INNOVATIVE
AND TECHNOLOGY-ENHANCED
TEACHING AND LEARNING

TEACHER'S HANDBOOK

Co-funded by the
Erasmus+ Programme
of the European Union

PRINTeL
Promoting Innovative Teaching & Learning

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ERASMUS+ PRINTEL PROJECT

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This Handbook is developed by the joint efforts of the partner universities involved in the ERASMUS+ CBHE "PRINTeL" project (www.printel.am). It is intended for the teaching staff and students of higher education institutions, as well as the professionals from the field of education and training, who are interested in the technology-enhanced innovative teaching and learning interactive methods.

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Forword

The current Handbook is developed within the frames of Erasmus+ PRINTeL project aimed at promoting innovative teaching and learning (T&L) pedagogies in Eastern Partnership Countries (EPC) - Armenia, Georgia and Belarus. The project contributes to enhancing student real-life learning experience by introducing a major change in the classroom via interactive and technology-enhanced T&L practices. The training of the university teaching staff on new, interactive T&L methods and approaches is on PRINTeL target as well.

The expertise and experience of EU and EPC universities participating in the project have served as a basis for this Handbook development. It compiles the materials of PRINTeL training of trainer (TOT) workshops held at 5 EU partner universities, which later were fine-tuned by EPC university trainers based on their 100 in-house teacher trainings (TT) experience.

The Handbook consists of five chapters, each devoted to a certain T&L method and/or strategy, as follows:

Through the material, experience and best practices accumulated in this manual, the Handbook delivers general knowledge on the use of active T&L pedagogical methods mentioned above, suggests practical tips for teachers and trainers, offers methodological patterns applied in students teaching and teachers training and provides a depository of resources on the specified innovative T&L methods.

Each T&L method in this Handbook is described in detail and advices on advantages and challenges of each are offered. The Handbook allows the users to set the pace of their learning, as well as the depth to which they strive in relation to each method.

The present Handbook aims to offer support both for university teachers who themselves want to learn more about active learning methods and for trainers who train their colleagues on the use of these methods. The proposed activities can be undertaken individually, jointly with a few peers or in a more

formal training group. In case of group training, the trainer decides which resources listed in the Handbook to apply. Individual learners can make their own selection of provided material.

Readers interested in being engaged in virtual communities and discussion groups of various teaching practices, as well as seeking for additional Open Educational Recourses (OER) for their practice are kindly invited to get registered and become a member of the **Virtual Academy of Teaching and Learning (VATL)** at www.vatl.ysu.am, - an online platform and a depositary of OERs for the teachers and students interested in innovative and technology enhanced T&L.

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EU partner institutions:

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- Universitat de Barcelona (UB), Spain
- Universidade do Porto (U.PORTO), Portugal
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For further information about the PRINTeL project please visit the project's website on www.printel.am.

Chapter 1

INNOVATIVE AND TECHNOLOGY ENHANCED TEACHING AND LEARNING: ACTIVE LEARNING WITH SPECIAL FOCUS ON TECHNOLOGY ENHANCED COLLABORATIVE LEARNING

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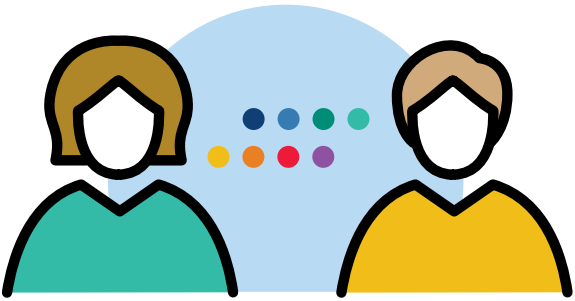
PART 1

AN INTRODUCTION INTO ACTIVE AND COLLABORATIVE LEARNING

Why is it active?
Why will it be collaborative?



1.1. Introducing Activating Teaching for Obtaining Active Learning

The whole idea of reformation of higher education (HE) and changing didactics towards active learning is to be framed into several global changes in education:

- a shift in HE from general universal development to competence development and application of knowledge,
- a leap forward progress in information and communication technology,
- the globalisation of science and education based on a new tendency of managerialism and neoliberalism.

The reorganisation of the European Higher Education started with the Sorbonne and Bologna declarations. The most practical impact for HE in partner countries was the introduction of the ECTS, the European Credit Transfer System from 1989. Formally, from 2007 on, ECTS has been introduced in all HE institutes participating in European educational projects (e.g.: Erasmus+). However, in international cooperation projects the actual operational status of ECTS in many countries and universities is different or even divergent from the original aims of the ECTS system. Especially, in practical cooperation essential misunderstanding, lack of basic operational rules and standards, ambiguities or even contradictions between national legal requirements and internationally accepted quality rules in the European Higher Education Area (EHEA) are the order of the day.

The academic level of universities in the EHEA today is far from homogeneous. Simple differences in the formulation of teaching and operational goals, assessment methods and examination goals, student and teacher workload definition, legal and educational quality requirements, the universities' funding rules, integration of research and service to society in the universities' teaching tasks are all influencing in as many ways the educational output of HE, they are

still hindering student and staff mobility in the EHEA and limit educational and didactic degrees of freedom for university students and staff.

Even the introduction of new didactic methods, i.e. new IT based methods in Teaching and Learning (T&L), is influenced and is being threatened on all sides by these annoying internal and external divergent parameters. Now that the use of photographic slides in teaching really becomes out-dated, the acquisition of suitable IT teaching hardware may become a new barrier.

That is why we have not only to pay interest to new and commonly available educational and didactic methods, but as well to the universities' organisational systems.

That's why this brochure must be more than a cookbook, a simple list of recipes, but has to pay attention to the whole environment of educational "cooking practice".

1.2. Active Learning: a Definition

The website of Queen's University (CA) (https://www.queensu.ca) in its section on "teaching and learning" is offering a suitable definition of active learning [1]:

"Active learning is an approach to instruction that involves actively engaging students with the course materials through discussions, problem solving, case studies, role plays and other methods. Active learning approaches place a greater degree of responsibility on the learner than passive approaches such as lectures, but instructor guidance is still crucial in the active learning classroom. Active learning activities may range in length from a couple of minutes to whole class sessions or may take place over multiple class sessions".

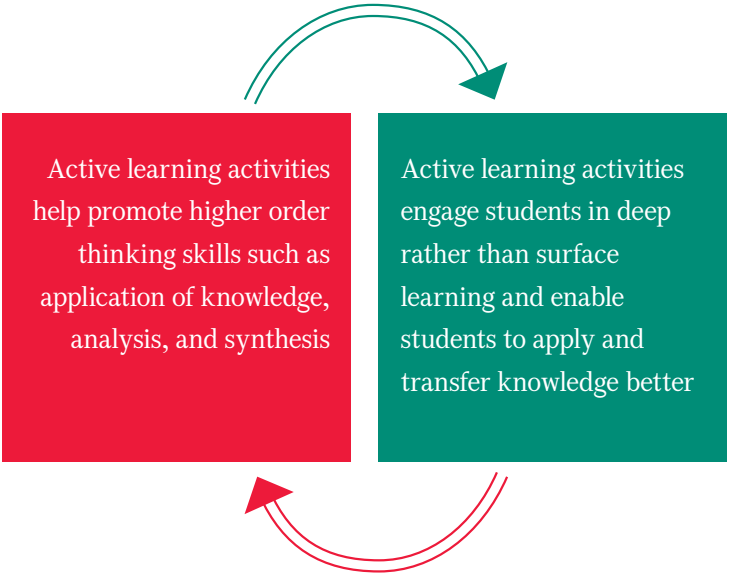


Fig. 1. Active learning: the teacher's and the learner's perspective

This website also mentions a practical answer to the question why to apply active learning and allows to explore how and when action is required in active learning from a teacher's perspective as well as from the learner's point of view.

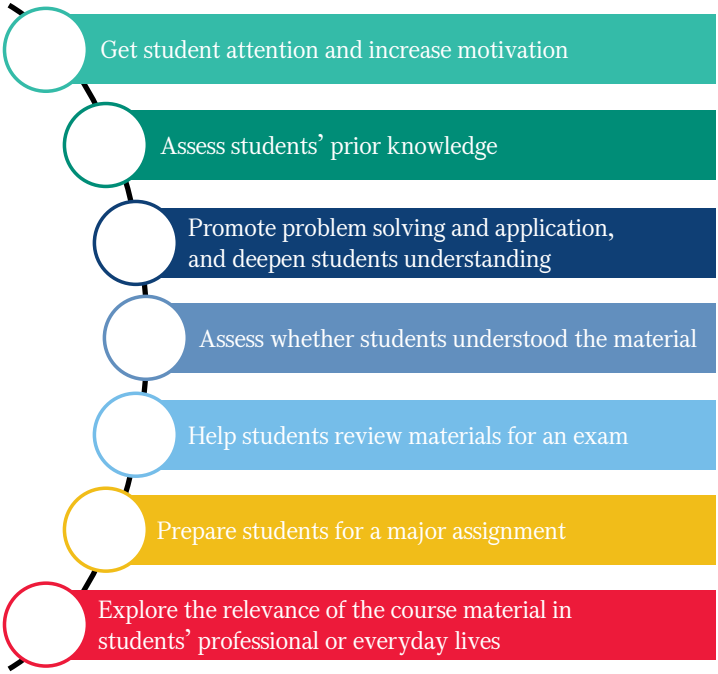


Fig. 2. Major outcomes realized by active learning

1.3. Active Learning: is it an Opportunity or a threat to the Teacher?

… Or is it simply a matter of changing didactical concepts, methods and attitudes?

The lecturer had a nagging question: " for so many years I wrote a good course text; why should I change it now?"

… The students have changed,
… the graduates' profile has changed,
… the field of professional teaching has changed,
… the university changed,
… the world changed,

… even you changed, but did you change your teaching method? So, … shouldn't you change it now?

To our oinion active T&L offers a perfect opportunity for changing academic T&L: updating programme and course building concepts, teaching methods and past attitudes.

In the past few decades, several major facts have lead to significant changes that should be taken into account when talking about education and learning and definitely, when providing academic education and designing academic programmes and courses.

External factors of change

Discussion text based upon the ideas of Sir John Daniel [2].

The overwhelming growth of IT-technology.

The digitalization of the world and the availability of vast amounts of information created a new environment for young people and for education. Undoubtedly, the generation of students now starting an academic education is acquainted with IT-technology: PCs, laptops, tablets, smartphones, … are common elements in their daily world and they are using these technologies. This is the first real IT-generation. These younger people are IT-literates, but do they use these sources of information for learning? Or does this abundance of information result in a very ephemeral confrontation that has no learning effect?

Is this IT generation really "learning" by using IT-technology?

The changing economy.

Where the previous centuries were dealing with industrialization, mechanization and automation, industry in the last few decades has been catapulted into computerization. The fast growth of IT-technology transformed industry into a knowledge-economy. This fast transition created

a huge increase in demand for highly educated scientists and highly skilled technologists, while expelling unskilled workers.

Although the demand for competent graduates is high, the study offer never has been as large as today and the study duration has never been as long as today.

Do IT-generation students study and learn in an effective and efficient way?

Employment, unemployment and underemployment.

Computerization and robotization are destroying simple jobs for low and middle-skilled workers causing a huge problem of unemployment all over the world, even for younger people.

On the other hand there is a massive problem of underemployment of graduates while – very contradictory – employers loudly complain that they cannot find the highly qualified people they need: technologists and scientific generalists, engineers.

Lots of graduates seemingly do not dispose of the competences and attitudes requested by industry. The graduates' profile should change because professional fields have changed.

Are our IT-generation students not learning the right things?

Internal factors of change

The student has changed.

University students' profiles changed dramatically; some characteristics of the generations Y and Z heavily impact their ability to study and to learn.

- The Internet allows fast tracing of information, but the perception might be fragmentary and often there is no proof of scientific value.
- The abundance of information on the Internet causes great volatility of the students' attention and loss of concentration during a scientific search; constant distraction and loss of attention prevents logical thinking and good understanding of complex scientific concepts.

- The false idea of having all information at hand via the internet search engines causes a lack of motivation to find and to acquire new knowledge; "we all know it anyway" in fact means: "Google" knows.

The university is changing. The shift in competences required for graduates should influence dramatically the content of university education and greatly contribute to the urgent need of life-long learning. Is that really so? Historically, universities have an inbuilt "conservatism" and that is good, because the university not only provides market directed professional education. However, changing education programmes, working habits or teaching methods is going slow before it is answering to the call of rapid social and economical developments.

Because of a rapid transformation of professions, the education system should already train students for both, newly emerging jobs, the scope of which is not clear yet, and for future jobs that yet are not defined or known at all.

Can we speak today about a crisis of "graduates' profiles"? Then, what is the new role of the university? Therefore, the university clearly needs to redefine the learning objectives and set again its scope of programmes and courses.

The university can cope with the shift in professional fields by shifting the education of students from specialists to scientifically educated generalists.

The students' profile – The profile of the IT-generation: generation Z

Let's spend some more attention to the changing students' characteristics.

Nowadays, learning and teaching systems at higher education institutions (HEI) in developing and developed countries are confronted with a generation of people born in the late 1990s and early 2000s, who are now leaving secondary school and are joining the university. This new students' generation is named the IT-generation or Generation Z (Fig. 3), they grew up with the Internet and social media and all these young people currently use smart phones, tablets, laptops, etc.

Many students are using various social networks for getting information and online tools for studying professional subjects (Fig. 3 and 4).

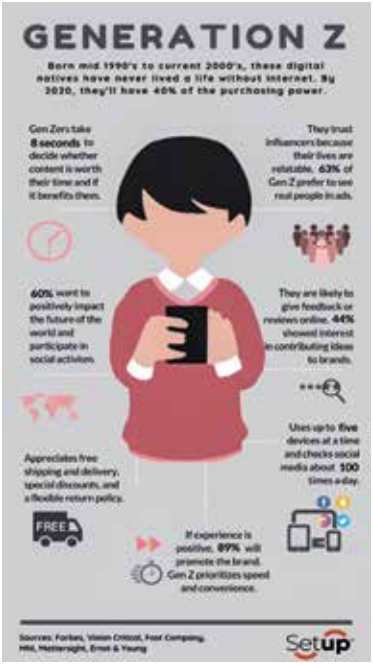


Fig. 3. Generation Z or IT-Generation
https://setup.us/infographics2/marketing-to-generation-z

To address this issue we first need to understand the possibilities and capabilities of students, lecturers and universities to modernize their educational systems and to implement new methods of teaching based on quality and tools that are used by the new generation. The raised issue is a challenge mainly for the HEI in developing countries as the modernization of teaching methods also based on IT technologies needs financial and human resources. For higher education in developed countries it is easier to cope with the pace that IT-technologies are firmly occupying their territory in the social and economical environment; for developing countries to move in the same direction with the same speed as it happens in the IT-generation is quite difficult.

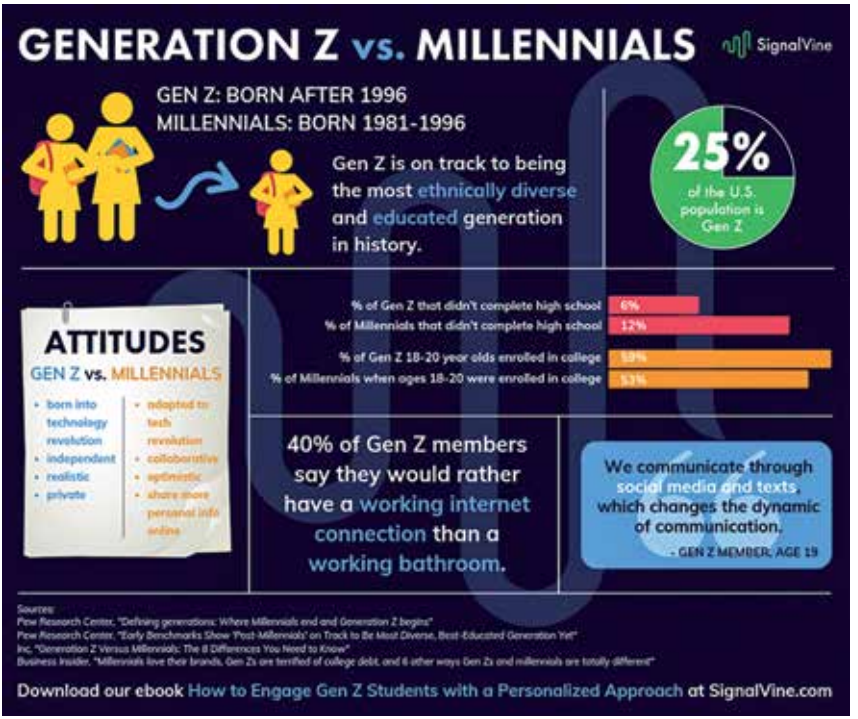


Fig. 4. Difference of Generation Z (born between 1995-2015) and Millenials (born between 1980-1994)
https://www.signalvine.com/higher-education/infographic-gen-z-vs-millennials

Moreover, because of the conservative character of the educational and research systems in HEIs the speed of change for responding to the new global environment will remain an issue for the coming 10 years.

One way to try to solve partially the issue is to implement active learning methods considering for some parts of the lectures using technology based active learning methods such as using online tools that are related to the use of smart phones or tablets, e.g. the assessment tool “Mentimeter”.

It is recommended that classical lectures would not be less than the suggested new ones (see Fig. 5). So, when deciding on the volume of implementation of this

new type of lectures or the percentage in the study programme we should be aware that these new methods might require more teaching time and that the positive learning effect is far from equally spread over the student population.

Adapted from Thinking Together:
Collaborative Learning in the Sciences – Harvard University – Derek Bok Center

Fig. 5. Possible lecture time frame when applying active methods
https://cei.umn.edu/active-learning

The main problems that can interfere are:

- Resistance within the education system;
- Calculation of the lecture hours and students' study load when pursuing active learning methods;
- Evaluation criteria used for exams and assessment;
- Student mobility effects;
- Difference in acquired study skills between bachelor and master programme students;
- Difference in learning goals between human and natural science programmes;
- Financial and human resources.

These are main issues that must be considered when implementing and deploying active learning methods on institutional level.

However, some methods can easily be used in PRINTeL PC-universities as these are already used by some lecturers, albeit not in a structured and formalized way.

Anyway, the first step should be to conduct a first cycle of trainings for university teachers in PC-universities. After controlled deployment, the success of the new methods should be evaluated after 3-4 years.

Next will be the change of the teaching environment, regarding the structure of auditoriums and lecture rooms (Fig. 6).

Of course not all methods can be accepted; that is why it is important to evaluate the needs of each university and involved educational programme , for each educational programme is requiring an individual approach.

For PC-universities it is suggested to implement active T&L first in the Master programmes as there is more flexibility in the study units' content compared to the Bachelor programmes.

In the Bachelor programme, it is more recommendable for ease of working to limit the implementation to multidisciplinary or general education courses or subjects.

Fig. 6. Active learning classroom: a multifunctional and flexible setup
https://www.insidehighered.com/digital-learning/article/2018/09/12/study-trying-new-forms-instruction-wont-lower-student

Overall the monologue lecture system must be transformed to interactivity, which will promote developing critical thinking among students (Fig. 7).

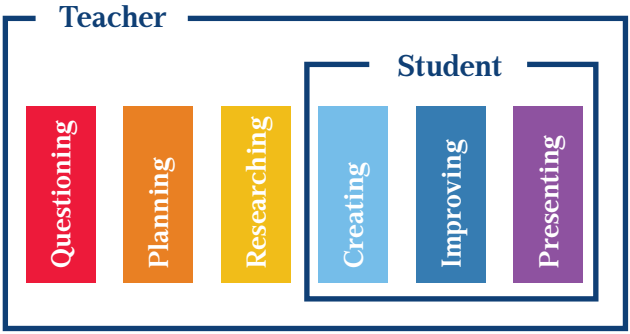


Fig. 7. Teacher and student responsibilities
http://institute-of-progressive-education-and-learning.org/k-12-education-part-ii/based-learning/

Moreover, specific active learning strategies (Fig. 8) should be chosen according to the specific requirements of the educational programme, which will help to develop skills and attitudes required by the professional environment on the labor market.

Nelson, Nancy "Active Learning"

Fig. 8. Goals when choosing strategies for active learning
https://www.slideshare.net/nnelsn/active-learning-ceea-2015-48809769

In PC-universities, today student mobility is limited and is a problem as students are not free to choose subjects from different faculties or universities.

Considering the study ability, the lecturer first shall evaluate the students' prior learning achievements to understand which methods to use during the lectures. This depends on the students' prior knowledge, socio-cultural acceptability and preparedness to study using these new T&L methods.

