[PT] Seminários online
[ES] Seminarios en línea
[SV] Digitala seminarier

Online seminars, or webinars, are web-based seminars with transmission of video and audio content online (over the internet) from one source to a limited audience with the purpose of training (Zielinski, 2020).

Online social interation

[CA] Interacció social en línia
[IT] Interazioni sociali in rete
[PT] Interação social online
[ES] Interacción social en línea
[SV] Social interaktion online

Communication and interaction between people in an online setting that can happen in a syncronous or assynchronous way (Gershoff & Mukherjee, 2015).

Online teaching and learning

[CA] Ensenyament i aprenentat-ge en línia
[FI] Verkko-opetus ja oppimin-en, online-opetus ja oppiminen
[DE] digital-gestütztes Lehren und Lernen
[IT] Didattica digitale
[PT] Ensino e aprendizagem online
[ES] Enseñanza y aprendizaje en línea
[SV] Digital undervisning och digitalt lärande

see e-learning

Online textbooks

[CA] Llibres de text digitals, llibres de text electrònics
[FI] Verkko-oppikirja
[IT] Libri digitali
[PT] Manuais digitais
[ES] Libros de texto en línea
[SV] Läroböcker på nätet

Online textbooks, commonly referred to as e-textbooks, digital textbooks, or e-texts, are electronic versions of a text that can be read on a desktop, mobile device, or ereader device that are available online. Online electronic textbooks may include part or all of the printed text version. It may also include additional content, such as multimedia content and hyperlinks, that would be impossible to render in a printed text. Some electronic textbooks may also include interactive content, self-assessments, or guided questions that provide real-time feedback. Interactive course content is often proprietary to the publisher and can include resources such as online homework assignments, quizzes, and instructor presentations (Molina et al., n.d.).

Open access

[CA] Accés en obert
[FI] Open access, avoin saatavuus
[IT] Accesso apertoi
[PT] Acesso aberto
[ES] Acceso abierto
[SV] Open access

Open access (OA) means free access to information and unrestricted use of electronic resources for everyone. Any kind of digital content can be OA, from texts and data to software, audio, video, and multimedia. While most of these are related to text only, a growing number are integrating text with images, data, and executable code. OA can also apply to non-scholarly content, like music, movies, and novels. A publication is considered in Open access if: i) its content is universally and freely accessible, at no cost to the reader, via the Internet or otherwise; ii) the author or copyright owner irrevocably grants to all users, for an unlimited period, the right to use, copy, or distribute the article, on condition that proper attribution is given; iii) it is deposited, immediately, in full and in a suitable electronic form, in at least one widely and internationally recognized open access repository committed to open access (Max Planck Society & ECHO Project, 2003; UNESCO, 2012).

Open educational resources

[CA] Recursos educatius en obert
[FI] Avoimet oppimateriaalit
[DE] Offene Bildungsressourcen
[IT] Risorse didattiche aperte
[PT] Recursos educativos abertos
[ES] Recursos educativos abiertos
[SV] Öppna utbildningsresurser

Learning, teaching and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others (UNESCO, 2019).

Open Learning

[CA] Aprenentatge obert
[FI] Avoin oppiminen
[IT] Didattica aperta
[PT] Aprendizagem aberta
[ES] Aprendizaje abierto
[SV] Öppet lärande

Policies and practices of openness in entry requirements (with minimal or no restriction on qualifications), choice of courses, place of study and time, etc. It is an educational philosophy where learning can happen anywhere, anytime from any resource, and therefore, can also inform practice in face-to-face institutions (Commonwealth of Learning, 2020).

P

Peer assessment

[CA] Coavaluació
[FI] Vertaisarviointi, vertaisarvio
[IT] Valutazione inter pares
[PT] Avaliação inter-pares
[ES] Evaluación entre compañeros
[SV] Kamratbedömning

Process undertaken by students to assess each others' work in related peer group tasks. Students contribute to the evaluation procedures by having input in individual team member scores. Peer assessment refers to situations where peers formatively and qualitatively evaluate the products or outcomes of learning of others in the team or group (Gogus, 2012).

Peer discussion

[FI] Vertaiskeskustelu
[PT] Discussão com Paresl
[ES] Discusiones entre compañeros
[SV] Kamratdiskussioner

The process of dynamically exchange ideas between colleagues in order to solve a problem, make a decision or reach a conclusion. As an effective means of active learning, peer discussion enhances understanding, even when none of the students in a discussion group originally knows the correct answer, and improves students' confidence in their answers (Smith et al., 2009; 2010).