When considering the implementation of active learning methods, it is important to review and to adapt the assessment and evaluation system for the students' performance. Moreover, there are many active learning methods and each of them requires a proper and effective evaluation method.

An important challenge in all PC-universities is the implementation difference in natural and human sciences subjects and this problem shall be solved at the institutional level.

In some cases, the same methods can be used for subjects in Bachelor and Master Programmes but still the evaluation criteria might be different.

Generally, on these issues the decision should be taken at university or faculty level specifically for each programme as it is part of the strategic plan for implementation.

In all universities, the financial and human resources always pose serious problems. Frequently, the university management shall be facing a shattering problem: how to maintain the high education quality level: decreasing the number of programmes, focusing on the strategically most important ones? Or should be opted for decreasing the lecturer's assignment of weekly lecture hours by increasing the multidisciplinary subjects? Or is it an option to resist to global educational changes by rejecting technological development in didactics and hence, or opting for a lower educational quality level?

1.4. Strategy for the Introduction of Active Learning

Strategic deployment of new, computer-assisted technology should contribute to improve the effectiveness of the learning process and should increase the efficiency of the educational practice. New IT-based educational technology should contribute to educational feasibility.

Educational feasibility is defined by four parameters:

- Learnability: are the learning content and the pace of teaching adapted to the students' prior knowledge and learning capacity?
- Teachability: are teachers sufficiently trained and technically able to apply the new IT-based systems for creative didactical and methodical application? It requires not only new skills, but also new structurally different ideas in programme and course development.
- Organizability: is the university management able and ready to put the new IT-based systems at disposal of the teaching staff? Will the adapted classroom with the required equipment at the right moment be available for each student group? The last factor might be a critical or limiting factor.
- Affordability: can the university dispose of the necessary budgets for acquiring and maintaining sufficient and adapted IT-based systems (hardware and software), to install these in the necessary classrooms? (Fig. 9. Educational feasibility).

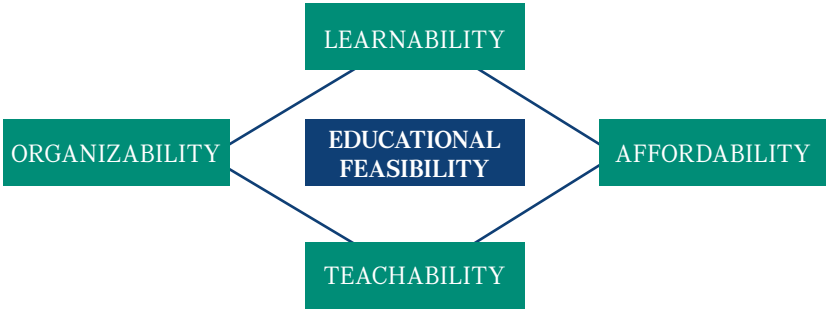


Fig. 9. Educational feasibility: defining parameters

As a consequence and a primary requirement for realizing educational feasibility, input and action is required from all stakeholders in the T&L (teaching and learning) process: i.e. students, teachers and the management level of the educational institutes.

At the level of teaching staff the introduction of active learning in a technology supported environment puts forward new requirements in instructional design:

- taking into account students' characteristics, i.e. previously acquired competences;
- defining educational goals, specific teaching goals, operational goals;
- defining the competences to be acquired according to the predefined educational goals;
- defining clearly the knowledge/skills that shall be transferred according to the specific teaching goals;
- strategically selecting teaching tools and methods according to predefined operational goals;
- creation of a supportive learning environment, teaching tools including assessment tools, coaching and supportive communication channels.

The university management is responsible for providing all means needed for the well functioning of the university community and for a university environment that is nurturing a good functioning of the university. It means that the university management shall create an academic environment that allows the university organisation and staff to work out their triple task: creating new science and technology by doing *research*, providing *academic education* and delivering *scientific service to society*.

Switching the university's system to the implementation and deployment of active learning is not possible without the support of the university management, for the management has an impact on the application of legal rules and educational quality requirements, on the budgeting of and investment in information and communication technology and on the human resources

management. Each of these three parameters has an undeniable and important effect on the academic education level and the education quality and hence, on the national and international reputation and ranking of the university.

It is therefore self-evident that university managers must be familiar with the new developments in building a "learning environment", the use of new teaching methods, including IT-facilitated teaching and learning, and on-the-job training for teachers. The university does not need full-blooded administrators; every university manager should remain a "learner" in the field of didactics and methodology.

Implementing active learning requires to adopt a set of well thought educational strategic goals and hence, a strategic planning how to reach these goals using the available means – financial and material means – and human resources, i.e. the corresponding group of teachers and students.

Basic ideas on strategic planning should underpin the actions of the administrative, financial and educational management team of the university for introduction and deployment of active learning.

Even when the university management provides all necessary resources and creates an environment that promotes academic education, innovation and initiative for the introduction of active learning, effective initiatives and practical introduction will have to come from the teaching staff. Therefore teaching staff should be motivated and must be well instructed and trained. So, retraining, additional training, and on-the-job training are an absolute necessity and continuous learning is the destiny of every teacher.

Even teachers shall know and understand the university's strategic plan for introduction of active learning because it is up to them to execute the university's "*active learning strategy*".

How to bring the university teaching staff towards the introduction of active learning?

Even though you will find competent teachers everywhere, let us be fair, it is not the teaching staff that shall draw up the university's strategic plan for active learning.

Even though in all schools, in all universities, one will always find individuals experimenting with activating learning and new teaching methods, the main question is how to bring these many small islands of innovation together in a structural innovation project of the university's teaching culture.

Maybe, an Erasmus+ project like PRINTeL can do? At least, this is the main aim of the PRINTeL project. And we know that there are many of these projects on-going and some already finished. So, the seeds of educational innovation may generally be present, a structured innovation project can be the tool for uniting individual initiatives.

How to start the "active learning" innovation project?

An "active learning" innovation project per definition is a strategic project. The strategic goal is to introduce active learning as a generalized didactic approach within a well-defined timespan, for example five years. The realisation of this strategic goal requires an updated learning environment, the adoption of new teaching and learning methods and therefore we need a well-trained teaching staff that can dispose of adapted IT-supported technologies.

To make a success of an "active learning project" we have to work out this project in regular business terms and should approach it as a strategic project. This approach includes: linking the realization of the educational innovation *goal* in each *specific university* to the *available means* – material means such as buildings, class rooms, technology, but also people as teaching staff, students and the whole university organisation support.

This project management approach requires some well defined steps:

- Write a *good* ***vision statement***, based upon the *mission statement* and *values* of the university, which is always a variant on the same theme: "Offering the best academic education, developing new knowledge by doing research and offering scientific service to society …".

The vision statement is telling where the university wants to stand within a defined timespan (e.g. 5 years) in this case concerning the deployment of active learning in the university.

Example. Vision statement of university x. Within five years, university x will reorganize its teaching and learning system in such a way that the whole university organization, all teachers and students, will be able to participate in active learning.

- A ***gap-analysis*** *and a* ***SWOT-analysis***: we need to compare the situation "as is" to "as should be", hereby defining the gap that we have to bridge. A SWOT analysis is defining Strengths, Weaknesses, Opportunities and Threats in our specific situation; it reveals the university's capabilities, opportunities and risks. Of course, these parameters will be different and specific for each academic institution, for each university.

Example. A gap and SWOT analysis for university x might reveal that:
- *classrooms are not equipped to allow the use of the necessary electronic tools for active learning,*
- *the furniture of the classrooms does not allow practical rearrangement,*
- *there is insufficient expertise available in the university for the introduction of active learning,*
- *the teachers' corps is insufficiently trained to apply active learning,*
- *there are insufficient information and communication resources available.*

- ***Strategic priorities.*** The SWOT analysis is the basis for the defining the *strategic priorities*: these are the limited numbers of essential and well-delineated concepts and conditions to fill in first for realizing our vision statement.

Example. University x could define as strategic priorities:
- *Necessary material and financial means. Provide on middle long term financial and material means and electronic tools allowing for the*

implementation and deployment of active learning methods in the regular educational system

- *Knowledge and skills. On short term, start a central service organization within the university to bring together and to broaden all available individual expertise related to active learning and teaching and to build up resources and structures to anchor and generalize this expertise in the teaching staff through on-the-job training*
- *Technological means and electronic learning platform. Install a central electronic learning platform to allow sufficient information retrieval for academic education and inter- and intra-university communication.*

- ***Strategic objectives.*** From the strategic priorities can be derived a limited number of strategic objectives or goals. What shall we aim at, first of all?

Example. University x could define as strategic priorities:

- *Equip classrooms in each faculty building with the necessary electronic tools for active learning;*
- *Adapt the layout of (small and medium sized) classrooms to allow flexibility and rearrangement enabling interactive teaching and learning methods;*
- *A central service department will be staffed with the required pedagogical and technical experts for research into active learning and for technical supervision and methodical coaching of teaching staff for active T&L;*
- *Offer training in active teaching and learning methodology for all university teachers;*
- *Adapt the university's educational organization to the implementation and deployment of active T&L;*
- *A central electronic learning platform will be installed to allow sufficient information retrieval for reaching pedagogical, didactical and methodical information and for inter- and intra-university communication with all the university's stakeholders.*

- ***Effective projects, operational objectives and operational plans.*** Each strategic objective shall be worked out in a *subproject*, having this specific

project goal to be reached through the achievement of delineated *operational objectives* and *operational plans*. Do not forget to define the operational plan answering the questions: *what, who, where, when, and how?* Effective projects are ordered in a time-schedule, which can be clearly presented on a *time-line*.

Example. In the following enumeration we can only mention some possible outlines of project themes.

- *Classroom equipment: install in the classrooms the required electronic hardware and software: a laptop or PC, connected to the university's central IT-system, a beamer and/or interactive whiteboard, … Remember that the classical teaching system by lecturing at the blackboard still has its merits and does not have to disappear completely.*
- *Adapt the classrooms' layout for offering flexibility in class arrangement: rearrangement of classroom furniture to allow for interactive teaching, refurbishment of classrooms, …*
- *Training for active teaching and use of new learning methodology: training and retraining the largest possible number of teaching staff members, which most efficiently could be done in an external training-for-trainers schedule, coupled to an internal train-the trainer schedule, …*

  Internal promotion of active T&L might be fruitful: highlighting individual active T&L success initiatives, offering a reward system for successful active T&L projects, providing an instalment for a competitive system for financial and/or material support for active T&L teams and projects, …
- *A central electronic learning platform. This is a must for each well performing university management system. An electronic learning platform includes a central administrative and operational management system, a full educational system (lecture tables and announcements, provision of all documents like courses and additional reading, coaching system, electronic assessment system, etc.), a functional communication system for organizational staff, teachers and students (communication of organizational data, e-mail, chats, online phone-communication), etc. …*

- ***Milestones*** and ***Key Performance Indicators*** (KPI). The follow up of the achievement of the subprojects in function of time can be guaranteed when the end of each subproject is defined as a milestone on the time-line. Reaching subsequent milestones visualizes the progress of the over all project performance.

  KPIs are measurable values that demonstrate how effectively the project's key objectives have been achieved. KPIs are used to evaluate the success at reaching targets.

> *Example. Hereafter we can only mention some examples of KPIs and milestones.*
> - *KPIs: number of (re)trained teachers, percentage of course texts offered on the learning platform, numbers of course units using active T&L methodology, teachers' and students' satisfaction data, …*
> - *Milestones: start/end of T&L train-the-trainer cycle, opening of refurbished classrooms, opening of the electronic active T&L library, …*

- ***Continuous improvement***. Apply the ***PDCA-cycle*** to improve continuously the process achievements.

> *Example. The management of each project is always subject to the Plan-Do-Check-Act cycle. It means that after ending a (sub)project, the project team shall restart a PDCA cycle to guarantee the good quality of the project's outcomes. The PDCA cycle is a systematic way for continuous improvement. More information on quality management and the PDCA cycle you can find in literature on project and quality management.*

As we have mentioned before, the introduction of active T&L originates from individual initiatives of teachers. The shattered introduction of a new student-centred didactic method can create a wake-up call for a wider part of the university staff, teaching staff as well as management staff.

The strategic approach of a university-wide introduction and a generalization of practice shall be conceived and guarded or at least shall be actively supported by the *university management team*. That is part of the management's decision-making responsibility.

The scientific and operational aspects of the project belong to the *teaching staff's* tasks.

The *IT-department and the financial and administrative departments* of the university shall play only a supportive role.

PART 2

INSTRUCTIONAL DESIGN: THE BASICS FOR DESIGNING A GOOD COURSE

Good design and planning, while crucial for every type of course, are even more important for activating and technology enhanced courses. In traditional training, the largest effort is in the delivery of training sessions, while in activating and technology enhanced learning, the design and development of the learning environment and materials is much more crucial to guarantee the quality and achievement of the objectives. Therefore, the use of **instructional design** is imperative.

> ***Instructional design (ID), also known as instructional systems design (ISD), is the practice of systematically designing, developing and delivering instructional products and experiences, both digital and physical, in a consistent and reliable mode toward an efficient, effective, appealing, engaging and inspiring acquisition of knowledge and skills.***

In the next chapters the following **instructional design basics** will be covered:

2.1. A good starting point for incorporating technology into active learning is to apply the **TPACK model**. It blends the use of technology, content and pedagogy by finding the ways in which they connect, intersect and then support active learning. As a teacher it gives you a good overview of the knowledge needed to successfully integrate technology in your course(s).

2.2. The components that need be taken into account while designing a course will be examined by using an **instructional design model developed by the KU Leuven (Belgium)** turning mainly at users without much prior instructional design experience.

2.3. Then it's time to take a closer look at the actual instructional design process itself. The **ADDIE Model** and its five design phases are used to illustrate the practice of systematically designing, developing and delivering a course.

2.4. Finally the actual design and development of these instructional design

components will be examined more in-depth using the five design phases of the ADDIE Model. We will take a closer look at how you can address them **in practice** and introduce qualitative technology enhanced learning experiences in your course or curriculum.

2.1. Knowledge Needed as a Teacher - TPACK Model

Technological pedagogical content knowledge (**TPACK**) is a framework to understand and describe the kinds of knowledge needed by a teacher for effective pedagogical practice in a technology enhanced learning environment. Mishra and Koehler added technology as a third modeling element to Lee Shulman's pedagogical and content knowledge based model. They proposed that addressing content knowledge, pedagogical knowledge AND technological knowledge concurrently provides a framework for successful technology integration in the curriculum [3].

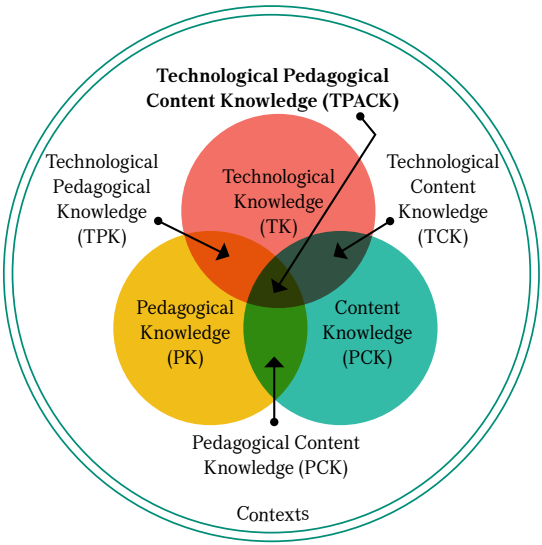


Fig. 10. TPACK Model

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At the heart of the TPACK framework there are three main components of teachers' knowledge:

- **Content Knowledge (CK):** Knowledge about the subject matter to be learned or taught.
- **Pedagogical Knowledge (PK):** Knowledge about the processes, practices or methods of teaching and learning.
- **Technological Knowledge (TK):** Knowledge about ways of thinking about, and working with technology, tools and resources.

The TPACK approach goes beyond seeing these three knowledge bases in isolation by emphasizing the kinds of knowledge that lie at the intersections:

- **Pedagogical Content Knowledge (PCK):** Knowledge of pedagogy that is applicable to the teaching of specific content.
- **Technological Content Knowledge (TCK):** Knowledge of the manner in which technology and content influence and constrain one another.
- **Technological Pedagogical Knowledge (TPK):** Knowledge of how teaching and learning can change when particular technologies are used in particular ways.

Therefore to effectively incorporate technology into active learning, teachers need to combine all the above components:

- **Technological Pedagogical Content Knowledge (TPACK):** TPACK is the basis of effective teaching with the use of technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones.

Learning always takes place in a specific **context (dotted line)**. Effective technology integration, therefore, requires developing sensitivity to the dynamic, transactional relationship between the TPACK components and the unique context it's situated in: individual teachers, grade-level, school-specific factors, demographics, culture, infrastructure and other factors ensure that every situation is unique, and no single combination of content, technology, and pedagogy will apply for every teacher, every course or every view of teaching.

2.2. Instructional Design Components - KU Leuven Model

The KU Leuven (Belgium) designed the following all-inclusive and low threshold instructional design model for its own teachers. This model is aimed at user-friendliness and allows first time users to (re)design their course without much prior instructional design knowledge or skills.

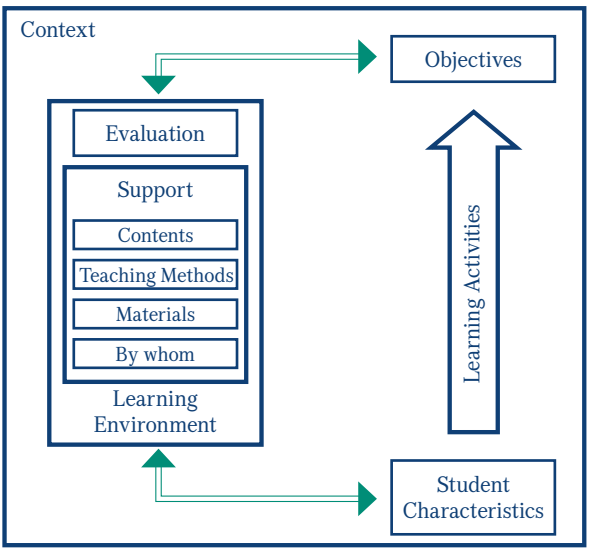

Fig. 11. Instructional Design Model at KU Leuven

This model collects all components that need to be taken into account while (re)designing a course and makes it feasible for less experienced teachers to (re)design their course by taking a closer look at all components and their intermediate relationships:

- **Student Characteristics** - What characteristics do the students have?
- **Learning Activities** - Through which activities will these students acquire new knowledge and skills?
- **Objectives** - Which knowledge and skills do the students have to acquire?
- **Learning environment** - How will the learning of the students be supported and evaluated?
- **Context** - What is the context of learning for the students?

2.3. Instructional Design Process - ADDIE Model

Now we know about the different instructional design components, it's time to take a closer look at the actual **design process** itself. Instructional design (ID), also known as instructional systems design (ISD), is the practice of systematically designing, developing and delivering instructional products and experiences, both digital and physical, in a consistent and reliable fashion toward an effective, efficient, appealing, engaging and inspiring acquisition of knowledge and skills.

The **ADDIE model** is the most used generic design process traditionally used by instructional designers and training developers. The five phases – Analysis, Design, Development, Implementation, and Evaluation – represent a dynamic, flexible guideline for building an effective training or course [4].

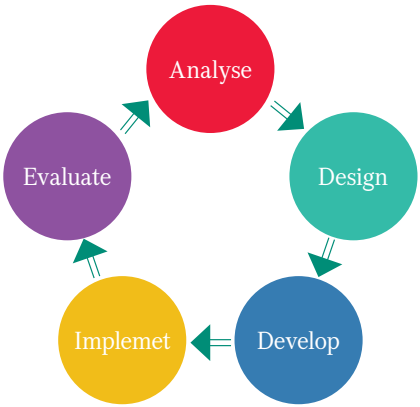

Fig. 12. ADDIE Model

In the ADDIE model five design phases can be distinguished, where each step has an outcome that feeds into the subsequent step:

1. Analysis phase

In the analysis phase the instructional problem is clarified, the instructional goals and objectives are established and the context and learner's existing knowledge/skills are identified. Below are the components (see. 2.2) that are addressed during the analysis phase:

- Student characteristics
- Objectives
- Context.

The process of asking these questions is often part of a needs analysis. During this needs analysis instructional designers will determine constraints and resources in order to fine-tune a plan of action.

2. Design phase

The design phase deals with the different components of the learning environment that need to facilitate learning and help students achieve the course objectives: content of the course, teaching methods, tools and materials used, who will teach/guide the course, how will it be evaluated, …?

The design phase should be systematic and specific. Systematic means a logical, orderly method of identifying, developing and evaluating a set of planned strategies targeted for attaining the course goals. Specific means: each element of the instructional design plan needs to be executed with attention to details. The design phase may involve writing a design proposal to aid final development or funding.

The components (see 2.2.) that are addressed during the design phase:

- Contents and Materials
- Teaching methods and learning activities
- By whom
- Evaluation.

3. Development phase

In the development phase, instructional designers and developers actually create and assemble the components described in the design phase. If e-learning is involved, now you develop (new) or integrate (existing) technologies and tools needed. Always test and debug the e-materials and procedures. After completing the development of the course material, an imperative pilot test should be conducted. Involving key stakeholders and giving the new learning environment with its course material and tools, teaching methods, evaluation and teachers a thorough test run, can carry this out. A final revision now takes place based on the reviews of this test run according to the feedback gathered.

4. Implementation phase

During the implementation phase, a procedure for training facilitators and learners is developed. The facilitators' training should cover the course content and materials, objectives, teaching method and evaluation procedures. Preparation for learners includes training them on new tools (software or hardware) and student registration.

This is also the phase where the course manager ensures that the course materials, hands on equipment, tools and software are in place as well as the learning management system or website is functional.

5. Evaluation phase

The evaluation phase consists of two parts:

Formative evaluation is present in each stage of the ADDIE process, by using a range of formal and informal assessment procedures during the instructional design process in order to modify and optimize all components.

Summative evaluation consists of tests designed for specific components and provides opportunities for more in-depth feedback from the users on course reception, learning outcomes and behavioral outcomes. A summative evaluation is mostly done at the end of the course or at specific intervals.

2.4. Instructional Design – In Practice

Here the actual design and development of the instructional design components will be examined more in-depth using the five design phases of the ADDIE Model. We will take a closer look at how you can address them **in practice** and introduce qualitative technology enhanced learning experiences in your course or curriculum.

2.4.1. Analysis phase

During the analysis phase the instructional objectives are established, the student characteristics are identified and the broader context in which this learning takes place is determined. The process of asking these questions is often part of a needs analysis, determining constraints and resources in order to fine-tune the plan of action.

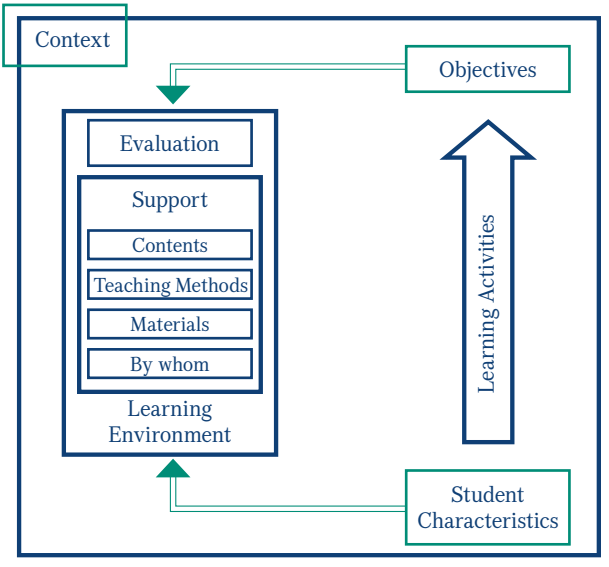

Fig. 13. Components covered during Analysis Phase

Analysis of student characteristics

The concept of student characteristics is used to designate a target group of learners and define those aspects of their personal, academic, social or cognitive self that may influence how and what they learn. Student characteristics are important for instructional designers as they allow designing and creating tailored instructions for a target group. It's expected that by taking account of the characteristics of learners, more efficient, effective, and motivating instructional materials can be developed [5].

Dick and Carey (1978) describe the process of analyzing students and identify a set of student characteristics shown to affect learning above and beyond general characteristics such as age, grade level and topic being studied [6]. While this may seem like a lot of information to collect about students, it can be very helpful in designing effective education programme s. The most important characteristics to take into account are:

- **Entry Behaviors** - Which skills associated with learning goals, should already be mastered by the students?
- **Prior Knowledge of the Topic Area** - What should students already know about the topic?
- **Attitudes Toward Content and Potential Delivery System** - What are the students' impressions and attitudes about a topic and how it might be delivered? In other words, will they have any preconceived notions about the topic or the delivery system (teaching method and materials)?
- **Academic Motivation** - How motivated are students to learn the topic and skills, and how much is it likely to interest them?
- **Educational and Ability Levels** - What are the achievement and general ability levels of the students? Knowing this helps determining the kinds of instructional experiences they may have had and their ability to cope with new and different approaches to instruction.
- **General Learning Preferences** - What types of learning approaches do the learners prefer? For example: lecture, seminar, case study, collaborative, e-learning, …?
- **Attitudes Toward Training Organization** - How do the learners feel about the organization providing the training?
- **Group Characteristics** - Is there heterogeneity within the target population? If so, make sure to accommodate the diversity. Also, get a general overall impression of the target population based on interactions with them.

Digital natives

Information and Communication technologies (ICTs) have changed our societies. As a consequence knowledge is changing; access to and acquisition of knowledge are changing; the ways in which we work with others are changing. In this digital society, a new generation has emerged: **digital natives**. They have grown up in the digital age, rather than having acquired familiarity with digital systems as an adult, as a digital immigrant.

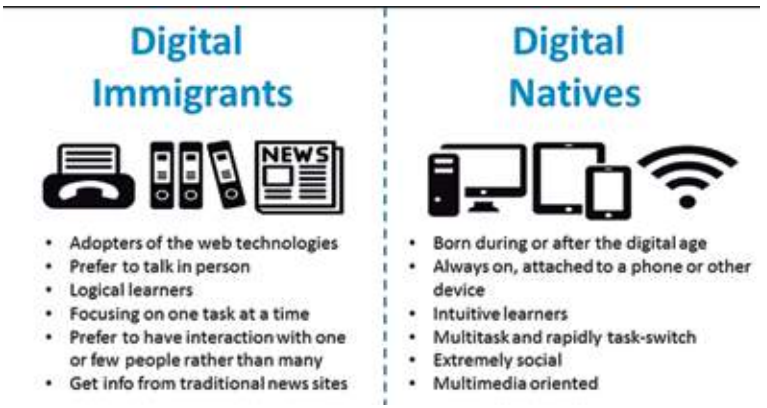

Fig. 14. Characteristics of Digital Immigrants vs. Digital Natives

The new era of technology accompanies with it the new era of education. These digital natives shall be taught in a way quite different than ever before. Therefore adapting courses to an active learning format with a special focus on technology enhanced and collaborative learning is an important step towards taking into account modern student characteristics and making it future proof [7]. Some helpful guidelines on working with digital natives:

- Examine the content of your "traditional" course and focus more on content and skills that are essential to knowledge construction in the digital era.
- Embed digital and technological content in your teaching.
- Instead of focusing on the teacher, the education system should focus on the student.

- Instead of teaching students how to memorize information, teachers should teach their students how to discover it themselves using critical thinking skills.
- Instead of delivering a one-size-fits-all form of education, customize the education to fit each student's individual learning styles.
- Encourage them to collaborate among themselves and with others outside the school.
- Learn to communicate in the language and style of the Digital Natives.

Analysis of the context

The **context** in which learning takes place, can greatly affect the student's ability to learn [8]. Therefore it's important to already consider the learning context and its ability to facilitate the content being taught during the analysis phase, in order to optimize learning for all students. An examination of the context allows us to address the fact that learning is not just a mental activity that occurs in a vacuum. Rather, many interacting factors affect learning and performance. Consider some of the following questions when planning the learning environment to gain insight in the characteristics and possible restrictions or opportunities of the context in place:

- **Infrastructure** - What are the characteristics of the teaching location? Which equipment and technologies are available? Are they suited for the learning activities of the students and the teaching methods of the teacher? Is the learning environment comfortable, free from distraction and does it adequately enable learning?
- **Accessibility** – How can the course and the accompanying materials be made available for the students? Are there access restrictions? Learning management system available?
- **Mobility** – What about learning beyond the classroom? Support for 24/7 anywhere, anytime' e-learning possible? Learning management system available?
- **Culture** – How does local culture influence learning? What is the learning culture on institutional level?

- **Size of the group** – What is the group size? What are the group dynamics? How will these influence teaching method, location, guidance and evaluation?
- **Technological resistance** – How open for and experienced with technology are the students, teachers and institution?

SWOT Analysis

A helpful tool to gain insight into the learning context is by doing a **SWOT analysis**. A SWOT analysis organizes the strengths, weaknesses, opportunities and threats of your course into an organized list and is usually presented in a simple two-by-two grid. Strengths and weaknesses are internal to your course/institution—things that you can control in some way and can change. Opportunities and threats are external—things that are going on outside your course/institution, in the larger environment. You can take advantage of opportunities and protect against threats, but you can't change them.

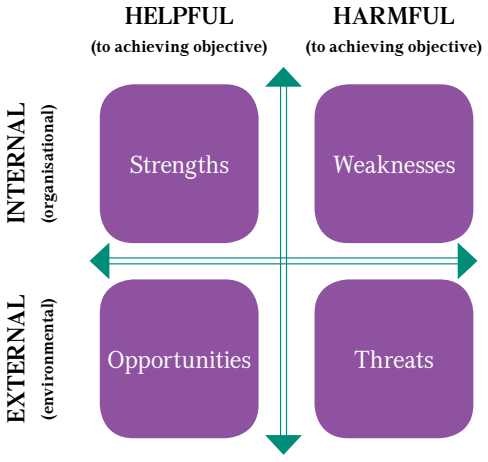

Fig. 15. SWOT Analysis

To perform a SWOT analysis, first you gather people involved in the course and from different parts of your institution [9]. Then you start generating a list

of prioritized ideas for each of the four quadrants:

- **Strengths** - Internal, positive attributes of your course/institution. These are things that are within your control.
- **Weaknesses** - Negative factors that detract from your strengths. These are things that you might need to improve on to optimize your course and facilitate learning.
- **Opportunities** - External (or environmental) factors that are likely to contribute to the teaching and learning success.
- **Threats** - External factors that you have no control over. You may want to consider putting in place contingency plans for dealing with them if they occur.

Based on the results of the SWOT analysis, you gain insight into the main characteristics of the context and you can start thinking about strategies on:

- how to use the strengths and take advantage of the opportunities?
- how to optimize the weaknesses?
- how to combat possible threats?

1.3. Objectives

Learning objectives

A **learning objective** is a description of what the learner must be able to do upon completion of an educational activity. They are the foundation for instructional alignment whereby the learning objectives, evaluation tools and teaching methods mutually support the desired learning outcome. Therefore a well-written learning objective outlines the knowledge, skills and/or attitude the learners will gain from the educational activity and does so in a measurable way.

Research from Simon and Taylor (2009) shows why it's so important to have clear learning objectives for the learners and the teachers [10]:

- **Learners** - "Students expressed relief and gratitude at being given *clear direction* as to how to *focus* their efforts, most notably in the lectures, and

also in organizing their studying, reviewing, and preparing for exams".

- **Teachers** – "The most common point made by the instructors was that learning goals enhanced *communication*, both with students and other faculty members… The instructors mentioned that the learning goals streamlined the process of writing exam questions and improved *assessment*".

SMART Method

The **SMART Method** - Specific, Measurable, Attainable, Relevant, and Time-bound—can be used to develop all the elements of a well-written learning objective. SMART learning goals, with their detailed structure, provide focus as well as a clear idea of what you want to achieve. This structure makes it easier to 1) select relevant learning activities, 2) measure the progress towards achieving the goal and 3) know when the set goal is met [11].

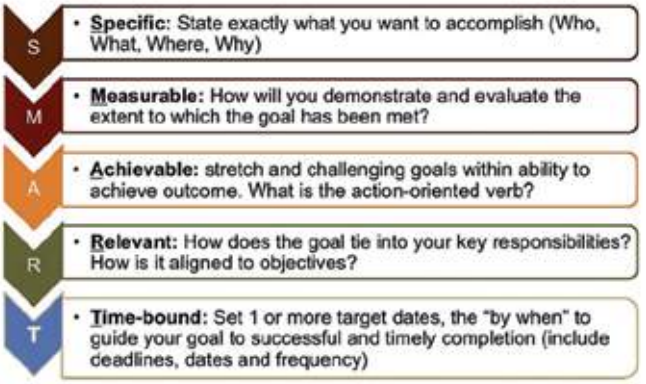

Fig. 16. SMART method for formulating learning objectives

Bloom's Taxonomy

An important element of a well-written learning objective is the **action verb**. Always choose an action verb that is measurable and observable to specify the desired learner performance. To help teachers with selecting an appropriate

action verb the use of **Bloom's Taxonomy** can be advised. Bloom's Taxonomy describes six levels of hierarchy in the cognitive domain: knowledge, comprehension, application, analysis, synthesis, and evaluation (revised 2001 version). Each level of the hierarchy correlates to action verbs that teachers can use to help formulate learning objectives.

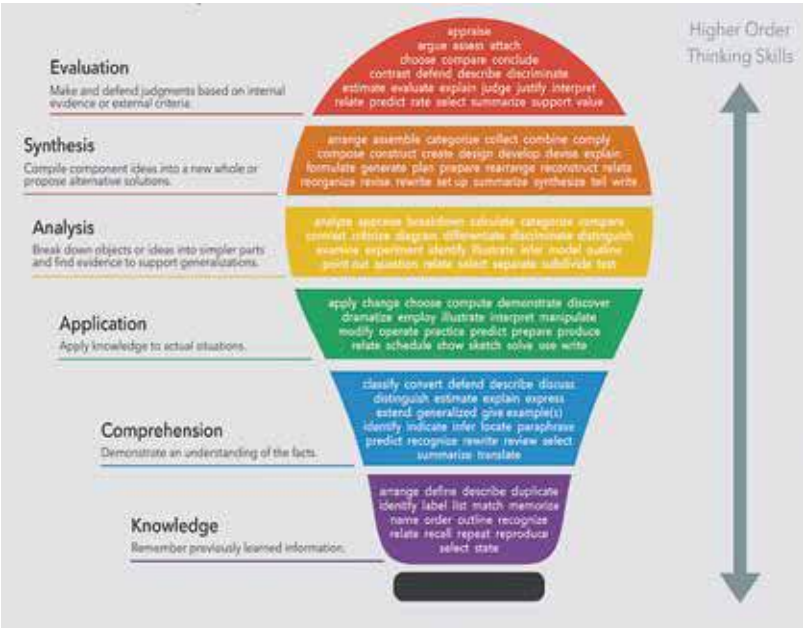

Fig. 17. Revised Bloom's Taxonomy (2001) with corresponding action verbs
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With the advent of technology and digital natives, Andrew Churches developed a more recent interpretation of Bloom's Revised Taxonomy. He has aligned *Bloom's Revised Taxonomy* with specific digital skills to create ***Bloom's Digital taxonomy.***

With the advent of online tools that provide students and teachers with easy access to options for collaboration and sharing, a new level was added to the framework: *sharing*. This framework can be a valuable resource when incorporating technology and active learning in a course.

Bloom's Digital Taxonomy

FRACTUS LEARNING

Bloom's taxonomy	Bloom's modified taxonomy	Bloom's extended digital taxonomy	Functional Levels	Activities with digital tools
		Sharing	Publicly sharing, publishing, broadcasting	Contributing to open social networks, podcasting, broadcasting, networking
Evaluation	Creating	Creating	Designing, constructing, planning, producing, inventing, devising, making	Programming, filming, animating, blogging, video-blogging, mixing, remixing, wikiing, videocasting, podcasting, directing
Synthesis	Evaluating	Evaluating	Checking, hypothesising, critiquing, experimenting, judging, testing, detecting, monitoring	Blog commenting, reviewing, posting, moderating, collaborating, refactoring, testing
Analysis	Analyzing	Conceptualizing	Comparing, organising, deconstructing, attributing, outlining, finding, structuring, integrating	Hacking, mashing, linking, validating, reverse engineering, checking
Application	Applying	Applying	Implementing, carrying out, using, executing	Running, loading, playing, operating, uploading, sharing with group, editing
Comprehension	Understanding	Connecting	Interpreting, summarising, inferring, paraphrasing, classifying, comparing, explaining, exemplifying	Boolean searches, advanced searches, blog journaling, tweeting, categorising, tagging, commenting, annotating, subscribing
Knowledge	Remembering	Doing	Recognising, listing, describing, identifying, retrieving, naming, locating, finding	Bullet pointing, highlighting, bookmarking, group networking, shared bookmarking, searching

Higher Order Thinking Skills

Lower Order Thinking Skills

2.4.2. Design phase

The design phase deals with the different components of the learning environment that need to facilitate learning and help students achieve the course objectives: content of the course, teaching methods, tools and materials used, who will teach/guide the course and how it will be evaluated. The design phase should be systematic and specific and may involve writing a design proposal to aid final development or funding.

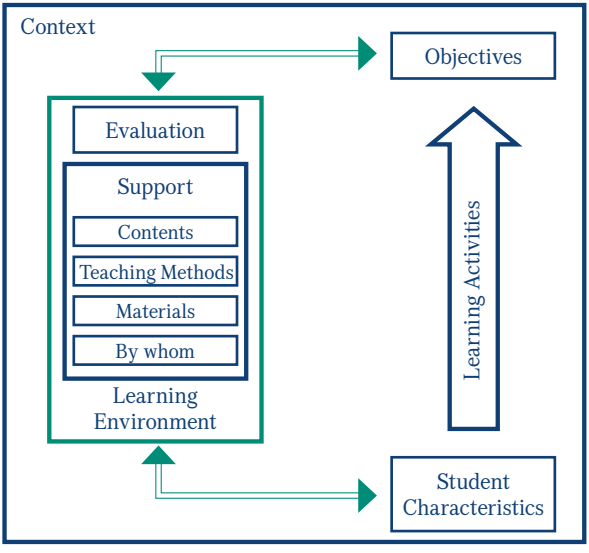


Fig. 19. Components covered during Design Phase

Design phase: 1. Instructional strategy (Contents – Teaching methods – Materials)

Based on the results of the analysis phase the different components of the learning environment that are needed to facilitate the learning and help the students achieve the course objectives have been identified. Now the instructional designer must propose the appropriate mix of teaching methods and materials for the content that needs to be delivered. This mix is called the **instructional strategy**.

Teaching methods & formats

The design of a technology-enhanced course will involve using a combination of the following types of **teaching methods** [12]:

- **Instructive methods** - which emphasize the "absorption" of new information by the students. Instruction methods include lectures and demonstrations.
- **Application methods** - which emphasize the active processes that learners use to perform procedural and principle based tasks and build new knowledge. Application methods mainly include exercises and simulations in any shape or form.
- **Interaction methods** – which emphasize the communicative dimension and engage learner/teacher interactivity. Interaction methods include discussion, debate and brainstorms.
- **Collaborative methods** - which emphasize the social dimension of learning and engage learners sharing knowledge and performing tasks in a collaborative way. They include group work and project work.

Each type of the four above-mentioned teaching methods can be delivered in different **formats**. For example, for the instructive method you can use the lecture format but also the demonstration format. Another example is for the interaction method, in which you could opt for the online debate format but also for brainstorm sessions in smaller groups in the classroom.

Therefore, the selection of the most suited teaching method and format should be done carefully and based on the factors determined during the analysis phase:

- **Student characteristics** – What are the personal, academic, social or cognitive characteristics of the target group that may influence how and what they learn?
- **Learning objectives** - What must the learner know or be able to do upon completion of this educational activity?
- **Context** - What are restrictions/opportunities of the context in which the learning takes place?

Teaching materials & tools

Once teaching methods and formats have been selected, you will need to complete the instructional strategy by pairing them with accompanying **teaching materials and tools** to facilitate and support the learning in your course. For example the teaching format of a lecture can be facilitated by different teaching materials and tools like a PowerPoint, web college, virtual classroom, … Therefore, these materials and tools should be chosen with care and keeping in mind the factors determined during the analysis phase.

Instructional strategy design model

The following **"instructional strategy design model"** was created for assisting teachers with designing an instructional strategy for an activating and technology-enhanced course. It gives an overview per teaching method of the main learning objectives addressed – activities of all stakeholders – different teaching formats available – which teaching materials and tools could be used. For more info and examples of specific teaching materials and tools, see chapter 3.

	Teaching Method
Learning Objectives	Which learning objectives are addressed by this teaching method?
Learner Activities	What is the learner doing during this teaching method?
Teacher Tasks	What is the job of the teacher during this teaching method?
Teaching Formats	What are the most used formats for this teaching method?
Teaching Materials & Tools	What are good teaching materials and tools to facilitate and support this teaching method/format? (details see chapter 3).