Peer interaction

[FI] Vertaisvuorovaikutus
[PT] Interação com pares
[ES] Interacción entre compañeros
[SV] Kamratinteraktion

Peer interaction, or peer-to-peer interaction, describes an approach to interaction and collaboration between participants in a shared project or activity that is characterized by network-based organizational structures, a shared common resource base, and an assumption that all participants have the potential to make constructive contributions. Modern forms of peer-to-peer interaction are substantially inspired by online peer-to-peer communication technologies; however, the principles and ethics of peer-to-peer interaction have also been translated to offline contexts (Bruns, 2016).

Peer learning

[CA] Aprenentatge col·laboratiu
[FI] Vertaisoppiminen
[PT] Aprendizagem com pares
[ES] Aprendizaje entre compañeros
[SV] Ömsesidig lärande

Learning situation where peers support each other in learning processes. There are different forms of peer learning such as peer support groups, supplemental instruction, peer tutoring, peer teaching, and peer-assisted learning. Peer learning emphasizes the experience of all participating students. Peer learning is the acquisition of knowledge and skill through active helping and support among peers who are equals in standing or matched companions. Peer learning occurs among peers from similar social groupings, who are not professional teachers, helping each other to learn and in doing so, learning themselves (Gogus, 2012.

Peer review

[CA] Revisió d'experts
[FI] Vertaisarviointi
[IT] Valutazione inter pares
[PT] Revisão dos pares
[ES] Revisión entre compañeros
[SV] Kollegial utvärdering

Process of subjecting an author's scholarly work, research or ideas to the scrutiny of others who are experts in the same field. It functions to encourage authors to meet the accepted high standards of their discipline and to control the dissemination of research data to ensure that unwarranted claims, unacceptable interpretations or personal views are not published without prior expert review (Kelly et al. 2014).

Peer support

[CA] Suport entre companys
[FI] Vertaistuki
[PT] Apoio dos pares
[ES] Apoyo entre compañeros
[SV] Kamratstöd

Peer support involves bringing people together to share experiences that aim at helping each other, providing a space where everyone feels accepted and understood and treating everyone's experiences as being equally important. It encompasses both giving and receiving support (Mind, 2019).

Peer-led team learning (PLTL)

[CA] Realitat estesa
[IT] Realtà estesa
[PT] Realidade extendida
[ES] Aprendizaje en equipo dirigido entre compañeros
[SV] Peer-led team learning, kamratlett lärande i lag

Peer-Led Team Learning (PLTL) is a collaborative instructional model that advances student achievement through active learning in a peer-led workshop. Typically, six to eight students meet with a peer leader for one and a half to two hours per week to discuss topics and solve problems that reinforce lecture and textbook learning, while also deepening their conceptual understanding and critical thinking. The workshop problems and activities are constructed to reinforce these goals and provide relevant applications. The workshops stretch students to work beyond what they could accomplish individually, so that through cooperative activities and appropriate guidance from the leader they reach new levels of understanding and performance. The workshops are integrated into the course so that students can discuss their understanding of the concepts presented in the lectures and textbook in a non-threatening environment. Peer leaders facilitate the workshops, clarify goals, ensure that the team members engage with the materials and with each other, and they provide guidance as needed in solving problems (Varma-nelson, 2006; Varma-nelson & Gafney, 2008).

Pilot project

[CA] Projecte pilot
[FI] Pilottiprojekti
[DE] Pilotprojekt
[IT] Progetto pilota
[PT] Projecto piloto
[ES] Proyecto piloto
[SV] Pilotprojekt

Pilot projects are common means to apply, test and adapt a new concept, idea, or innovative proposition to a real situation. These type of projects usually act like a learning platform and enable knowledge development about the interactions of the innovation and the real-world context, allowing to test new solutions in a small scale environment (Vreugdenhil et al, 2012).

Pitch

[CA] Micropresentació
[FI] Pitch, myyntipuhe
[PT] Pitch
[ES] Pitch, presentación corta
[SV] Pitch, säljpresentation

Type of short, straight-to-the-point, presentation. The presenter functions as the pitcher (baseball reference) and is tasked with establishing the momentum behind and control over the pitch. The catcher represents the audience to whom the pitcher pitches –those stakeholders who catch-on to the pitch and, ideally, are receptive to the innovation. Typically lasts between 2 and 10 minutes (Belinsky & Gogan, 2016).