Fig. 20. How-to-use the "Instructional Strategy for a Technology-Enhanced Course" model

	Instructive Methods	Application Methods	Interaction Methods	Collaborative Methods
Learning Objectives	Develop: - Knowledge	Develop & Apply: - Knowledge - Skills	Develop & Apply: - Communication skills	Develop & Apply: - Knowledge - Communication skills - Interpersonal skills - Problem solving skills
Learner Activities	Listen & read/observe	Apply knowledge & skills	Interact with students/teachers	Work together
Teacher Tasks	Instruct & present	Provide guidance & coaching	Interact with students	Provide guidance & coaching
Teaching Formats	▪ Lecture ▪ Demonstration	▪ Exercises	▪ Brainstorm ▪ Discussion ▪ Debate ▪ Role play	▪ Group work ▪ Project work
Teaching Materials & Tools (see chapter 3)	▪ Presentation ▪ Web college ▪ Virtual classroom ▪ Audio - Video rec. ▪ Screencast	▪ Dig. exercise platform ▪ Simulation ▪ Edugames ▪ Virtual classroom	▪ Forum ▪ Mindmapping ▪ Poll ▪ Weblog ▪ Edugames ▪ Conference tools ▪ Virtual classroom	▪ Collaborative work space ▪ Virtual classroom ▪ Conference tools ▪ Digital collaborative tools ▪ Social media ▪ ePortfolio

Fig. 21. Model for designing an Instructional Strategy for a Technology-Enhanced Course

Design phase: 2. By whom

Designing a technology enhanced course requires capabilities in certain areas – such as technology and multimedia-related skills – that are not essential when designing a traditional course. Moreover, people may have to diverge from their traditional **roles** and perform new tasks. For example, a subject matter expert (SME) still provides the required knowledge for the course, but will need to interact with other professionals needed for designing a technology enhanced course like the instructional designer (ID), web and media developers, etc.

Some of the roles described in this section could be combined into a single profile. In fact, the **composition of the team** depends on factors such as:

- Size of the project
- Amount of work outsourced
- Capacity of team members to cover different roles
- Specific tools, media and technologies required

The **roles** described below are required to perform the **ADDIE model's** activities [13]:

Human resources/Capacity development manager

This managerial-level person conducts needs and audience analyses before starting the course design, coordinates all activities and roles in the different stages of the process and evaluates the results for the institution.

Instructional designers (ID)

IDs are responsible for the overall instructional strategy. They work with managers to understand the training goal, collaborate with SMEs to define which skills and knowledge need to be covered in the course, choose the appropriate instructional strategy and support the team in teaching methods and evaluation strategies. IDs also are responsible for designing specific learning activities, tools and materials that will be part of the course.

Subject matter experts (SME)

SMEs contribute the knowledge and information required for a particular course. They collaborate with IDs to design a course and define evaluation strategies. In facilitated or instructor-led learning, SMEs can act as instructors leading or supporting the (online) classroom activities. They can prepare and present material, assign tasks to participants and answer their questions.

Web and media developers

Web and media developers are responsible for developing the technological components of the course: digital courses and course material, multimedia and interactive components, e-tools, learning platform, website, …

Course administrators, facilitators and tutors

These are roles involved in the implementation stage. Course administrators manage learners' subscriptions. (Online) tutors and facilitators support participants' learning activities and motivate learners during the course. They create an environment that inspires participants' confidence in the learning process, assure the flow of information among the different stakeholders, motivate participation and facilitate and mediate participants' exchanges.

Technical support specialists

Technical support specialists usually are required to assist both producers and users of technology enhanced courses at every stage of the process.

Fig. 22. Areas of responsibility for key roles in the ADDIE process

Design phase: 3. Evaluation

Evaluation strategy

Another important decision relates to the **evaluation strategy** for your course. It is very important to think about this from the design stage. Asking "Why assess my students?" is the starting point and prerequisite of an effective evaluation strategy. Assessment happens not simply because there is a need for grading students, but the key purpose must always be to improve students' learning by providing feedback.

Assessment methods & format

First you need to decide upon which (combination) of assessment methods will be used. There are two well-known methods of assessment: **formative assessment** and **summative assessment**. Formative assessment measures student learning during the learning process and summative assessment measures learning that occurs at the end of an instructional lesson or unit.

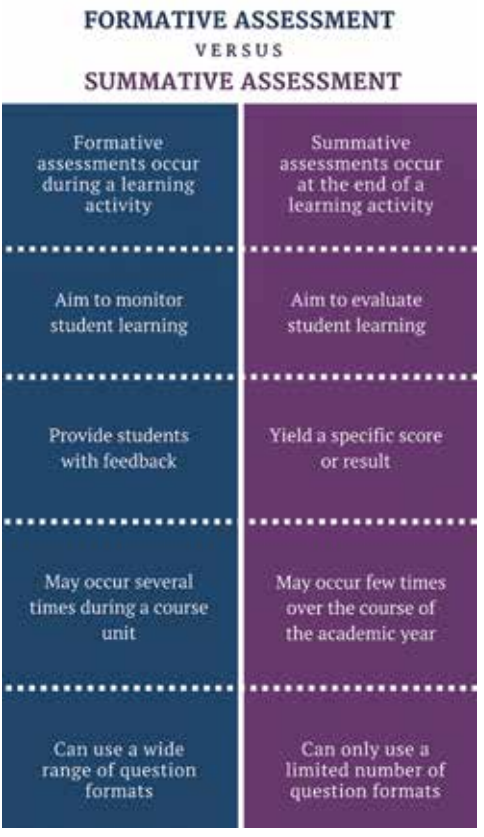


Fig. 23. Formative vs. Summative Assessment

Assessments are designed to measure the skills and knowledge the learner has mastered during instruction. While tests/exams are often used to assess mastery, there are countless other evaluation methods that could be equally (or more) effective for the given learner population, context, and learning objectives. It is important to keep in mind that the student characteristics, as well as the context and objectives, should influence **which evaluation method** you choose and develop. Varying the methods of assessment throughout a course will help to support appropriate skill and knowledge assessment,

and appeal to different learning and testing preferences of the learners. The following model will guide you through the different steps of choosing an appropriate evaluation format:

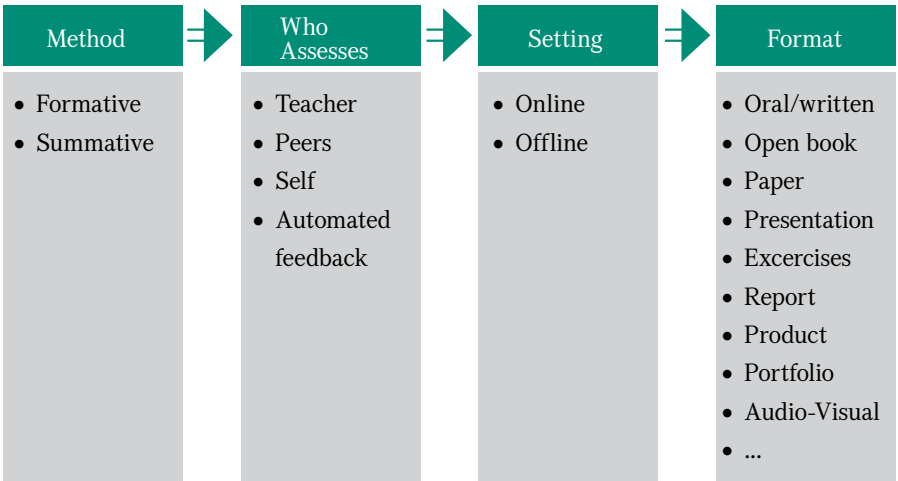


Fig. 24. Different steps in selecting a suitable assessment format

Principles of assessment

The following **principles of assessment** serve as the main guidelines while designing an evaluation strategy further and ensure that a test is useful, appropriate, effective and plausible:

- **Validity** - Validity ensures that assessment tasks and associated criteria effectively measure student attainment of the intended learning outcomes at the appropriate level.
- **Reliability** - There is a need for assessment to be reliable and this requires clear and consistent processes for the setting, marking, grading and moderation of assignments.
- **Transparency** - Clear, accurate, consistent and timely information on assessment tasks and procedures should be made available to students, staff and other external assessors or examiners.

Alignment with learning objectives

Another important principle is to ensure that the **assessment is aligned with the learning objectives**. An aligned course means that your learning objectives, activities and assessments match up so students learn what you intend and you accurately assess what students are learning. For this reason it is advisable to start drafting the assessment from the first stages of the project, just after the definition of the learning objectives.

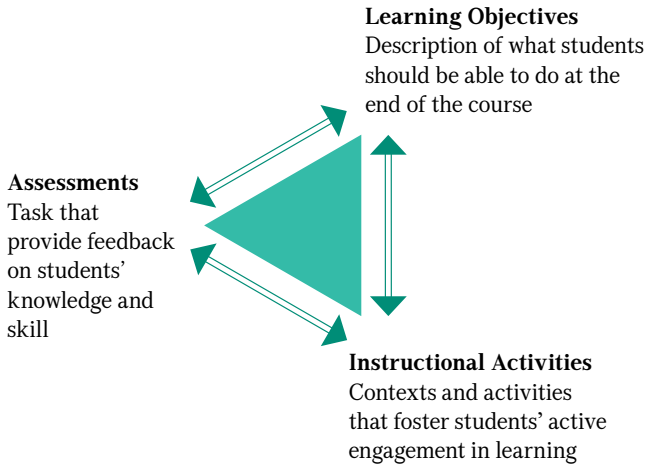


Fig. 25. Course Design Triangle – Alignment between components

2.4.3. Development phase

In the development phase, instructional designers and developers actually create and assemble the components described in the design phase. Because developing something for a technology-enhanced course can vary considerably from doing this for a more traditional course, we will focus now on the development of technology enhanced courseware and tools/technologies. After completing the development of the course material, an imperative pilot test should be conducted, so a final revision before implementation can take place.

Development of course materials & tools

Unfortunately, existing traditional course materials and documents cannot be automatically transformed into e-materials by just making them available from a website. It differs too much from face-to-face training and requires specific formats and tools. The development of these technology enhanced course materials and tools is comprised of three main steps [14]:

1. **Content development** - Writing or collecting all the required knowledge and information.
2. **Storyboard development** – Then we start integrating the instructional methods (all the pedagogical elements needed to support the learning process) and digital elements. Developing the storyboard does this. This storyboard is a document describing all the components of the final product, in the sequence they will be used: images, text, interactions, assessment tests, tools.
3. **Courseware development** – Finally the development of the actual technology enhanced courseware and accompanying tools can start. Depending on the technological development level needed, the help of a web or media developer could be necessary. If possible, integrate all elements into a learning platform that learners can access anywhere and anytime.

Pilot test & final revision

After completing the development of the course material, an **imperative pilot test** should be conducted. Involving key stakeholders and giving the new learning environment with its course material and tools, teaching methods, evaluation and teachers a thorough test run, can carry this out. A **final revision** now takes place based on the reviews of this test run according to the feedback gathered.

2.4.4. Implementation phase

During this stage, the materials created during development are introduced to the target audience and the learning process starts. The application of materials can take **different forms**, depending on the instructional strategy chosen during the design phase [15]:

Online Learning - Learners acquire knowledge autonomously by taking an electronic course and trying to understand the material with no/limited outside help.

Face-to-face - Knowledge transfer is facilitated by an instructor or a group of instructors using the developed materials as a basis for teaching. They deliver the information to learners and make sure that the main concepts of the course are well understood.

Combination - Learners study a part of the course autonomously, while an instructor, who also controls the acquisition and retention of knowledge from the parts of the course the learners studied with no assistance, explains the rest. Some examples are blended learning or flipped classrooms.

Depending on the chosen format, the implementation stage will likely include the following **main steps** to a greater or lesser degree:

1. **Training the facilitators** – Provide adequate training for the facilitators and make sure that they have all the necessary information about the course (course content and materials/tools, objectives, teaching and evaluation method) before the learning process begins.
2. **Preparation of the learners** – Prepare the learners for the upcoming education process. First and foremost that means making sure that they are familiar with the tools and have the knowledge required for completing the course.
3. **Preparation of the environment** – Ensure that the technical and organizational requirements of the course, formulated during the development phase, are met, and to prepare the environment where the teaching will be conducted. Depending on the chosen format, the

preparation may include the following: course material, equipment, tools are in place + learning management system/website is functional.

2.4.5. Evaluation phase

Despite the fact that evaluation is the final stage of the ADDIE methodology, it should be considered not as a conclusion of a long process, but as a **starting point for the next iteration** of the ADDIE cycle. Diligent evaluation will enable you to review and keep on improving the educational programme . Instructional Design is an iterative process, and evaluation should be carried out on a regular basis. Besides, keep in mind that to achieve best results, it is recommended to keep an eye on the quality of the course under construction throughout the development process according to the ADDIE framework, and not only at its conclusion. This phase can be broken down into two parts: Formative and Summative.

Formative evaluation

Formative evaluation is an essential component of the ADDIE model and has to be present in each phase of the instructional design process by using a range of formal and informal assessment procedures to **evaluate and optimize all components**. Special attention should be paid to the imperative pilot test during the development phase and evaluation moments running parallel to the learning during the implementation phase. The most common formative evaluation methods can be separated into the following categories [16]:

1. **One-to-One Evaluation** – In this format the developer works individually with some learners who are representative of the target population to evaluate specific components. There are three criteria by which this form of formative evaluation occurs: clarity, usefulness and relevancy.
2. **Small Group Evaluation** – Meant to understand how well the activities, materials and tools included in the course work in a group setting. Form a small group, preferably consisting of representatives of the various subgroups

that make up the student body that is the course's target audience.

3. **Field Trial** – Once the small group evaluation is complete, it is recommended to do one more trial, this time under conditions as similar as possible to the actual environments that will be used in the learning process. This "field trial" will help you evaluate the efficacy of learning in a specific environment and under specific conditions.

Summative evaluation

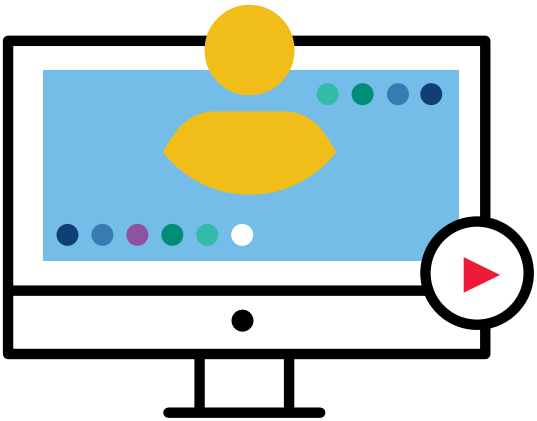
The main goal of summative evaluation is to prove, once the course is finished, that the performed training had the **desired outcome and effects**. It consists of tests designed for specific components and provides opportunities for more in-depth feedback from the users on course reception, learning outcomes and behavioral outcomes. Mostly done at the end of the course or at specific intervals.

The **Donald Kirkpatrick training evaluation model**, which has long ago become the standard for evaluating the effectiveness of training, could be a good starting point here [17]. Donald Kirkpatrick divided his model into four levels:

1. **Reaction** – The degree to which participants find the training favorable, engaging and relevant. (e.g. questionnaire).
2. **Learning** – The degree to which participants acquire the intended knowledge and skills during the training. (e.g. test or survey).
3. **Behavior** – The degree to which participants apply what they learned during training. (e.g. observation or focus groups).
4. **Results** – The degree to which targeted outcomes occur as a result of the training. (e.g. control group or test before and after).

PART 3

NEW IT-BASED TEACHING AND LEARNING METHODS AND TECHNIQUES FOR ACTIVE LEARNING



In part 1, we already defined the idea of "active learning" and broadened the terminology to "activating teaching for active learning".

We described the goals to achieve when using active T&L methods (see: Fig. 4):

- **A**ccountability
- **C**ritical thinking
- **T**eamwork
- **I**ntegration of knowledge
- **C**reating added value
- **E**ngagement.

We also were putting emphasis on the role of both primary partners in the process of active teaching and learning: the teacher and the student. Of course both partners in active T&L cannot be viewed separately from their educational environment: the university as an organisation is actively participating in the T&L process. Therefore, we also discussed the inputs and limitations of all three "parameters" in Part 1.

When choosing for introduction of active T&L we always have to be aware of the context of our action: the education activities are part of the university education and hence, are submitted to the organisational rules and procedures and to the legal provisions to which the university is bound. These rules and legislation eventually defines the type of academic programme s, the workload for teachers and the study load for students, the programme content, the educational organisation and even the teaching methods and types of assessment. We noted major differences between the national legislation of partner HEIs, the structure and educational goals of the universities and the educational Quality Management Systems.

Formally all partner country (PC) universities accepted the standards of the European Higher Education Area, and introduced formally the ECTS system. However, we detected different interpretations of these European provisions.

The international ranking of the partner country universities is an indicator for the many differences in academic education quality level, research outcomes and value, student guidance and social support and stakeholder relationship.

Using active T&L methods is not hassle-free, not without obligation or free of risk for failure. Besides of organisational and technical limitations, cultural or socio-ethological differences in student groups are holding risks for failures.

Remember that not all active L&T methods require sophisticated IT-technology. A somewhat older publication by the CTL of Stanford University [18] is giving a good overview of risks linked to some noncomputerlinked activating and collaborating techniques. (Fig. 26.)

A Classification of Instructional Stategies According to Students' Activity and Risk Involved

Students Are Active/Lower Risk	Students Are Active/Higher Level of Risk
Structured small-group discussion Surveys or questionnaires Demonstrations Self-assessment activities Brainstorming activities In-class writing Field trips Library tours Quizzes or examinations Lecture with pauses Lecture with discussion Feedback Lecture	Role playing Small-group presentations Presentations by individual students Guided imagery exercise Unstructured small-group discussion Responsive lecture
Students Are Inactive/Lower Level of Risk	**Students Are Inactive/Higher Level of Risk**
Show a film for the entire class period Lecture for an entire period	Invite a guest lecturer of unknown quality

From Charles C. Bonwell and James A. Eison, *Active Learning: Creating Excitement in the Classroom*, ASHE-ERIC Higher Education Report No. 1. Washington, D.C.: The George Washington University, School of Education and Human Development, 1991

Fig. 26. Instructional strategies and inherent risks

Whatever method of active T&L you might introduce, don't forget that it will be more time-consuming than a classic reading-lecture. The extra-time needed, can cause conflicts in the calculation of the workload for students as it is a parameter used for calculation of the ECTS-credits attributed to the course and hence, to the number of lecturing hours for that specific course.

In the following part, we intend to present a non-exhaustive enumeration of methods and techniques. For more details on active T&L methods, we refer to the contents of the PRINTel TOT-training courses and the Teacher Training Courses organised in the PRINTeL PC-Universities.

These data and training documentation is published on the PRINTeL website and will be available on the PRINTeL VATL portal.

For practical reasons, we will subdivide teaching activities requiring adapted computer- and IT-based T&L methods in four major classes, according to the aim for using that specific T&L method:

1. transfer of learning content,
2. interactivity in the classroom,
3. assessment of the acquired knowledge,
4. organisation of the curriculum and teaching activities.

3.1. Methods and Techniques for Transfer of Learning Content and Reaching Intended Learning Goals

- *Printed courseware with accompanying electronic resources* (photo, video, access to the editor's website giving access to additional online resources). The method is expensive for students, but highly useful and a valuable source of information for the teacher when designing a new course or filling in his lecture subjects. However, good courseware is also offered in free OER (Open Educational Resources) and has been discussed in one of the PRINTeL training courses (KU Leuven, November 2019).

- *Printed course texts, published by the lecturer* and eventually printed by the university.
  This is a classical way for lecturing, but frequently the course text is not including references, operational and teaching objectives, or a tool for self-assessment by the student. When the university disposes of a central electronic learning management system (LMS), an electronic version (PDF) of all printed course texts should be offered (for free) to the students enrolled for that specific course.

- *Blended learning.*
  Full online courses or fully interactive teaching is seldom used in the university context. Classical forms of teaching shall be alternated with self-directed and collaborative forms of active T&L. This teaching strategy is the most preferred one and perhaps the most effective and efficient one.

- *Use of slide-presentations and video.*
  The era of photographic slides might be over, but the same photos and slides can be presented now in PPT presentation. When using PPT slide shows and sharing them with your students, do so in a PDF-version to have a minimal protection or, when uploading it online, don't forget that you can copyrightprotect your work. CreativeCommons.org offers a simple and free way for copyright protection.
  (see: < https://creativecommons.org> or in the PRINTeL – KU Leuven – OER-training report and course materials, Nov. 2019)

- *Use of an interactive white board.*
  A perfect alternative presentation tool for replacing the laptop and beamer the teacher has to carry on to the classroom, but expensive and it will not completely replace the old-fashioned blackboard.