Problem based learning

[CA] Aprenentatge basat en problemes
[FI] Ongelmalähtöinen oppiminen
[DE] Problembasiertes Lernen
[IT] Apprendimento basato sui problemi
[PT] Aprendizagem baseada em problemas
[ES] Aprendizaje basado en problemas
[SV] Problembaserat lärande

Problem-based learning (PBL) is an instructional method that drives all learning via solving an authentic problem. Knowledge is learned in the context of the problem, and there is a reciprocal relationship between knowledge and the problem. Knowledge building is stimulated by the problem and applied back to the problem. Instructors are facilitators (not lecturers) who support and model reasoning processes to facilitate group processes and interpersonal dynamics, probe students' knowledge deeply, but do not interject content or provide direct answers to questions (Marra et al., 2014).

Process-Oriented Guided Inquiry Learning (POGIL)

[ES] Aprendizaje de indagación guiada orientado a procesos (POGIL)
[SV] Processorienterat guidad förfrågningslärande

Active learning, team-based pedagogical approach to instruction in engineering based upon the learning cycle model.Rather than sitting in traditional lectures, students work in teams to complete worksheets that guide them through the process of learning. The instructor's role in this class is to act as a facilitator of learning. In this way students are actively engaged in processing the information and have the opportunity to utilize and develop important skills such as teamwork, communication, and critical thinking (Douglas & Chiu, 2013).

Project Based Learning

[CA] Aprenentatge basat en projectes
[FI] Projektioppiminen
[IT] Apprendimento basato su progetti
[PT] Aprendizagem por projecto
[ES] Aprendizaje en base a proyectos
[SV] Projektbaserat lärande

Project-Based Learning is a type of student-centred learning characterised by student teams working on problems, but with the added component that they have to submit a project report (Kolmos & de Graaf, 2009).

Q

Qualifications Framework

[CA] Marc de qualificacions
[IT] Quadro dei titoli
[PT] Quadro de Qualificações
[ES] Marco de Cualificaciones
[SV] Kvalifikationsramen

The hierarchical classification of the levels of formal learning programmes and their associated qualifications and certificates. National qualifications frameworks can also play a role in facilitating stakeholder interactions, creating coherent qualifications systems, ensuring fit-for-purpose qualifications, supporting wider quality assurance processes, recognizing learning gained outside formal education and training and for driving broader educational reforms. They also make national qualifications systems more transparent to foreigners (Keevy & Chakroun, 2015).

Questionnaires

[CA] Qüestionari
[FI] Kyselyt
[IT] Questionari
[PT] Questionários
[ES] Cuestionarios
[SV] Enkäter

A set of carefully designed questions given in exactly the same form to a group of people in order to collect data about some topic(s) in which the researcher is interested (McLean, 2006).

Quizzes

[CA] Joc de preguntes i respostes
[FI] Visat, testit
[DE] Quiz, Test
[IT] Quiz
[PT] Quizes
[ES] Cuestionarios
[SV] Frågesporter, korta prov

A quiz refers to a quick and informal test of knowledge, typically around 10 questions in length, with question formats often including multiple choice, fill in the blanks, true or false and short answer. A quiz is much shorter than a traditional test or exam and is rarely impactful on a final course grade (Top Hat, n.d.).

R

Reflective Learning

[CA]Aprenentatge reflexiu
[FI] Refllektoiva oppiminen
[IT] Apprendimento riflessivo
[PT] Aprendizagem reflexiva
[ES] Aprendizaje reflexivo
[SV] Reflexiv inlärning

The process of learning through and from experience towards gaining new insights of self and/or practice. This often involves examining assumptions of everyday practice. It also tends to involve the individual practitioner in being self-aware and critically evaluating their own responses to practice situations. The point is to recapture practice experiences and mull them over critically in order to gain new understandings and so improve future practice. This can also be understood as part of the process of life-long learning, for example (Finlay, 2008).