- *Video recordings of lectures or lecture-fragments.*

Video recordings can be used:

- To increase access to learning, to make learning more flexible and diverse;
- To give students the opportunity to resume a lecture or part of it, or to learn independently;
- To feed the students' interest for a specific subject or a course;

Therefore the use of video recordings needs some recommendations [19]:

- Video should be short to keep the students' attention;
- Eliminate extraneous and highlight important information;
- Speak at a natural pace and with enthusiasm;
- Video should be used in addition to other active learning methods, e.g. as part of an assignment or in preparation for the flipped classroom;

Video should match the teaching/training course.

Video recordings of fragments can easily be used for presenting an additional and alternative way explaining complex scientific phenomena. Fully recorded lectures cannot replace the regular lectures, but can be handy instruments for students who want a lecture or lecture-fragment to be repeated when studying the course at home. It can bridge a gap in the students' course notes. Making video recordings of lectures requires some basic technical equipment and – besides that – a lot of teaching experience and camera habituation from the presenter. This technique has been explored in depth and trained in the PRINTeL TOT courses.

- *Use of open educational resources and open courseware.* This technique has been explored in depth in the PRINTeL training course at KU Leuven, November 2019.

- *Online T&L / MOOCs* (Massive Open Online Course).
  See: the PRINTeL training course at KU Leuven, November 2019.
  Making a MOOC is a tedious and time-consuming task. Offering a MOOC requires a well-equipped, well-staffed and experienced IT-service.

- *Use of simulation software for instrumental lab-work.*
  Simulation programmes can be used to prepare students for handling complex and expensive laboratory apparatus and hence, to protect these apparatus from being mishandled or damaged. It is a common practice in chemistry, physics and material testing. Simulation software is often available from the companies selling the lab-hardware. Simulation of experiments can be a cheap alternative in chemistry lab-work, saving on expensive chemicals or hardware. Some simulation software is freely available on the Internet. Specialised simulation software is complex to write and very expensive to acquire.

- *Blending formal and informal learning.*
  Informal learning never has been made that easy as with the modern available IT-technology and the Internet. Hence, self-directed learning never has been that accessible as today; almost all learning materials can be found online. Peer-to-peer learning can be an inherent part of informal learning and in this way is stimulating intensively collaborative learning. However, students should be trained for effective and efficient collecting information and how to process it and learn from it. In this way of working, a very important task for coaching of students online or face-to-face is attributed to the teacher. This coaching is a fairly new part in teaching assignments and also requires teaching time on top of the lecture hours. Again, as we told before, a balanced alternation of formal and informal self-directed learning is most desirable.

- *Flipped classrooms.*
  The basis for the flipped classroom method is that the students study a well-delineated package of the subject matter in advance and that during the lecture time the teacher is answering their questions, highlighting the most important topics, explaining more complex concepts once more if needed. The flipped classroom is an ideal system for high-achievement

learners experienced in retrieval of essential information, selecting and processing this information in self-directed learning. For that reason, it is evident that it will be easier and more effective using this technique in Masters' courses rather than on Bachelors' level. The system is time-consuming for students; it is not a simple transfer of knowledge, but it is training them effectively for autonomous learning. And, don't forget, coaching by the teacher is an essential new task.

3.2. Methods and Techniques for Promoting Interactivity in the Classroom

- *A specific and appropriate organized classroom* is a need for efficient application of interactive or collaborative teaching methods.
  Although it is a real need for efficient working in this teaching strategy; most classrooms in older university buildings still have a layout for classical teaching: the lecturer in front and several parallel rows of tables and seats for 10 up to 600 students. Changing this setup will be difficult and expensive for the university organisation and for that reason should be part of a strategic project for refurbishing university teaching buildings. It should be clear that most active T&L methods are meant for relatively smaller groups of students, but on the other hand, this setup definitely will require more floor area per student and will be more expensive for the university or faculty.

- *Use of laptops, tablets or smartphones connected to the LMS*/Internet.
  Almost all students today dispose of a smartphone, tablet or laptop; so, why not to use it in the classroom for educational purposes instead of emailing or surfing on the Internet during the lecture. Smartphones, tablets and laptops can be used for requesting information from the central server (on condition that the teacher has uploaded that

information in advance) or the Internet (although this may cause a lot of distraction and loss of concentration). Welldefined packages of information then could be used for teamwork assignments, information processing techniques, as basic materials for presentations and communication, etc. These IT-tools can be used in interactive parts of a lecture and for assessment phases and as a classroom response system. This application allows the teacher to assess at each moment and on the spot whether or not the audience is following and understanding the presented subject matter. On the other hand, the teacher needs to prepare the key-questions that allow evaluating the attention and cooperation by the audience. This means additional work for the teacher in preparing the lecture: questions shall be drafted to assess whether the educational objectives for that part of the lecture has been understood and is mastered by the audience.

- *Teamwork/electronically shared documents and projects.*
  See also above: Use of laptops, etc.
  We should emphasize that teamwork and communication in all academic programmes is a "compulsory to reach" competence and fully corresponds to the Qualification Descriptors – originally the Dublin descriptors – of the ECA (European Consortium for Accreditation in higher education – see: < http://ecahe.eu/w/index.php/Dublin_Descriptors >). It means that training towards this competence is indispensable in all academic programmes.

- *Electronic portfolios* allow proof of self-directed working and autonomous learning by students. A student's portfolio is becoming an indispensable tool in specific professional education programmes.

- *Online classroom response systems*, e.g. Mentimeter.
  See above: Use of laptops, etc.

3.3. Methods and Techniques for Assessment of the Acquired Knowledge

Remember that the only purpose for examination and assessment is testing whether the learner reached the learning objectives. Changing teaching methods by turning to active T&L, includes the pursuit of acquiring new or different competences and therefore requires reconsidering and adapting the learning and operational objectives.

- *Electronically supported examination and assessment.*
  Since the introduction of the first computers in the university, already 50 years ago, the automatic processing for correction of written examination papers has been pursued and the use of multiple-choice exams has won ground. Multiple-choice is not always a good examination system, frequently even a bad one when testing only memorisation and reproduction of course subjects. It all depends upon the quality of the questions; are these questions testing effectively whether the proposed learning objectives have been achieved? Even open-question exams can be taken electronically and corrected by detecting selected keywords in the answers.

- *Online examination and assessment* is possible and yet applied, although we should admit that technical problems are many and safety problems are imminent. Developing a fraud-proof system is an absolute requirement. Current application of online exams is not easy and it makes little sense to use this system in regular university programmes.

- *Students' peer assessment* is a good method for improving the students' critical thinking; it is easiest to apply when the assessment results can be collected anonymously, e.g. by using an online classroom response system, cf. Mentimeter.

- Portfolios. See 3.2.
- *Online classroom response systems*, e.g. Mentimeter.

  See 3.2.: Use of laptops, etc.

3.4. Methods and Techniques for Organisation of the Curriculum and Teaching and Coaching Activities

- *The university's Learning Management System* (LMS; electronic learning platform) should be a specific module in the electronic university management system and should give access for staff and students to the learning content of curricula, communication facilities (email, messages, chats, …) and the teaching organisation system (academic calendar, lecturers' time schedules, tasks and assignments, …). Many LMS are commercially available; well known are Blackboard (https://www.blackboard.com/teaching-learning/learning-management), CANVAS or MOODLE. An extensive comparative list of learning management systems for higher education is given on the PAGELY website <https://pagely.com/blog/learning-management-systems-in-higher-education/>.
- *The university management system* can be used for general management of the university administration and in the education framework for attribution of adapted classrooms for teaching activities to enable active T&L activities.
- *On duty active T&L training centre*. The university's Teacher Training Centre (TTC) should provide a proper offer of teaching and training for teachers on duty.
- *Coaching of teachers starting with active learning* is another task for the Teacher Training Centre.

- *Organising freely accessible study rooms* for students, providing access to the LMS.

- *Organising a students' mentoring system and/or a students' buddy system.*

This is not a complete list of possibilities for introducing and deploying active T&L in HE systems. It is an indicative overview and contains many subjects that have been presented in the PRINTeL TOT and Teacher Training courses.

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Chapter 2

INNOVATIVE AND TECHNOLOGY ENHANCED TEACHING AND LEARNING: ACTIVE LEARNING AND ICT-ENHANCED TEACHING: M-LEARNING AND GAMIFICATION

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INTRODUCTION

Nowadays students are exposed to all kinds of information from very different sources. Innovating in the classroom so as to keep them motivated and engaged is a challenging task. Active learning teaching interventions are the answers to this challenge. This chapter aims at showing teachers new ways of teaching implementing two methodologies, m-learning and gamification, to help them go beyond the traditional class.

Currently, there seems to be an urgent need to integrate new technologies in the educational process. M-learning has become a powerful tool to support this. Innovative teaching approaches such as m-learning go beyond time and the physical boundaries of the classroom so as the teaching and learning processes become ubiquitous.

In this brochure, the principles of m-learning are described exploring the benefits and challenges of using m-learning in Higher Education. M-learning will help the teacher in many ways, creating successful interactive learning and allowing to monitor students' knowledge, to give immediate feedback, and to manage the teaching process outside the classroom. We will also talk about the roles of the teacher and students and provide some very useful apps to implement m-learning such as polling apps, apps for quizzes, or apps to use augmented reality in the learning materials.

Integrating m-learning increases the two-way interaction between teachers and students and helps both to be on the same track in the education process. Teachers can use m-learning in a class to observe and monitor the ongoing process of students' understanding and to evaluate a lesson, both from the students' and the teachers' perspective. Some recommendations when implementing m-learning will be provided and some mobile applications suggested to contribute to active students' involvement and active interaction not only between the students and the teacher, and also amongst the students.

Another approach to engage students is to implement the methodological strategy of gamification. This teaching strategy focuses on introducing gameful experiences in the learning and teaching processes to motivate students.

A definition of what gamification involves in teaching is introduced to distinguish it from other gameful approaches such as game-based learning. To understand this approach is essential so as not to confuse it with the use of games in the class. Gamification applies other strategies introducing features of games and videogames that are the ones that influence students' engagement.

All these gamification elements are firstly described and then the roles of the teachers and students that should be adopted to make the gamification process successful. In addition, some resources and applications that teachers can use in order to gamify their teaching are introduced, taking into account different levels of implementation, either using gamification platforms, gamified quizzes, game-like features in virtual learning environments (VLEs), or using different ICTs. Finally, some recommendations are suggested so teachers have a useful guide on how to implement a successful gamification in their teaching.

PART 1

MOBILE LEARNING

1.1. Introducing M-learning

The 21st century generation lives on a widespread use of the Internet and mobile devices. The day-to-day development of mobile technologies presents some challenges. On these grounds, there is a need to integrate new technologies into the education system.

Mobile learning is the use of mobile technologies in the educational process both individually and with other teaching methods. Online learning enables students to be involved in learning anytime anywhere. Learners can use their mobile devices to access educational resources, and to interact with others in classrooms and outside.

> ***Mobile learning 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 (UNESCO, 2013).***

UNESCO defines mobile devices as digital, easy-to-use devices that are usually owned and controlled by an individual rather than an institution, which can access the Internet, have multimedia capabilities, and solve a number of problems. Learners today are more likely to access learning through digital gadgets rather than with traditional books, and journals, therefore, teachers should take advantage of this fact and exploit the affordances that mobile devices provide.

M-learning is a powerful educational tool that can support the educational process in a way that was not possible before. In that way, mobile learning

enables learning anytime, anywhere and can facilitate personalized learning and provide immediate feedback.

The physical boundaries of the classroom and time for learning no longer prevail because the learning becomes ubiquitous, students can communicate with teachers, other students and anyone else to satisfy their need for knowledge using the new generation of mobile devices – laptops, smartphones or tablets. Besides, smartphones are becoming very popular in today's life since almost everyone can afford one. During the last decade the role of mobile phones has changed dramatically; they are no longer considered as a tool for communication only, now they are also used in teaching and learning. Moreover, mobile devices make it possible for students to gather, access and process information outside the classroom.

Figure 1. M-learning: mobile devises for learning and teaching
Source: https://www.pulselearning.com/fs/2016/06/Why-mLearning-is-not-just-eLearning-on-a-mobile-device.png

HE students are increasingly using mobile devices in their studies as they are more accessible. Therefore, there is a need to introduce these to all strands of education, and even to make them accessible to those living in remote areas where there are no schools, teachers or libraries. In addition, m-learning promotes a variety of learning resources, making education more fun and exciting. Through mobile learning, teachers can add videos, visuals, and different types of styles to make the lessons more interesting.

Mobile learning has both its benefits and challenges. One of the benefits of mobile learning is its personalization - mobile phone and tablet applications can, for example, choose more difficult or easier texts based on the skills and knowledge of a particular user. This technology helps ensure that students are not left behind. One-size-fits-all approaches to teaching are insufficient for teachers and students, and mobile learning offers a perfect methodological approach to personalize the curriculum.

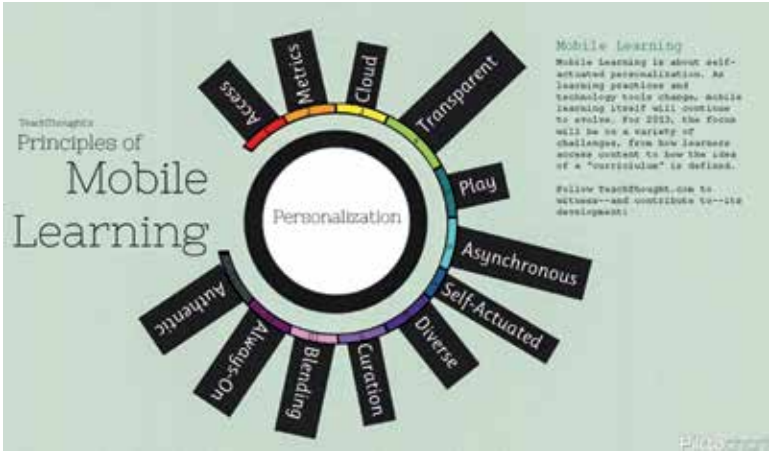

Fig. 2. Twelve principles of mobile learning
Source: https://www.teachthought.com/wp-content/uploads/2012/10/Principles-of-Mobile-Learning.png

Heik (2018) lists 12 principles of mobile learning. In m-learning **access** is constant and with access to the **cloud**, all data sources and materials are constantly available. The **metrics** of understanding and "performance of knowledge" are also available. **Transparency** is the natural result of connectivity, mobility, and collaboration. M-learning performance gains an immediate audience with both local and global communities of learning through social media platforms. Among the most powerful principles of mobile learning is **asynchronous access.** Mobile learning changes the tone of learning

from academic and compliant to personal and **playful**. It also enables a learning experience that is increasingly personalized: *just in time, just enough, just for me* (Heik, 2018). With asynchronous access to content, peers, and experts comes the potential for **self-actuation** and comes **diversity** as well. Learners can act as experts of resource and assessment and apps and mobile resources can support **curation** of content. M-learning provides a **blending** of digital interactions. There is an **always-on** learning, persistent and iterative. All these principles converge to allow students to have experiences that are **authentic** and personalized.

One of the best features of mobile learning is its **flexibility**. Teachers and students can learn from their own experience and their own pace. Different types of teaching methods and dynamic materials can have a great impact. They help make the material **accessible** permanently through, for instance, websites, podcasts, video or other multimedia formats. **Feedback** is also key in mobile learning. Mobile technologies can streamline assessments and provide learners and teachers more immediate indicators of progress. Both real-time feedback and real-time **interaction** with students give a great impact on overall learning.

M-learning is a bridge between formal and informal learning. Using a mobile device, students can easily access additional materials. Mobile learning may include students with physical disabilities. It also makes education-related costs effective. Mobile learning generates and develops students' digital competence. It also gives us the opportunity to get acquainted with modern teaching methods, stay in touch with the use of education in the field of education innovation.

Figure 3. M-learning: Benefits to using Mobile Devices in the classroom

There are some challenges that should be faced when applying m-leaning. Firstly, there are some technical challenges such as connectivity and battery life. Using mobile devices for learning can be a problem if users have poor connectivity. Wi-Fi and mobile networks should work in a consistent manner, otherwise, this connectivity problem can lead to frustration on the part of teachers and learners and it is likely to contribute to demotivate them. Moreover, enough electricity power outlets in the classrooms for recharging students' mobile devices should be taken into account to normalise their use in classes.

Accessibility and cost for learners could also be a significant issue. Teacher should evaluate which access and connectivity students have outside the class. Apart from that, file sizes and formats that are compatible with a computer often lead to performance problems for mobile devices. When creating materials teachers should take into account size as continuous use of small handheld devices can cause eyestrain and headaches. Moreover, they need to keep in mind that any learning task should render well on different screen sizes and be compatible with different operating systems.

Teachers need to make sure that mobile devices in the classroom are not used for other purposes than learning and get distracted with browsing social media channels or even answer calls. The solution is to devise an interesting learning activity to keep them engaged using their mobile devices to enhance their learning.

1.2. Roles of the Teacher and Students in M-learning

People see smartphones as an integral and inseparable part of their lives. Smartphones have become an indispensable device and useful for our daily tasks. People are already using mobile phones to get information whenever they can. Therefore, teachers can take advantage of this fact and use them in class for learning purposes. The crucial task for teachers is to design a lesson plan that exploits fully the potential of these devices.

Figure. 4. Learners' preference for mobile learning
Source: https://elearninginfographics.com/
top-4-reasons-why-learners-prefer-mobile-learning-infographic/

1.3. M-learning: Apps and Resources

"**89% of smartphone users download Apps, 50% for education**" – Source: *Towards Maturity (Growth Engeneering (2017), Mobile Learning and the Future of L&D).*

Nowadays, the Internet provides different resources and applications that can be used in learning processes and environment, especially in mobile learning.

Mobile learning apps and resources conventionally can be divided into 8 groups:

1) *Learning Management System (LMS) apps*
2) *Polling apps*
3) *Apps for quizzes and tests*
4) *Apps for research, note taking, and self-training*
5) *Podcast apps*
6) *Apps for communities*
7) *Lesson planning apps*
8) *Apps for fostering students' creativity*
9) *Augmented reality.*

1. *Learning Management System (LMS) apps*

A learning management system (LMS) is a software application for the administration, documentation, tracking, reporting, and delivery of educational courses, training programme s, or learning and development programme s. The learning management system concept emerged directly from e-Learning. Although the first LMS appeared in the higher education sector, the majority of the LMSs today focus on the corporate market. Learning Management Systems make up the largest segment of the learning system market. The first introduction of the LMS was in the late 1990s. (Source: Davis, B., Carmean, C., & Wagner, E. (2009). «The Evolution of the LMS: From Management to Learning». The eLearning Guild Research. 24).

LMSs have some features which are useful for managing courses, users and roles with ease, and for providing online assessment, tracking students' attendance and receiving timely feedback from learners. Many LMSs have created their own apps for mobile phones, and learners can receive assignments and all the necessary information on their phones.

Examples of LMS:

- Moodle Mobile - https://docs.moodle.org/38/en/Moodle_app
- Talent LMS - https://www.talentlms.com/mobile
- Schoology: https://www.schoology.com/k-12/mobile-app.

2. *Polling apps*

Polling apps are software applications for creating and managing different types of surveys and polls. Polling apps are very useful for understanding students' prior knowledge and for diagnostic assessment. These apps are also helpful for the assessment of learners' needs and expectations and live polls with instant results. Some polling apps provide instant analyzed results that are visually very impressive and helpful for students to understand where they are and what they want to achieve.

Some examples of polling apps:

- Sli.do - https://www.sli.do/
- Mentimeter - https://www.mentimeter.com/
- Polleverywhere - https://www.polleverywhere.com/.

3. *Apps for quizzes and tests*

The following apps are very helpful for individual or group testing, contests. They also provide opportunities for Gamification (see section 2.5 Resources for gamification).

- Kahoot - https://kahoot.com/

- Socrative - https://socrative.com/
- QuizUp - https://www.quizup.com/en.

4. *Apps for research, note taking, and self-training*

The following apps can be useful for making flashcards or memo cards, organizing information portions, creating notes, finding the necessary information easily, working in groups and even challenging each other. These apps can be used for individual and group work. With some of these apps learners can analyze their thoughts and structure those using different Mind maps and layouts.

- Evernote - https://evernote.com/intl/ru/
- Simplemind - https://simplemind.eu/
- Quizlet - https://quizlet.com/ru
- Elevate - https://www.elevateapp.com/.

5. *Podcast apps*

According to The Oxford English Dictionary, a podcast is an episodic series of digital audio files that a user can download in order to practise listening. Podcasts can contain files in PDF and EPUB formats also. Videos also can be shared following a podcast model.

An enhanced podcast displays images simultaneously with audio. It can contain hyperlinks, markers, images, all the needed information can be displayed in the same window, making it easier to display materials. Podcasts can be successfully used in m-learning.

- Pocket casts - https://www.pocketcasts.com/
- Himalaya - https://www.himalaya.com/ru.

6. *Apps for communities*

There are different apps for communities that can be used by learners

and researchers for connecting with the needed people and professional networks. These apps can be useful for creating open and close groups, finding information, articles, and sharing own research results. Some of the following communities provide opportunities for group discussions, surveys in bigger communities, etc.

- Academia.edu - https://www.academia.edu/Documents/in/App
- Researchgate - https://www.researchgate.net/
- LinkedIn - https://www.linkedin.com/
- Facebook - https://www.facebook.com/
- Reddit - https://www.reddit.com/.

7. *Lesson planning apps*

The following apps help teachers to manage the classroom and engage the students. These are useful tools for planning lesson activities with the learners in HEIs.

- Padlet - https://padlet.com/
- Edmodo - https://new.edmodo.com/?go2url=%2Fhome.

8. *Apps to foster students' creativity*

This group of apps is very useful for encouraging students' creativity and curiosity. These apps give teachers and students an opportunity to create infographics and videos easily. Using these apps is a lot of fun. Moreover, students will be able to create interesting and useful short videos and report their own learning experience.

- Canva - https://www.canva.com/
- Adobe spark video - https://spark.adobe.com/
- Stop motion studio - https://www.cateater.com/
- Flipgrid - https://info.flipgrid.com/.

9. *Apps for Augmented Reality (AR)*:

With AR you can superimpose computer-generated images on top of your view of reality, thus creating a composite view that augments the real world. Point your camera at something that the app recognizes, and it will generate a 3D animation or a video superimposed over whatever is shown on your camera screen.

- HP Reveal: https://www.hpreveal.com/
- Layar: https://www.layar.com/
- CoSpaces Edu: https://cospaces.io/edu/.

1.4. Some Teaching Practices of M-learning

M-learning, as a component under the active learning umbrella, gained popularity after observing students' behaviour change while attending classes. Students' "addiction" to mobile phones is both obvious and strong. Mobile phones are one of the essential devices that students use to communicate and express themselves in their everyday lives. Using smartphones as a medium for involving and interacting with the learners during the classes is becoming more and more popular and effective.

Integration of m-learning in introducing active learning methodology makes classes dynamic, increases two-way interaction between teachers and students and helps both to be on the same track during the lecture.

There is a huge number of m-learning apps that can be used for teaching purposes. Sometimes it is difficult for teachers to navigate among so many alternatives and get confused and abandon the idea of going beyond traditional lectures with active learning activities using mobile devices. One of the suggestions is to start with just one app, practice and experiment it during the real process of educational activity. After mastering one, another app can be chosen and experience the same process. In addition, it is important to have a

repository of different apps and tools and upgrade them permanently.

Teachers may use m-learning activities in every phase of the lecturing process. It is important to be creative and enthusiastic experimenting with different apps in teaching. Here are some teaching practices to help teachers exploit m-learning and adapt it to their field of teaching.

A. Using M-learning at the beginning of the lecture

It is not only interesting but also relevant for a teacher to know the students' expectations for the course or for a teacher. This kind of information enables a teacher to understand interests and identify the knowledge gaps students have. Based on the gained information, a teacher can adjust and tailor the content of the session to the revealed information. This makes classes more interesting, fruitful and active. Students are satisfied as they got the information that they were curious for or had a lack of.

M-learning provides teacher with the possibility to gather information about expectations students have. Students can express their wishes anonymously as sometimes speaking up in front of a large audience is a bias for them. Different apps, such as *Mentimeter* or *PollEverwhere* can be used in different ways – asking open ended questions about the expectations or providing multiple-choice questions with a limited number of answers. So, students choose what they are willing to listen to.

B. Observing the ongoing process of understanding

It is also necessary to monitor students' ongoing understanding of the topic that the teacher teaching during the class. In addition, having students' active attention during the teacher enables teachers to keep students involved and engaged. M-learning apps such as *Kahoot!* or *Socrative* are helpful and easy to use in this situation. A teacher can prepare questions in a form of a short quiz in advance to ask after each chunk of the lesson.

Using mobile apps for this purpose is beneficial both for the students and the lecturer. While answering the questions, students are provided with a summary of the content covered and the feedback of the concepts that they did not understand. As for teachers, the process of ongoing monitoring the students' understanding of the topic helps the teacher to cover students' knowledge gaps and readjust their lesson plan.

C. Assessment at the end of a lesson

Teachers can also use m-learning apps to monitor students' understanding at the end of the sessions. Polls may play a role of "exit ticket" asking a couple of appraisal questions and suggestions from students. As in all other situations, here some apps are useful for analytics and reporting the data received from the audience. While using Polls at the end of the lectures, a teacher can compare two sources of data – data collected from the beginning of the class and compared to the data at the end of the session. This relevant information helps teachers to improve their lessons and to take into account the students' feedback either to improve their teaching method or to readjust the content of the lesson.

D. For discussion purposes

M-learning apps might be used in lectures to introduce discussions or debates on controversial topics to develop students' critical thinking. Polling apps such as *Mentimeter* or *Sli.do* allow students to express their ideas freely in front of the class as their responses remain anonymous. This type of tasks makes lectures very interactive since students are actively engage with what is being discussed.

1.5. Recommendation when Implementing M-learning

The rapid development of ICTs has influenced all the spheres of people's

activities. The HE system has also undergone significant changes. Teachers face the need to transform and modernize their education process. Nowadays, teachers must focus not only on the contents of the subjects they are teaching but also on the teaching methodology they are going to use to motivate their students. The role of the teacher is definitely changing. It is not enough to be an expert in the discipline you are teaching. Teachers should take into account how to attract their students' attention, look for ways of engaging them and build up an active two-way interaction in order to achieve the best result in the process of teaching. The use of the technology helps the teacher:

- to create interactive learning environment,
- to check up students' knowledge very quickly,
- to give immediate feedback,
- to make the process of education more varied,
- to conduct the process of teaching outside the classroom,
- to personalize the process of teaching and build up an individual educational paradigm for each student,
- to provide connection between formal and informal teaching, and
- to make the process of looking for new and additional information on the topic easier.

When implementing m-learning, teachers should follow some parameters. First of all, they should be ready to change their approach to teaching, secondly, to improve the level of their competence, and finally, to invest in their own professional growth. In addition, universities should have appropriate resources to organize new active learning processes providing technical support, suitable mobile devices, excellent internet connectivity, etc.

Here follows a set of recommendations concerning the role of the teacher and their own effort in the process of modernizing education.

1. Teachers should understand that the transformation of the higher education system as a whole is inevitable. Unfortunately, some teachers

view these changes as optional, with unnecessary workload, but not as an opportunity for improvement the quality of HE teaching.

2. Teachers today should innovative methodologies to activate their classes.
3. The teacher should experiment teaching trends that make use of ICTSs so as to improve their interaction with their students and improve their teaching processes.
4. The teacher should be ready to invest their own resources (time, money) in the development of competences and mastering necessary skills.

The second block of recommendations deals with the usage of mobile technologies in the classroom and interaction with students.

1. It is necessary to make sure that the classroom gives the opportunity to work with mobile applications with good internet connectivity and sufficient electricity sockets.
2. Students should be told in advance that they will need some mobile devices, smartphones, tablets or laptops, to work in the classroom. This should be done so that none of the students will drop of the interaction with the group.
3. It is not advisable to introduce all possible applications and programme s at the beginning of the transformation of the educational process. Teachers themselves need time to master these apps to monitor their work inside and outside the classroom.
4. Teachers should understand whether the use of the applications is appropriate in a particular discipline and in a particular group of students. A mobile application should always contribute to the achievement of the goals of the educational process.
5. Teachers should explain students why a particular technology is being used, what exactly they should do with it and what results they should achieve. This must be done to avoid rejection, when students do not understand their task and do not see how the application that they are using is connected with the learning task in a meaningful way.

6. Teachers should be aware of the students' reaction to the use of any app or programme in class.
7. Teachers should have a clearly set timing of the lesson, in which a teacher is planning to use some applications, especially if the teacher and the students have never done it before. It is necessary to set aside some time to understand how the application works. Each programme/application needs a short introduction to explain how and why it will be used. Students should be provided with clear instructions concerning the use of a given programme . Teachers should understand that students might work with the application at different rates: some students will work quickly and without any help, some might need more time and help from the teacher or other students. It is also necessary to allot some time for feedback to discuss the results of their work with the application and to analyse these results together with the students.
8. Teachers should not use more than two or three different programme s and applications in one lesson due to time limit of a lesson. When using more than one, teachers should take into account that students will need time to switch from one programme to the other or from an active learning activity to more traditional forms of teaching.
9. Teachers should be aware that not all the applications are effective for every lesson and in every subject. However, there are general mobile applications that can be used in a variety of teaching contexts, such as polling apps, *Mentimeter, Poll Everywhere*, or *Sli.do*, and gamified tests such as *Kahoot!* or *Socrative*. Short questionnaires can be used at the beginning or at the end of every lesson to check up students' comprehension. Visual display of the results provides the opportunity to see the general level of the group or to monitor each student's individual achievements.
10. The creation of word clouds is another teaching strategy that helps to engage students with the topic of the lesson. It is really useful to use it at

the beginning and at the end of the lesson. In this way, teachers can see whether the students' understanding of the content has changed.

The most important thing in the transformation of the education process with the help of m-learning is not to forget about the main educational goal, which is to help students master specific knowledge and to develop their skills and specific competences of the discipline they are studying. Mobile applications must contribute to the achievement of this goal and ensure students' engagement and more active interaction within the group and with the teacher.

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PART 2

GAMIFICATION

2.1. Introduction to Gamification

Currently, working with the digital generation, teachers face new challenges. They must apply innovative teaching methods that will make the student active, motivated, and engaged in the learning process. Recent pedagogical approaches are being developed using playful elements such as gamification.

Before defining gamification and to be able to understand this educational strategy deeply, we should consider other educational approaches that use playful components but are different from gamification: game-based learning (GBL), serious games or simulations.

Game-based learning uses existing games and incorporates them into teaching contexts so as to harness their entertainment elements for the benefits of learning goals. Game-based learning can be implemented in a more or less intensive way depending on the number of games that are included in the programme, from a use supporting certain aspects of the curriculum, to an entirely game-based approach. In this area Digital game-based learning (DGBLL) refers to using actual digital video games as learning tools.

Serious Games are games created for reasons other than pure entertainment. Their main purpose is "serious" and not simply to entertain, i.e. to teach or train in areas such as education.

A simulation is a virtual representation that tries to imitate the real world such as a flight or drive simulators, 3D computer simulators, etc. Simulations do not need gameplay elements. They allow users to practice an activity in a safe environment.

These educational approaches should not be confused with gamification. Gamification is "the use of the elements of the game and design techniques of digital games in a non-game context" (Werbach & Hunter, 2012, p. 26). The

purpose of gamification is to engage people, motivate action, promote learning, and solve problems (Kapp, 2012, p. 10). Marczewski (2016) distinguishes these gameful approaches in the following figure:

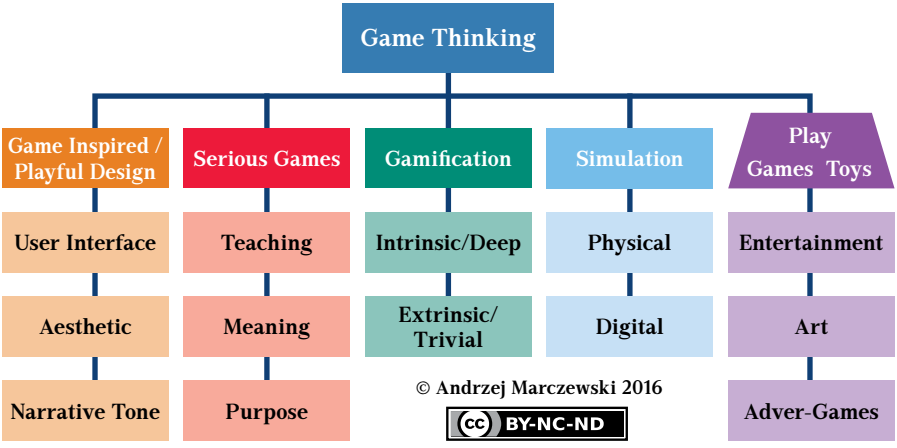

Figure 5. Differences between games, serious games, and gamification (Marczewski, 2016)

For more information about the difference between Gamification and Games see the following video by Kapp: https://youtu.be/kHn0Maj8ygs.

2.2. Elements of Gamification

Which are the game design elements that we could use to gamify our teaching? The game design elements are the ingredients which are used "to cook" a successful recipe for a gamified learning experience.

There are different taxonomies and classifications of these elements which are very heterogeneous and overlap between them (Kim, Siong, Lockee, & Burton, 2018; Sailer, Hense, Mayr, & Mandl, 2017). Deterding, Dixon, Khaled, and Nacke (2011) identify that game elements fall into five levels

of abstraction: game interface design patterns, game design patterns and mechanics, game design principles and heuristics, game models and game design methods. Alternatively, Hunicke, LeBlanc, and Zubek (2004) establish their description of game elements within the MDA (Mechanics, Dynamics and Aesthetics) framework. The mechanics of the game (e.g. points, badges, …) cause a certain type of dynamics, i.e. how the game works, and the aesthetics refers to their emotional response that the player exhibits while playing the game.

Werbach and Hunter (2012, p. 81) argue that game elements are in a hierarchy, the DMC Pyramid, identifying three categories: dynamics (aspects of the gamified system that have to be considered but never directly enter the games), mechanics (basic processes that drive the action forward) and components (the specific instantiations of mechanics and dynamics). These concepts, however, are not equivalent to those in the MDA framework. The dynamics, mechanics and components are connected to each other in different levels of abstraction being the dynamics the ones with a higher amount of abstraction (see Figure 6) For instance, a learner receives a *badge* after completing a task; this gamification component is connected to at least two game mechanics such as *challenge* and *reward*, which, in turn, relate to *emotions* or *progression*.

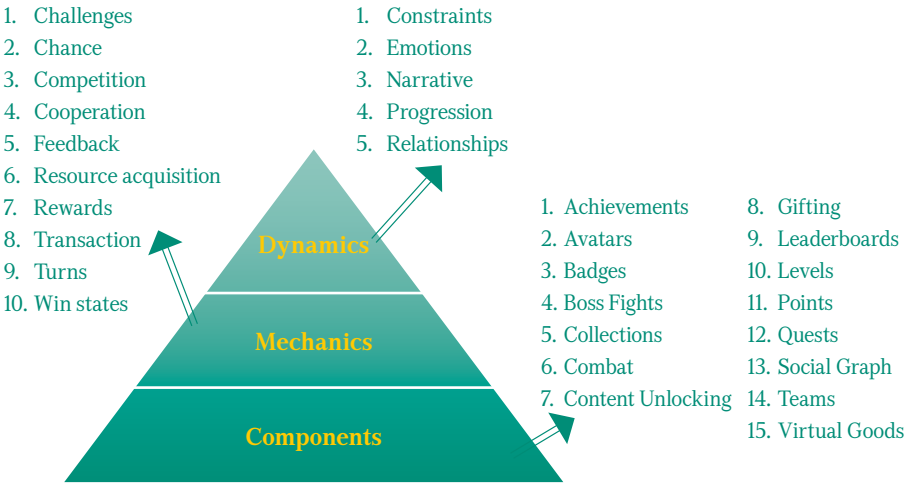

Figure 6. DMC Pyramid. Werbach and Hunter (2012)
Source: https://images.app.goo.gl/vqF59Ckt1H3n9CzU6.

Werbach and Hunter (2012, p. 78) consider five dynamics: *constraints* or limitations; *emotions* (curiosity or competitiveness etc.); *narrative* (a coherent storyline); *progression*, i.e. growth and development; *relationships* or social interactions. They also identify the following important game mechanics (2012, p. 79): *challenge* (the kind of a task which requires an effort to solve); *chance* or an element of randomness; *competition*; *cooperation*; *feedback*; *resource acquisition* through obtaining useful items within the game; *rewards*; *transaction*, i.e. trading with the other players; *turns* or sequential participation in game activities; and finally, *win states*, which relate to performing an objective in order to win. With regards to the components Werbach and Hunter (2012, p. 80) list fifteen game components which include *achievements, avatars, badges, boss fights, collections, combat, content unlocking, gifting, leaderboards, levels, points, quests, social graph, teams* and *virtual goods*. From all these, the most frequently used components in gamification implementations are *points*, *badges* and *leaderboards* (PBL) (Chou, 2015; Werbach & Hunter, 2012; Zichermann & Cunningham, 2011)

so as to reward the users' performance. Points are usually earned by learners' successful interactions with the gamified environment (Werbach & Hunter, 2012) and help them identify how far they have progressed. The accumulation of points is commonly displayed in a leaderboard which rank learners according to their performance (Landers & Landers, 2015); and finally, badges are visual representations of accomplishments (Abramovich, Schunn, & Higashi 2013; Fanferelli, 2018; Kyewski & Krämer, 2018).

PBL can be motivating but they should be well designed for a successful gamified experience (Kapp, 2012) and be implemented with care (Goethe, 2019). Badges, for example, must be attainable, some easier and some more difficult. Similarly, leaderboards can be very motivating for students at the top of the table, but demotivating for those at the bottom. Therefore, the ranking can be devised in a way that avoids the demotivating factor of being in the last positions. It is considered, however, that the PBL is not sufficient to maintain motivation and engagement in a constant and sustainable manner (Chou, 2015; Kapp, 2012; Marczewski, 2013) as it only affects students' extrinsic motivation. Many gamified teaching designs are based on PBL (Chou, 2015) because of the simplicity of implementing these elements and introducing students to a gamified activity. However, PBL are not sufficient to maintain students' engagement in a prolonged task such as a full course, although some short-term benefits of PBL are already proved (Attali & Arieli-Attali, 2015; Landers, Bauer, & Callan, 2015; Sailer et al., 2017). Besides, research on how PBL increase student performance seems to be still inconclusive.

2.3. Structural and Content Gamification

Kapp (2012, 2013) distinguishes two types of gamification: structural and content. On the one hand, structural gamification refers to a model in which the structure of the learning tasks is gamified without modifying the content.

The main objective of this type of gamification is to engage students through rewards using, for instance, points, badges, and leaderboards (PBL). In this type of gamification, the learning content does not become game-like. On the other hand, content gamification implies altering the content to make it more like a game or video game, such as including a storyline in which challenges related to the story must be solved to achieve the objectives of the course. In this case, the gamification elements are embedded in the all the teaching-learning process.

Gamification learning experiences should aim at trying to influence students' intrinsic motivation. In this regard, a more holistic approach to gamification design is needed when devising a learning experience so as to include other gamification elements beyond the PBL. One of these engaging elements is introducing the dynamic of a narrative. The narrative is the actual nuts and bolts of the gamification experience participants go through (van der Meer, 2018). Two main types of narrative are identified in a study of different gamified language teaching interventions: those which included a story and those which only set up a scenario (Batlle & Gonzalez, 2017). Adding a story or a scenario to a gamification design has an impact on the other elements of the whole gamification procedure (avatars, challenges, rewards, etc.) and provide more opportunities for teachers to integrate these elements into their teaching tasks in a coherent way (Pujolà & González, 2019).

2.4. Roles of the Teachers and Students

In active learning, teaching and learning consists mainly in the assumption that the learner must be autonomous and the role of the teachers changes so as to facilitate students' learning activities. When implementing learning tasks, teachers should prompt active, independent, and meaningful activities to students. The main task of the present HE teacher is to facilitate students'

acquisition of knowledge and to activate autonomy, critical thinking and creative attitude.

Gamification educational environments should create learning conditions to increase students' motivation, to develop students' autonomy, to attract students' attention and ultimately, to engage them. In gamification, learners are motivated by helping them find the solution to practical problems and by the actions to achieve their own learning goals. The development of intrinsic motivation in gamification begins with the students' involvement with the gamification processes, with their desire to take part in them.

Intrinsic motivational processes unfold in a situation of choice, which encourages students to take independent actions meaningful to them. Meaningful actions as a result of choice turn the learning process into a vital goal, which is a condition for effective learning. Students are not alienated from the educational process, as happens in traditional education, but become involved in it because their own motive for solving the educational problem is associated with the internal content of mastering the subject. The formation of their own meaningful attitude to learning involves the fact that the implementation of gamification should take into account students' needs, capabilities and expectations so as the gamification is accepted by them. In these conditions, the pedagogical dialogue between teachers and students begins with an action that promotes interaction, mutual influence, and collaborative work of the participants in the educational process. A well-planned gamified teaching unit also contributes to the formation of internal motivators - self-esteem, intellectual moods, beliefs, interests, attitudes, and moral principles.