Reflective self-assessment

[CA] Autoavaluació reflexiva
[FI] Reflektoiva itsearviointi
[IT] Autovalutazione riflessiva
[PT] Auto avaliação reflexiva
[ES] Autoevaluación reflexiva
[SV] Reflekterande självbedömning

Through self-assessment and reflection learners learn to assess their own learning for the purpose of improving it. To become capable assessors of their learning, learners must have clear goals, the opportunity to help create a definition of quality work, ongoing feedback, and the opportunity to correct or self-adjust their work before they turn it in. After finishing the project, learners need to reflect on the strengths and weaknesses of their work, make plans for improvement, and integrate the assignment with previous learning. Through self assessment, learners become more responsible for their own educational growth; more reflective, autonomous, motivated, and effective (Intel, 2007; Paris & Ayres, 1994; Stiggins, 1997; Wiggins, 1998).

Research Based Learning (RBL)

[CA] Aprenentatge basat en la recerca
[FI] Tutkimukseen pohjautuva oppiminen
[IT] Apprendimento basato sulla ricercai
[PT] Aprendizagem baseada em Investigação
[ES] Aprendizaje basado en la investigación
[SV] Forskningsbaserat lärande

The application of teaching-learning strategies that seek to connect research with teaching, which allows for the partial or total inclusion of the student in an investigation based on the scientific method, under the supervision of the teacher. Research-based learning (RBL) consists of a framework that helps to prepare students to be lifelong inquirers and learners. The term “research,” which often conjures up a picture of students writing research reports, is here defined as a way of thinking about teaching and learning, a perspective, a paradigm. It is a specific approach to classroom teaching that places less emphasis on teacher-centered learning of content and facts and greater emphasis on students as active researchers. In a research-based learning approach, students actively search for and then use multiple resources, materials, and texts in order to explore important, relevant, and interesting questions and challenges. They find, process, organize and evaluate information and ideas as they build reading skills and vocabulary. They learn how to read for understanding, form interpretations, develop and evaluate hypotheses, and think critically and creatively. They learn how to solve problems, challenges, and dilemmas. Finally, they develop communication skills through writing and discussion (Fuerte, 2020; Seif, 2021).

Reskilling

[FI] Uudelleenkoulutus
[IT] Riqualificazione
[PT] Recapacitação
[ES] Recapacitación
[SV] Reskilling, omskolning

Retraining, the provision of new skills to enable a change in role. The process of learning new skills needed to do an entirely different job (Allas, Fairbairn & Foote, 2020).

Roleplay

[CA] Joc de rols
[FI] Roolipeli
[IT] Gioco di ruolo
[PT] Encenação
[ES] Juego de rol
[SV] Rollspel

Practice of having students take on specific roles - usually ones in which they are not familiar - and act them out in a case-based scenario for the purpose of learning course content or understanding complex or ambiguous concepts. The guidelines for the role-play are usually modeled on realistic criteria so the students can get as close to the real scenario as possible. Roleplay exercises give students the opportunity to assume the role of a person or act out a given situation. These roles can be performed by individual students, in pairs, or in groups which can play out a more complex scenario. Role plays engage students in real-life situations or scenarios that can be “stressful, unfamiliar, complex, or controversial” which requires them to examine personal feelings toward others and their circumstances (Sogunro, 2004; Bonwell & Eison, 1991)

S

Self assessment

[CA] Autoavaluació
[FI] Itsearviointi
[DE] Selbstüberprüfung
[IT] Autovalutazione
[PT] Auto avaliação
[ES] Auto evaluación
[SV]Sself assessment, egen-värdering, självutvärdering

Assessment by which the learner gathers information about and reflects on his or her own learning, judges the degree to which it reflects explicitly stated goals or criteria, identifies strengths and weaknesses, and revises accordingly. It is the learner's own assessment of personal progress in knowledge, skills, processes, and attitudes (UNESCO-IBE, 2013).

Seminar

[CA] Seminari
[FI] Seminaari
[DE] Seminar
[IT] Seminario
[PT] Seminário
[ES] Seminario
[SV] Seminarium

Seminars can be defined as small, discussion-based courses. Typically, students complete readings and assignments before the class and discuss major themes or topics during class. Moreover, this kind of semi-public dialogue can facilitate better speaking skills and human reasoning (Hollander, 2002; Yale Poorvu Center, 2020).

Sense of Presence

[CA] Sensació de presència
[IT] Senso di presenza
[PT] Sentido de Presença
[ES] Sentido de presencia
[SV] Känsla av närvaro

The sense of being in a particular place or time period. Awareness of one's current existence. In virtual reality technology, sense of presence refers to the user's sense of being inside the simulated environment. A sense of "being in and belonging in" a course and/or a feeling of "involvement, warmth, and immediacy" from physically-separated participants (learners and instructors) while interacting with each other in online environments; The individual experience in immersive environments, which reflects the degree to which an individual feels present in the environment (American Psychological Association - APA Dictionary of Psychology, 2015).