2.5. Resources for Gamification

Gamification platforms and tools

There is a diverse variety of platforms, apps and tools for teachers to use when implementing gamification in their teaching. Four approaches to use them can be established according to Pujolà & Appel (2020):

a) gamification platforms that help to set up and manage gamified lessons or entire courses,
b) gamified quizzes that help teachers improve lesson interaction and also build gamified tests for assessment purposes,
c) game-like features used in regular virtual learning environments (VLEs), and
d) using different ICTs when implementing a gamified teaching intervention.

a) *Gamification platforms*

The following four platforms can help teachers gamify a whole course:

Classcraft < https://www.classcraft.com/>is a platform that looks like a video game of the "World of Warcraft". Teachers can create a world of character such as Mages, Healers and Warriors with unique of powers who must cooperate and participate in missions so as to get points and gold for their teams. The objective is to progress collaboratively through a gamified storyline while learning and developing their knowledge.

Figure 7. Classcraft screenshot
Source: https://www.freetech4teachers.com/2017/10/using-classcraft-for-gamified.html

ClassDojo <https://www.classdojo.com/> is a free virtual classroom management web or mobile app that serves as a digital token economy system. Teachers can assign avatars to students, and award points as students perform tasks reflecting behaviour aspects. Although it has a rather childish interface, it can also be used in HE as an effective method for tracking data (see fig. 7).

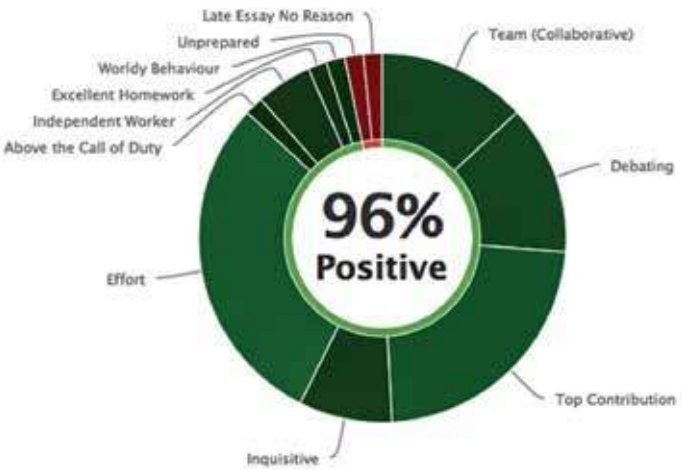

Figure 8. Dojo's tracking report of a student
Source: https://historyotters.files.wordpress.com/2013/10/photo-5.png

GradeCraft <https://www.gradecraft.com/>, a cloud-based LMS developed by the University of Michigan to support gamified courses. Students can set their own goals, get badges and stay informed about their learning analytics throughout the class (Holman, Aguilar, & Fishman, 2013). Teachers can also determine what tasks must be carried out before students can unlock the next set of material for them to reach their next goal. This LMS helps teachers apply gameful methodologies and design gamified learning environment through features such as levelling systems, badges, leaderboards, planners, rubrics and unlocks.

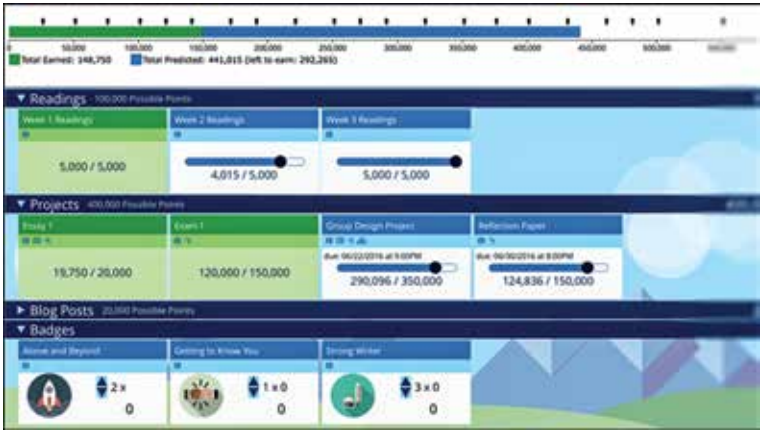

Figure 9. Point system and badge record in GradeCraft
Source: https://cdn0.capterra-static.com/screenshots/2130745/165549.png

b) *Gamification quizzes as Personal Response Systems*

Kahoot!, Socrative, Quizalize or Quizziz, to name just a few, are mobile applications that can be used as Q/A response systems that provide instant feedback and can be used in a lesson to assess students' knowledge or opinions and to encourage interactive lessons.

Kahoot! and Socrative are quite popular and have different game-like tasks, self-paced or timed, and can be played individually and in teams. Both include similar gamified tasks that keep track of students' points, in which students' ranking is based on correct answers to questions. Most of these apps are used for assessment in which teachers try to engage their students in a competitive mood as if they were a contest gam. For example, in Socrative teachers can organise a rocket race asking question to their students in groups (see Figure 10).

Figure 10. Socrative – SpaceRace Rockets
Source: https://stg.socrative.com/1.0.105/img/screenshots/space_race_711x409_@2x.jpg

These Q/A apps increase students' motivation, interactivity, participation, interaction, and engagement. They are also helpful for feedback and formative assessment and encourage collaborative learning.

c) *Gamifying VLEs*

Another option to devise a gamified course is to include the game-like elements into regular VLEs such as Moodle. Although Moodle is not a virtual environment specifically for gamification, there are some features that allow teachers to gamify their courses in Moodle (Somova & Gachkova, 2016; Gachkova, Takev, Somova, 2018) by using, for instance, a scoring system or

the choice activity to help learners set their own goals. Moreover, different plug-ins can be added for gamification purposes such as:

- Quizventure - quiz questions from the course and sends possible answers in the form of spaceships. Students have to shoot the correct answer.
- Level Up! - it lets students "level up" each time they complete a quiz.
- Ranking Block - A ranking block to show the top three top students.
- Stach - let students find items by exploring the activities.

Denmeade (2015) provides advice and information about how to set up a scoring system, to make use of activity loops, to set challenges for students to self-access their abilities and to set learning goals with the choice activity, to configure gateways and to include badges for students' mastery achievements.

d) *Using other ICTs*

The last approach to gamify your teaching is to integrate different ICT tools and resources. Based on Pujolà and Appel (2020) the following table illustrates some possibilities of implementing gamification components and their corresponding mechanics using a variety of ICT tools.

Table 1: Introducing gamification components and mechanics in classroom tasks

Mechanics	Components	Task	ICT tools/resources
Identity	**Avatars**	Students design their own avatars to use them in the narrative of the gamification proposal.	Voki: https://www.voki.com/ Avatar Generator: https://www.generateit.net/avatar-generator/
	Logos/ Emblems	Students define the common characteristics of their teams and embody these in the logo designs.	DesignEvo https://www.designevo.com/logo-maker/
Challenge	**Achievements**	Students make an infographics (as an intermediate or final product) of a topic as a challenge.	Canva https://www.canva.com/
	Missions	Students identify a secret code in a video by answering questions.	Edpuzzle: https://edpuzzle.com/ PlayPosit https://go.playposit.com/
	Secret Missions	Volunteer Students to carry out an activity unknown to the rest.	Teachers can use any digital communication tool to inform selected students.
Competition & cooperation	**Combats**	Students in teams devise their own Kahoots! for revision purposes at different points in the course. Points or badges are awarded.	Kahoot! https://kahoot.com/

Mechanics	Components	Task	ICT tools/resources
Cooperation	**Teams**	Organize an Educative Escape Room or *breakoutEdu* (https://www.breakoutedu.com) so Students in groups have to cooperate to succeed in getting out.	ICT for designing puzzles, QR codes or any mlearning app to be used to solve them. If teachers opt for breakout.edu, consult: https://www.breakoutedu.com/.
Rewards	**Badges**	To organize a badge system to reward attitudes or skills in performing some tasks.	Teachers can use *Makebadges* to design badges to be included in their VLEs https://www.makebadg.es/ To get track of badges: Flippity: http://www.flippity.net/ or ClassDojo: https://www.classdojo.com/.
Feedback	**Points and Leaderboards**	Establish a system of scoring to measure the development and achievement of students' tasks.	To manage points and leaderboards, Teachers can use *Pointagram*: https://www.pointagram.com/ or *Flippity*: http://www.flippity.net/.

2.6. Some Gamification Practices

Using gamification as a teaching method requires teachers to concentrate on the goals they want to achieve. The goal might be achieving learning outcomes or solving a challenge or a problem. Keeping the final goal in mind while planning the process of gamification is essential for following the right track and reaching the set goal effectively and efficiently.

A good hint for a teacher is to think about the gamification teaching intervention as a "student journey" to reach the learning goal which could be set by the students, the teacher or in collaboration with both. Also, it is a good practice for teachers to put themselves in their students' shoes and to imagine themselves as students in class. This is an excellent strategy to use on each step of the gamification planning.

The first step for designing gamification is to analyse the target group deeply. Exploring audience characteristics will help teachers to define the gap between existing knowledge and skills and learning outcomes. At this stage, it is very important to take into consideration the course year of the students, and devise the gamification intervention accordingly to the students' skills. Target group analysis also implies detecting what type of players our students are. Consequently, teachers can understand their possible students' reaction to the gamification intervention according to players' characteristics: player, achiever, free spirit, disruptor, philanthropist, socializer (Marczewski, 2016). Teachers can then plan the challenge level accordingly after this analysis. Doing this analysis thoroughly is a necessary step so as to identify the components, mechanics and dynamics for a successful gamification.

One of the key points teachers should consider in the planning phase is the timing of the whole gamification process and the connection of each step to provide a smooth flow of all the gamification process. A storyline or narrative can help teachers to design a more coherent gamification to glue the different steps together.

Another piece of advice for teachers who want to try gamification is to design a dynamic intervention in which students feel constantly active, asking them to overcome different challenges, getting appraisal and rewards, making them more engaged and curious to continue. It is also very important to show students' progression so they are aware of where they are in the gamification process.

Teachers should monitor the ongoing process to detect weak points and reformulate the planning accordingly. After implementation, teachers should also measure whether the set of learning goals was achieved. They should incorporate three levels of evaluation: students' perception, learning and performance measures.

2.7. Recommendations to Gamify Teaching

Gamification in education requires developing an effective strategy, requiring in-depth analysis of the educational context: determining the characteristics of learners and setting the learning objectives. For that purpose, firstly teachers should consider the following five tips (Figure 11) for developing a successful gamification design.

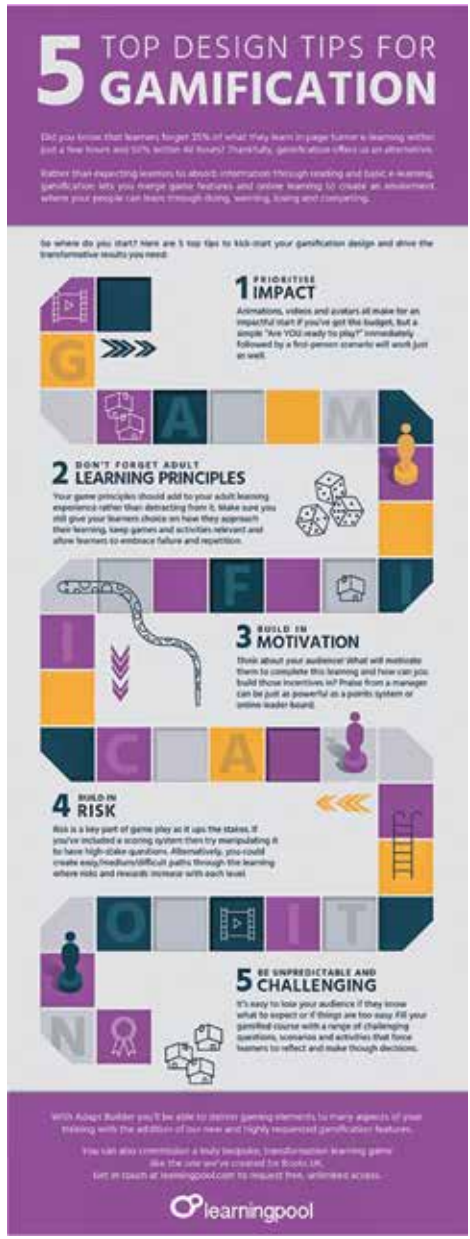

Figure 11. Design Tips for Gamification

Source: https://elearninginfographics.com/gamification-design-tips-infographic/

In more detail, basics steps have been formulated to help teachers create a successful gamification strategy.

Step 1: Assess and analyse your learner

a) Identify your students' needs and difficulties:

- Gamify your classroom to keep students engaged.
- Pinpointing student difficulties and they will help you determine the best gamification strategies for your classroom.
- Most importantly, identifying students' needs will put them at the forefront of your gamified learning strategy.

b) Survey your class:

- Just as marketers survey their target markets before gamifying their products, you should survey your class to determine the best ways to engage them.
- The purpose is to understand what type of games your students play, and guide your subsequent research into gaming. This, in turn, will help you introduce the gamification elements that are aligned with their interests. Keeping students actively involved in the gamification process will allow for greater engagement and retention.
- By using aspects from their favourite games, you should see a favourable response to your gamification.

Step 2: Define learning goals

a) Set learning and behaviour goals:

- To gamify your teaching, deploy clearly-defined objectives in the form of learning and behaviour goals that address the learning and competences you want your students to develop.
- Behaviour goals involve helping students concentrate and work efficiently. For example, you may set a learning goal to have your students master a specific skill by a certain deadline. A behaviour goal may focus on empowering students to tune out classroom distractions.

- These goals will help guide the gamified learning experience – a key to making sure you gamify your teaching effectively.

b) Structure open projects to help meet these goals

- Allow learners to choose their project such as a:
  - Digital presentation
  - Creative piece (infographics, webpages, …)
  - Paper or essay
  - Unique product that is appropriate for a given topic.
- Presenting choices encourages learners to test themselves in new ways and demonstrate their strong suits. In doing so, you will learn more about their distinct learning styles, which can help you structure future lessons.

Step 3: Structure the gamified learning experience

- Adjust your scoring system. Many students see their marks as the most nerve-wracking part.
- The gamification design should involve highlighting progress instead of mistakes.
- With regards to tests and assignments, you can give scores both traditionally and in the form of experience points.
- You can also award extra points for completing extra-curricular assignments, participating in class or anything else that demonstrates an effort to learn.
- You should show these points that they have been awarded throughout the year, giving them a clear reference landmark to see how much they have learned and accomplished.

Step 4: Identify resources

a) Create a manual and organize teams:

- Instruction manuals — either digital or physical — come with almost

every video game. They explain how to play and progress, sometimes including tips and secrets. Therefore, providing an instruction manual is a way of helping understand all the gamifying process.

- This manual should contain information such as:
  - The stages and challenges they have to go through to achieve the final goal.
  - The scoring system, including the ways students can gain XP.
  - How students can obtain rewards, and what kinds of rewards are available.
  - Tips on what they must do to succeed in the gamified learning environment.

b) Organize studying and learning teams:

- Dividing students into studying or learning teams not only opens the door to group work and collaboration, but helps replicate a core element of almost any game.
- Instant feedback should be provided. When handling a full class, you cannot provide observations at the same rate but peer feedback can help in this process.
- Devote a brief lesson to teach students about sharing constructive criticism, encouraging them to actively provide comments while working in teams.
- You can provide support and insight as needed to strengthen this fast feedback loop.

Step 5: Apply gamification elements

a) Make progress visible:

- Displaying students' progress and how much they have achieved from the start is a key element in any gamification design.
- You can create and share a bar chart that contains each student's progress

towards mastering a skill. Whenever a student achieves a certain score on a quiz or completes homework and assignments, you can fill in their appropriate skill-mastery bar with the amount of points or badges they have earned.

- As most teachers keep these charts posted for students to see, consider allowing them to submit nicknames that suit the gamification narrative. In this way, each student will know in which position is in the leaderboards without feeling anxious or embarrassed.

b) Offer rewards

- To combine gamification and learning in a way that truly engages students, you should strongly consider giving rewards.
- Research shows that reward systems in gamified teaching encourage students to acknowledge their accomplishments and continue to progress. This is a mechanic used in most modern video games — players receive trophies for completing certain tasks.
- The more difficult the task and lofty the achievement, the larger the reward. You can hand out your rewards-of-choice accordingly, giving badges for completing an assignment and to have excellent attendance over the course of a unit.
- This hallmark element of contemporary gaming plays a key role in creating an engaging experience, continuously incentivizing and motivating students.

Last but not least, Figure 12 illustrates four design mistakes to be avoided when implementing gamification in teaching.

Figure 12. Gamification design mistakes to avoid

Source: https://elearninginfographics.com/4-gamification-design-mistakes-avoid-infographic/

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Chapter 3

INNOVATIVE AND TECHNOLOGY ENHANCED TEACHING AND LEARNING: VIDEO AS A LEARNING TOOL FOR TEACHERS AND STUDENTS

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INTRODUCTION

The PRINTeL project No585760 is funded by the ERASMUS+ Programme of the European Union. The main objective of PRINTeL project is to enhance student learning experience in Partner Countries' HEIs by promoting development and innovation in teaching & learning, supporting integration of research and dissemination of good practice and contributes to modernization of higher education in Armenia, Belarus and Georgia. The PRINTeL project also aims to modernize HE in AM, GE and BY in line with the Bologna agenda and to establish cooperation in education & training between EU and the partner countries and amongst PCs by promoting virtual mobility of teachers and students, and enhancing lifelong learning resources & means.

To achieve these goals teachers from Armenian, Georgian and Belorussian Universities participated in the intensive TOT training courses. One of these training courses "Video as a learning tool for teachers and students " took place from 12th to the 16th of November 2018 at the University of Porto, Porto (Portugal). The course included several teaching strategies that aligned pedagogical aims, learning outcomes with video, inside and outside the classroom. Examples of tools that teachers can use to motivate and engage students, as well as increase the quality of their learning process were shown throughout the course. After returning home the trainers of the TT Course who passed ToT (Training of Teachers) Course at Universidade do Porto, have designed in-house TT courses for teaching staff members and shared with their colleague teachers all the experience they have previously gained from the training at the University of Porto.

PART 1

DESCRIPTION OF THE METHOD

In this chapter, we will discuss the usage of video within educational contexts. We will engage on the topics of how it is being use in Higher Education, its advantages and main difficulties.

Technology, today, plays an ever-larger role when it comes to education. References to technology date back as far as 2500 years (Bates, 2015). Tech involves a variety of things such as oral and written communication, video and, more recently, online virtual educational communities. Despite its growing significance, the use of video in education is not something new. As early as the 1960's, television broadcasted a series of educational contents in order to promote adult education. With digital evolution and the help of the Internet, video gained new power in the 1990's. In the early 2000's, initiatives such as the Open Courseware from the Massachusetts Institute of Technology (MIT), led to more and more video being shared online. YouTube, launched in 2005, has worldwide recognition today. In 2008, the first true Lecture Capture systems were developed and in 2009 the online magazine Campus Technology mentioned the buzz created by Lecture Capture[1].

Indeed, VBL (video-based learning) has a long history as a learning tool in educational classes. First experiments started during the Second World War. Soldiers were then trained with a combination of audio and film strips. As a result, the static film strips helped to increase their skills while saving a lot of time as well. By the late 1960s, educational television was used as an extra tool in classrooms. Also teachers were confronted with videos of their own lessons to reflect on their teaching methods and improve their performance. In the 1980s, VHS videotapes meant a quantum leap as it became much easier to use video in classrooms. However, learners were rather passive and could only watch the video. This changed with the rise of digital video CDs in the mid-1990s. Teachers could now add multimedia control and assessment

1. https://campustechnology.com/Articles/2009/06/10/Lecture-Capture-Is-Getting-Campuses-Talking.aspx?Page=1 20/01/2019

tools by using the video on a computer. Thus, learners became much more active than before. By the 2000's, classrooms got connected to the internet and interactive digital video as well as video conferences became possible. Since then, new technologies such as smartphones and tablets with social media such as YouTube have contributed to increase social interaction and made it easier as ever to integrate video applications in education.