Serious games

[FI] Hyötypelit
[DE] Ernste Spiele
[IT] Giochi seri
[ES] Juegos serios
[SV] Seriösa spel

Serious games are video games aimed toward problem-solving rather than entertainment.They use the same media as video games aimed at recreational play. However, serious games can help learners gain a good understanding of a specific topic and sustain the acquisition of complex competencies. Serious games are a new learning medium that holds a special interest for simulation. While they are not a simulation modality per se, they are a way to conceive a simulation activity by emphasizing the educational value of play. Serious games can apply as much to immersive simulation (especially VR simulation) as to procedural simulation (Pilote & Chiniara, 2019).

Skill-building activity

[IT] Attività di sviluppo delle competenze
[PT] Actividade de desenvolvimento de competências
[ES] Actividad de desarrollo de habilidades
[SV] Kompetensbyggande aktiviteter

Sometimes referred to as the “study focus” or “guided/controlled practice” element of lesson planning, skill-building activities are the building blocks that reinforce language elements and skills for students before they use them on their own. Skill-building activities are generally guided by the teacher, with support and scaffolding to help students learn. Skill-building activities tend to focus on language elements such as grammar, vocabulary, and pronunciation, although they can and should be used for all elements of a task (Centre for Canadian Language Benchmarks, 2014)

Skills

[FI] Taidot
[IT] Competenze
[PT] Competências
[ES] Habilidades
[SV] Kompetens, färdigheter

Refers to the ability to apply knowledge, use know-how to complete tasks and solve problems and carry out the tasks that comprise a particular job As an overarching/multidimensional concept/term, “skill” can be also used as a proxy measure on occupation, qualification, educational attainment (these measures have the benefit of being readily available in a range of quantitative datasets). Other abilities, used at daily work, such as teamwork and problem-solving, are also considered as skills (UNESCO-UNEVOC, n.d.).

Social Networking

[FI] Sosiaalinen verkostoitumin-
en
[SV] Använda sociala nätverk

The activity of sharing information and communicating with groups of people using the internet, especially through websites that are specially designed for this purpose (social networks) (Cambridge Business English Dictionary, n.d.).

Special needs education

[CA] Educació especial
[FI] Erityisopetus
[IT] Bisogni educativi speciali
[PT] Necessidades educativas
especiais
[ES] Educación para necesi-
dades especiales
[SV] Specialundervisning

Education designed to facilitate the learning of individuals who, for a wide variety of reasons, require additional support and adaptive pedagogical methods in order to participate and meet learning objectives in an educational programme. Reasons may include (but are not limited to) disadvantages in physical, behavioural, intellectual, emotional and social capacities. Educational programmes in special needs education may follow a similar curriculum as that offered in the parallel regular education system, however they take individuals' particular needs into account by providing specific resources (e.g. specially trained personnel, equipment, or space) and, if appropriate, modified educational content or learning objectives. These programmes can be offered for individual students within already existing educational programmes, or be offered as a separate class in the same or separate educational institutions (UNESCO-UIS, 2013).

Storytelling

[FI] Tarinankerronta
[IT] Raccontare
[PT] Contar histórias
[ES] Cuentacuentos
[SV] Berättande

The activity of telling, reading or narrating stories with an educational and pedagogical purpose. Stories are a way to settle the minds of students and focus their attention in the beginning of the sequence of instruction (NYU, 2020).

Summative assessment

[CA] Avaluació sumatòria
[FI] Tarinankerronta
[IT] Valutazione sommativa
[PT] Avaliação sumativa
[ES] Evaluación sumativa
[SV] Summativ utvärdering

Assessment that occurs at a point in time and is carried out to summarise achievement at that point in time. Often more structured than formative assessment, it provides teachers, students and parents with information on student progress and level of achievement. Summative assessments are used to evaluate student learning, skill acquisition, and academic achievement at the conclusion of a defined instructional period—typically at the end of a project, unit, course, semester, program, or school year (Great Schools Partnership, 2014; National Centre for Vocational Education Research, 2020).

Synchronous learning

[CA] Aprenentatge síncron
[FI] Samanaikainen oppiminen
[IT] Apprendimento sincrono
[PT] Aprendizagem síncrona
[ES] Aprendizaje sincrónico
[SV] Synkront lärande

Synchronous learning is opposite of asynchronous learning, where learner interacts with teachers and/or learners online at the same time from different place. Synchronous learning means engaging multiple people at the same time, where there is real-time interaction either in a classroom or on online platforms such as a zoom call or a web-conference (Commonwealth of Learning, 2020; Wilson, 2022).

T

Team Based Learning

[CA] Aprenentatge basat en equips
[FI] Ryhmälähtöinen oppiminen
[PT] Aprendizagem em equipa
[ES] Aprendizaje basado en equipos
[SV] Gruppbaserat lärande

Team-based learning (TBL) provides an active, structured form of small group learning, that can be applied to large classes. Student accountability is achieved through the specific steps of TBL, including pre-class preparation, readiness assurance testing, problem-solving activities, and immediate feedback (Burgess et al. 2020).

Think-pair-share

[FI] Ajattele-keskustele-jaa
[IT] Penso-scambio-condivido
[ES] Piensa-pareja-comparte
[SV] Tänk-par-dela

Problem solving method where students work on a task individually and then get into pairs to compare and improve their responses. Think-pair-share is a collaborative teaching strategy that can be used to aid students in forming original ideas by having those ideas discussed and analyzed in a group setting. The strategy can be used before reading or learning a specific concept and generally works better with smaller groups. The educator acts as a facilitator and poses a question or a problem to the students. The students are given a certain time period to think about the solution, after which the educator asks them to pair themselves and share their thoughts with each other. If time permits the paired students can share their thoughts with other pairs of learners and share their ideas with the whole group. Think-pair-share refers to a learning strategy that maximizes participation, focuses attention and engages students in comprehending the reading material. Think-pair-share is especially useful for actively involving all students during lectures or larger class structures (Lyman, 1981; Top Hat, n.d.).

Transformational Learning

[CA] Aprenentatge transformatiu

[FI] Transformatiivinen oppiminen, uudistava oppiminen

[IT] Competenze digitali

[PT] Aprendizagem transformativa

[ES] Aprendizaje transformador

[SV] Transformativt lärande

Process of deep, constructive, and meaningful learning that goes beyond simple knowledge acquisition and supports critical ways in which learners consciously make meaning of their lives. It is the kind of learning that results in a fundamental change in our worldview as a consequence of shifting from mindless or unquestioning acceptance of available information to reflective and conscious learning experiences that bring about true emancipation (Simsek, 2012).

U

Upskilling

[FI] Täydennyskoulutus, taitojen kehittäminen
[PT] Melhoria de qualificações
[ES] Mejora de cualificaciones
[SV] Upskilling, kompetenshö-jning

Short-term targeted training typically provided following initial education or training, and aimed at supplementing, improving or updating knowledge, skills and/or competences acquired during previous training (CEFEDOP, 2014).

V

Video-conferencing

[CA] Videoconferència
[FI] Videokokokous
[IT] Videoconferenza
[PT] Videoconferência
[ES] Videoconferencia
[SV] Videokonferenser

A conference between two or more participants by using computer networks to transmit live audio, video, text, and image data. Video conferencing is a technology-enabled type of meeting where two or more people, in different geographic locations, conduct live visual conferences through the internet for the purpose of communicating and collaborating. Video conferencing software (or hardware) enables transmission of high-quality audio, static images—sometimes full-motion video images—and text-based messages between multiple locations. As long as they have a webcam (an embedded camera), a desktop, laptop or mobile phone device can be used for video conferencing (Barley, 2021; Mitel, n.d.).

Virtual groups

[CA] Grups virtuals
[FI] Virtuaaliset ryhmät
[IT] Gruppi virtuali
[PT] Grupos virtuais
[ES] Grupos virtuales
[SV] Virtuella grupper

Distributed work teams whose members are geographically dispersed and coordinate their work predominantly with electronic information and communication technologies (e-mail, video-conferencing, telephone, etc.) towards achieving a common goal (Hertel & Geister, 2005).

Virtual laboratory (Virtual lab)

[CA] Laboratori virtual
[FI] Virtuaalilaboratorio
[DE] Virtuelles Labor
[IT] Laboratorio virtuale
[PT] Laboratório virtual
[ES] Laboratorio virtual
[SV] Virtuell labb

A virtual laboratory is a type of hands-on learning methodology where students do not interact with real equipment to obtain data, but rather with computer simulations of laboratory or industrial process equipment. A Virtual Laboratory is an interactive environment in which simulated experiments can be carried out. A laboratory can be characterised as "a playground for experimentation" providing tools that can be used to manipulate objects relevant to a specific scientific domain (Mercer et al. 1990; Koretsy et al., 2011; Stahre Wästberg et al. 2019).

Virtual Learning Environment (VLE)

[CA] entorn d'aprenentatge virtual
[FI] Virtuaalinen oppimisympäristö
[IT] Ambiente di apprendimento virtuale
[PT] Ambiente de aprendizagem virtual
[ES] Ambiente de aprendizaje virtual
[SV] Virtuell lärandemiljö

A virtual learning environment is an online-based platform that offers students and professors digital solutions that enhance the learning experience. Unlike a virtual classroom, which is meant to replicate and replace the physical classroom environment for distance learners, a virtual learning environment (or VLE) harnesses technology to supplement an in-class experience, with, for example, digital communication, interaction and quizzes or polls run through the VLE. A virtual learning environment refers to a system that offers educators digitally-based solutions aimed at creating interactive, active learning environments. VLEs can help professors create, store and disseminate content, plan courses and lessons and foster communication between student and professor (in the form of e-mails and discussions), even in real-time. Virtual learning environments are often part of a higher education institution's wider learning management system (LMS) (Top Hat, n.d.).

Virtual mobility

[FI] Virtuaalinen liikkuvuus
[IT] Mobilità virtuale
[PT] Mobilidade virtual
[ES] Movilidad virtual
[SV] Virtuell mobilitet

Virtual student mobility (VSM) is a form of mobility that uses information and communication technologies to facilitate cross-border and/or inter-institutional academic, cultural, and experiential exchanges and collaboration which may be credit-bearing or not for credit. Can be Academic, Experiential, Cultural or Emergency related (UNESCO-IESALC, 2022).

Virtual reality

[CA] Realitat virtual
[FI] Virtuaalitodellisuus
[DE] Virtuelle Realität
[IT] Realtà virtuale
[PT] Realidade virtual
[ES] Realidad virtual
[SV] Virtuell verklighet

Type of environment that involves the creation of a simulated experience that can be similar to the real world (Commonwealth of Learning, 2020).

Virtual workspace

[CA] Espai de treball virtual
[FI] Virtuaalinen työtila
[IT] Ambiente di lavoro virtuale
[PT] Espaço de trabalho virtual
[ES] Espacio de trabajo virtual
[SV] Virtuell arbetsyta

A virtual workspace is a workplace where users are digitally connected regardless of their physical location. Users who belong to a virtual workspace bridge the physical distance, separating them with an array of tools designed to foster close communication and collaboration. A virtual workspace replicates a physical office in the real world (Yfantis, 2020).

W

Webinar

[CA] Seminari web
[FI] Sähköinen tietokanta
[IT] Webinar
[PT] Webinar
[ES] Bases de datos electrónica
[SV] Webbseminarium

A seminar or other presentation that takes place on the internet with the purpose of training, allowing participants in different locations to see and hear the presenter, ask questions, and sometimes answer polls. A webinar can be delivered either live, or recorded and delivered “on demand” giving the flexibility to the viewer to watch the webinar whenever they wish. However, rather than requiring a download like a video podcast, a webinar uses a progressive video stream onto the user’s computer so there is no need for hard drive space nor managing leftover media files (Law Insider, n.d; Zielinski et al., 2020).

Web Quest

[CA] Webquesta
[IT] Web quest
[ES] Búsqueda web
[SV] Webbquest

Inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the internet, optionally supplemented with videoconferencing (Dodge, 1997).

Wiki

[CA] Wiki
[FI] Wiki
[DE] Wiki
[IT] Wiki
[PT] Wiki
[ES] Wiki
[SV] Wiki

An easily-edited set of one or more linked web pages that readers can add to or modify. Facilitates collaborative content creation. Wiki articles represent consensus, but can have an associated discussion page, and are continuously growing and developing in real time. In T&L, wikis are frequently used for peer editing of a document e.g. report, essay, paper; creating glossary of terms or collection of resources e.g. bibliography, reading list; brainstorming for a project; shared knowledge base on a topic, and others (Teaching Unit of the University of New South Wales - Sydney, n.d.).

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