Within the context of traditional face-to-face teaching learning scenarios, video has seen an increase of its use. However, in distance learning sets, video takes a central role as one of the main conveyers of information. One of the most visible faces are the Massive Open Online Courses (MOOC). On the other hand, when it comes to mixed learning environments such is the case of blended-learning (b-learning), educational videos also have the potential to become a successful practice, especially when considering new approaches such us Flipped Classroom "where the instructor pre-records video for out of class and uses time in class for interaction and problem solving" (Scagnoli et al., 2015).

1.1. Advantages of Using Videos in Learning

Using videos to communicate ideas and concepts makes learning engaging and insightful. A typical video consists of moving images, sound, and text. The benefits of using video content in educational process are more than obvious. Its convenience makes it a perfect tool for both, teachers and students, as well as for educational institutions that they make part of.

When a learner is watching an interactive video, he is engaging in **multi-sensory learning,** which literally means learning through two or more senses. When learners use multiple senses to grasp the depth of a concept, it allows for more cognitive connections. This not only facilitates deep thinking and understanding of the concept from different perspectives, but it also leads the student to acquire problem-solving skills which are crucial for better work performance.

Videos can be used to demonstrate procedures that can assist in mastery learning. If a learning material is procedural in nature, such as product training, then using videos would be the ideal way to present a string of procedures in a comprehensive way that can be referenced again and again. For example, videos are a great way to demonstrate case studies, clinical procedures or mechanical processes. They can also be used to reinforce information that has been previously explained in text.

Everybody has a different learning style: there are **auditory** learners who learn better through listening; **kinesthetic** learners who prefer doing an activity in order to learn; and there are **visual** learners who better understand and retain information when ideas, words and concepts are associated with images and videos. These learners learn best through what they see, and videos are an ideal recipe for visual learning.

Video based learning is good for developing some of the higher level intellectual skills and some of the more practical skills needed in a digital age.

Videos can made accessible on all devices with varying internet speeds if they are kept short and light. Multi-device delivery of videos enable learners to access the videos on a desktop or a laptop, at home or at the office, and with other devices are wildly used and handily.

Delivering videos is easier than ever. Everybody, in today's tech-dominated world, owns a Smartphone or a Tablet. Videos can be distributed in short bursts to learners' devices without too much effort. This rapid delivery of videos allows your learners not only an "anytime anywhere" access, but also lets them learn at their own pace.

The video instructions that are provided for audio and video learning can be rewound and seen and heard again and again.

1.2. Disadvantages of Using Videos in Learning

The main disadvantage is that there is no instant contact between the educator and the learner. So clarification of doubts can take some time to be clarify.

Big drawback to learning through video is that it promotes individualism, which can make learning harder. If one of the main benefits of video learning is that you can learn alone in the privacy of your home, this is also one of its drawbacks.

Group learning facilitates communal problem solving and builds teamwork and collaborative skills that are critical in life, and video learning is not a good medium for this. However, this is not set in stone: more and more video learning is taking place via 2-way cameras, which allows teachers to remain in a central location and reach students all over the world. This innovation alone could change everything about education in the future.

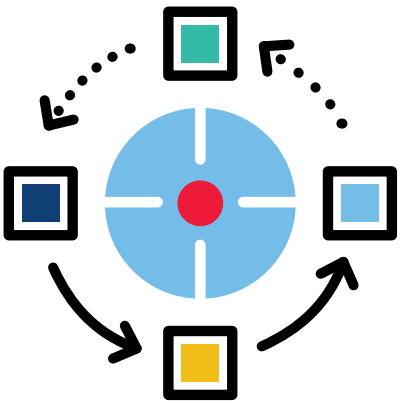
Proponents of video based learning claim that the main advantage of this learning method is that it is self-paced. It is true but on the other hand this advantage can provoke the absence of self-discipline. Students may switch off from fully engaging in the material.

Videos are hard to edit, once shot a video is most of the times static. It is a lot of work to edit and reissue a video if corrections are need.

Using videos in learning can be expensive and time-consuming; you have to spend money and hire people to script, edit and create the video.

PART 2

LEARNING OBJECTIVES



When considering the use of video, educators should consider why and how use this media. In this section, we will analyse the main topics/aspects regarding video and its usage within educational contexts.

Due to the technical innovations the historical methods of teaching have enriched with video. Today's students belong to screen generation, therefore, they are more likely to be satisfied by means of having access to information through screen and taking part in that process. It is a good strategy to give students the opportunity to use their tablets, cell phones as tools for learning. Video is a powerful tool in motivating, engaging and instructing students.

2.1. Why Use Videos?

This should be the first question to ask when considering the use of videos in teaching. The key goal is that each video is used not because it gives the impression of being very up-to-date, edgy content, but mainly because it makes sense to use video for that given context.

Video is a multimedia medium, meaning it brings together different media such as images, sound and text. Despite the general belief that video can be a more effective way to promote learning, for the sake of bringing together these different media, that does not mean that students are more effectively trained (Scheurwater, 2017).

Despite this initial glooming description, video is a very powerful media that allows educators the possibility of conveying a lot of information in a very short amount of time. It might be the most engaging output for a learning material, considering the target audience, the subject and the amount of time you have to produce it.

2.2. What do Students Gain from It?

Upon conveying information via a well-produced video, students have access to quality materials in a very "condensed" way that, allows them to further investigate the topics. In any case, the context of application dictates the gains students get when using video. If considering a scenario where video is use as a complement to a classroom setting, students might get more information in a video that was simply not possible to give face-to-face. Educators might as well record classes that allow student-workers to access information, otherwise would not be accessible to them. We can list some of the advantages for students:

- Flexibility of learning - lessons and content are more accessible, learning schedule becomes more flexible, it is especially important for postgraduate students, Master's students, students with special needs.
- Explaining a complex concept becomes easier with the use of videos.
- Videos are a great tool for the reinforcement of the information that has been taught during face-to-face class.
- Science students need lab experience, and video can be also a good way to get some of that experience.
- Students can control their own learning process.
- Opportunity to engage (and motivate) more students (videos are the most popular and fast way to transmit contents).
- It can be used as instructive feature for laboratory or practical classes.
- For e-Learning courses the use of video lectures is essential.
- Videos create a sensory experience impossible to transmit by the use of print materials only. The fact the students are simultaneously taught

via visual and audio channels put them into their everyday interaction conditions.

- Video materials provide the students with a "to go" information source that they can use from anywhere with the internet connection using their own devices including laptops, tablets and smartphones. It mobilizes the educational process and takes it for a wider context and a traditional.
- Videos easily increase knowledge retention, since they can be stopped and replayed as many times as it is needed for better understanding and can be reviewed long after the initial lesson was taught.
- The videos can be adapted for any subject teaching and learning, but they are particularly important for some complex or highly visual topics.

2.3. What do Educators Gain from It?

For educators, videos are just another form of achieving their pedagogical goals and allow students to engage with contents in a different way. It is also a shift on how you deliver content and change the time you spend face-to-face with your students. You may gain time to explore your students' interests or even your own with the help of educational videos that you either prepare or reuse. Upon mastering video usage, educators gain a very powerful mean of conveying information and of documenting behaviours and happenings. If

used in a meaningful way here are some of the advantages for teacher:

- Lectures can be reused.
- Research can be done to study the effectiveness of the methodology.
- More time for academic practice.
- It gives teachers the opportunity to create one-on-one interactions with students who are having difficulties.
- Video-learning can be implemented gradually.
- Video can be used as tutorials.
- Video can be used as introduction and course overview to motivate students (regarding elective disciplines).
- For some specific disciplines, video is a great opportunity to deliver knowledge and skills.
- Video materials is the best way to increase student's engagement, to make them interested in the subject and to boost their achievements.
- They offer the possibility to set the class discussion at any moment the teacher wants it by pausing the video or reviewing its parts.
- Video content can be easily used in traditional classroom settings but it also helps to create some new scenarios, like a flipped classroom, or "blended" learning environment.
- Video materials is the best solution for distant learning practice, as the teachers can instruct students from all over the world.
- Many web-platforms, like PlayPosit, NextThought, just to name some, even provide possibilities to track the whole group's or every single student's engagement and attendance, to add some exercises on the video content and to analyze the material understanding level, as well as the effectiveness of the video.

In other words, videos seek to change the roles of teachers from lecturers to facilitators, but it is important to note that videos are meant to enhance course materials and lectures – not to replace them.

2.4. What do Institutions Gain from It?

- Video content is able to improve an institution marketing and communication strategy by reaching a greater number of distant students. Video clips that contain short history of the institution, prominent personalities and important traditions can play significant role in attracting students. Videos can be posted and shared through various social, networks, apps, new tools, etc.
- Video learning can be also used for faculty and staff training, providing the training courses with more forms and new methods and giving a free access to the information that they can easily get and review at any time.
- Video can be a great tool to keep alumni updated and involved in what is going on at institution.
- By sharing live campus families, students and alumni will feel more connected to the institution, which will increase a more positive recommendation.
- By offering online courses, which are very popular, institution can reach and attract more students.
- Video lectures often lead to higher grade, which suggest that use of videos in education increases return on investment (ROI).

2.5. Role of the Teacher

Teachers play a key role when it comes to the use of video in education. However, it is important to clarify the distinction that exists when considering the use of video in blended-learning contexts vs e-learning contexts.

Considering the first scenario, blended-learning, using video might not introduce many differences. It all will depend on what you, as an educator, want to achieve with a given video/set of videos. A video might refer something mentioned before in class, or simply illustrate a concept. On the other hand,

different approaches such as flipped-classroom, might use video as a trigger to a discussion that will take place in class.

Considering e-learning contents, teachers will have to completely rethink their Modus Operandi and change the curricula of their courses to better suit this learning context.

The main idea behind the use of video is to, first, understand the context in which video will be used, and secondly, understand what you will need to do in order to deliver good quality videos. You, in an educational context, are not required to become an actor/actress and students will not demand professional grade videos. However, you will need to understand how to effectively communicate using this media, plan and prepare what you want to say or show so that, in the end, a good quality video will be delivered to your students.

Sometimes teachers have to cope with a new role as a producer in order to create videos for their students. They learn video technologies, software editing and the demanding process of video production. Throughout the process, teachers continues to play an essential role as content delivers.

2.6. Before and During the Class

To produce a video, previous planning is required. This means that beforehand a small script or, at the very least, some topics will have to be written down in order to have a good flow for the camera. Think about the location (where you record), what you want to show (if anything), what you want to say and how to say it. Most likely, you will have to make this video all alone without the help of a production team, it can be done, but be sure to plan everything carefully.

Before using educational videos in the classroom, we have to answer several questions:

2.6.1. What is to be learned?

Specifying the learning goal

The structure of the syllabus or curriculum for a subject may state an overall goal from which a number of tasks may be formed. If the learning goal is too broadly defined or open to interpretation it may fail to be grasped by the students. Conversely, setting a learning goal that is too narrow in scope may result in an overly simplistic video.

2.6.2. How is this to be achieved?

Selecting a teaching and learning strategy

The selection of a suitable pedagogic approach to attain the stated learning goals may suggest themselves from the nature of the content, from the specification of the learning goal, from experience, from advice, or from a combination of these.

2.6.3. How will the video be used?

2.6.3.1. Using videos in a flipped classroom

Providing students with the material, before class, allows them to gain a basic level of knowledge and understanding so class time can be used to deepen learning and develop higher-level cognitive skills. One of the core objectives of flipped learning is to move students away from passive learning and towards active learning where students engage in collaborative activity, peer learning and problem-based learning.

Within this context, the role of the teacher shifts towards that of facilitator and coach by empowering students to take control of their own learning. The use of different types of technology can enriches the flipped learning process and usually promotes skills that are essential for 21st-century learning.

The flipped classroom can offer opportunity to experiment different and new formats as well as a variety of media to deliver lecture material in more engaging ways. Without the constraints of the classroom or class time, many teachers shorten their content to short video incorporate multimedia and take their students on virtual tours by recording content in the field.

Below are several ideas for the types of content a teacher can create for flipped classroom lectures.

2.6.3.2. Theoretical or fundamental knowledge

The most common approach to the flipped classroom is simply to make the traditional lecture available ahead of class. As such, flipped class recordings provide a great medium for students to gain a baseline understanding of any given topic. Recorded PowerPoint presentations are most frequently used for this purpose.

2.6.3.3. Lab demonstrations

For laboratory-based classes, teachers can make videos available before lab-classes, so students can have an idea of the proceedings and techniques needed for the task they will be doing during lab-class.

In addition, video can actually improve the instructional content beyond what would be possible in a face-to-face classroom environment. For example, using several webcams, teacher could capture a simulation from multiple angles, including close-ups that help students see the details.

Finally, capturing and sharing lab demonstrations ahead of time can also help reduce student anxiety. This is especially the case when small mistakes have the potential to derail subsequent steps in the lab.

2.6.3.4. Facilitating thinking and problem solving

For all subjects that fall under science, technology, engineering and mathematics disciplines where problem-solving is a fundamental part of the course, recorded video lectures are a great way to present a given problem and suggest approaches to solving it.

For subjects listed above where problem-solving is a fundamental part of the course, recorded pre-lectures are a great way to present a given problem and suggest approaches to solving it.

2.6.3.5. Applications and examples from the field

Field trips have always been a great way to engage students and make classroom concepts more tangible. Video can be very helpful to illustrate abstract concepts and improve internal communications.

Video can offer a virtual experience when a class trip it is not possible. Moreover, as smartphone video cameras have become increasingly powerful, teachers can now capture broadcast-quality video of the 3- dimensional nature of underground excavations, enabling students to see the detail as though they are standing only inches away.

2.6.3.6. Audio content published as podcasts

Stemming from formats developed for radio, audio podcasts can be a great source of content for the flipped classroom. They often take the form of interviews or short stories, and today, there are podcasts available on nearly any subject. iTunes alone now boasts more than a quarter million podcasts. Most are available at no cost and can easily be played on any laptop or mobile device.

2.6.3.7. Documentaries and other online videos

Many teachers find that third-party video can be one of the best sources of content for the flipped classroom. Free accesses academic videos, as well as wildly publicly available video channels on YouTube, Vimeo and others, provide overviews and in-depth coverage of a wide range of subjects.

Universities have also increasingly been recording guest lecturers, which many make available to the public through their websites.

Copyright questions are a top concern for most educators and administrators when it comes to selecting third-party materials for use in the classroom. For the most part, using third-party materials for educational purposes is generally safe under the fair uses clauses of copyright law.

2.6.3.8. Student assignments

Since the in-class component of the flipped classroom lends itself well to collaboration, discussion and active learning, more and more teachers are curating content through the use of recorded student assignments. For example, students could capture video from an outdoor experience. These videos can then be shared as experiential learning for discussion with their peers in class.

2.6.4. What will the finished video look like?

Definition and typology of Educational video

One of the characteristics, which distinguishes video for teaching and learning from other forms of video, is that its purpose is to assist student viewers in their attainment of one or more learning goals. It may or may not have the lecturer visible and can include an animated film, or a demonstration. Educational video comes in many different forms, for example:

1. A screencast is a digital recording of computer screen output, also known as a video screen capture, often containing audio narration. The term screencast compares with the related term screenshot; whereas screenshot generates a single picture of a computer screen, a screencast is essentially a movie of the changes over time that a user sees on a computer screen, enhanced with audio narration.

2. A Talking-Head in context of a video shoot is a shot where a person talks directly into the camera as if addressing the viewer personally. It can include graphics, animations and cut to slides or images to break up the action or visually illustrate a point. These videos take longer to produce and are best used if you want a more intimate, physical presence of the person talking.

3. Lecture recording refers to the process of recording and archiving the content of a lecture, conference, or seminar. It consists of hardware and software components that work in synergy to record audio and visual components of the lecture.
4. On location lectures can be especially helpful to give the audience a feel for a physical location that you are discussing (e.g. electronic waste recycling in Thailand). These types of videos can make topics come alive in ways that just talking about them or showing images cannot. Depending on the location it is important to pay attention to where you are recording. The background needs to be illustrative and relevant to your points and you want to make sure that there are not too many distractions or loud noises that would interfere with the recording.
5. A knowledge clip is a short video providing knowledge. For instance, a short clip where the teacher explains some small part of the theory. Students can watch the video when it is convenient.
6. A podcast is a topic-specific digital stream of audio files that can be downloaded to a computer or a wide variety of media devices.
7. A vodcast is a similar device to a podcast in which students can access information through a series of audio clips, which includes video or pictures.
8. An instructional simulation, also called an educational simulation, is a simulation of some type of reality (system or environment) but which also includes instructional elements that help a learner explore, navigate or obtain more information about that system or environment that cannot generally be acquired from mere experimentation. Instructional simulations are typically goal oriented and focus learners on specific facts, concepts, or applications of the system or environment.
   a. Simulations are perfect for teaching complex tasks or abstract processes that are difficult to communicate with just words on a screen.
   b. Using real environments, such as a factory floor, prepares learners to recognize their surroundings quickly.

9. Video-based instruction refers to the creation of videos that a teacher makes outside of class contact hours that specifically teach a concept or content. It differs from flipped or blended learning in that the video is viewed in the classroom during the lesson time, rather than at home. This means that the teacher is in control of the exact content to be presented in the videos, and different videos can be made at various levels, catering precisely to student needs. It also changes the teacher's role to that of facilitator or coach, able to roam around the classroom overseeing the various videos being used as students complete their work.
10. Interviews involve one or more people answering questions on camera. This could be used with the "person on the street" format. These can be useful for bringing in outside perspectives or expert voices into the learning environment. They involve planning, preparation and good questions to make sure that the interviewee addresses the topic sufficiently.
11. Documentary video can mix various video styles mentioned above as well as voiceover and still images to tell a story about a particular topic or idea. This method allows for significant creativity and can treat the subject in an engaging, in-depth way. These videos can take a significant amount of time to plan, develop, edit, and produce.
12. Drawing a Concept or Diagram - these types of videos involve visually sketching out a concept using images, symbols, shapes, and text. They are useful for breaking down complex ideas, explaining them piece by piece, and visually illustrating a point. These videos are fairly quick to create but involve planning and practice ahead of time.

How can we use all these variety of educational videos in active learning? See some tips below for some suggestions:

Guided Lesson – short, topical videos (5-20 min) attached required documents (datasets, worksheets, etc.) – consists of one video with pauses or broken into sequenced activities. Begins with instruction/demonstration, pause video. Students work on problem or scenario, resume video and review the correct response.

Predict, Observe, Evaluate (POE): Students view the first part of video setting up scenario, predict what should happen next, observe the actual result, evaluate the original prediction.

Empathy: Students complete a survey or have a discussion to describe how they feel about the topic before and after viewing the video. If students' views change, they should describe what has changed their minds.

Dissonance: Appropriate for lesson introduction (short clip). Supposes introduction of a difficult or controversial topic, use of a powerful clip, which may disrupt assumptions and preconceived notions, as well as conduction of a discussion on theme.

Course description: Video can be used as Introduction and course overview to motivate students (regarding elective courses).

Manual for practical course: Video can be used in practical disciplines to explain how the homework or coursework should be done.

It is important to consider ahead of time what you hope your students will learn from the videos. You will also need to plan how you will help the students learn, and how you will know whether they have done so.

2.6.5. Assessment

Student assessment enables teachers to measure the effectiveness of their teaching. Traditional assessments are great at evaluating facts and figures, but it's challenging to assess every skill on paper, moreover, not everyone learns

the same way – some do better with written communication, while others struggle with it. Video assessment opens up a new way of evaluating students with different strengths. In case of video-based learning, questionnaires and student-created videos could be used to evaluate outcomes.

Within short bursts of video-based learning, assessments and practice tests can be built in to provide a break from learning as well as a tool to measure the effectiveness of learning. An effective video platform can measure user interaction, engagement, and course assessment as well as completion scores. Administrators can use the analytics to continue to provide content that is effective and take down videos that have proven to be ineffective. Analytics like these can provide quantitative insights to content planning.

In case of video-based learning, questionnaires and student-created videos could be used to evaluate outcomes: 1) video can contain questions on which students must give answers; 2) homework can imply a short video prepared by a student.

2.6.6. Practical aspects

There is a variety of tools and programmes educators can use to create powerful education videos, you can find open source software applications as well as enterprise ones. This is an area that it is always improving so new and better programme s come out almost everyday. We can name some, but it is important to look for what it is the best option at the moment you decide to start using video. Panopto, Camtasia, Snagit, VideoScribe, TouchCast, FinalCut Pro, Explain Everything, Kaltura, Echo360, Screencast-o-Matic, YouTube, IMovie, Movie Maker, MovAvi, Flickr. Classroom infrastructure: Classrooms should be equipped with computers, laptops, Wi-Fi, Portable Projector, Smartboard. They should be more flexible provided with lightweight and portable furniture in order to be able to organize an active lesson. If financial resources allow, it will be efficient to build a video recording studio at the university.

However, one should consider the practical aspects of recording. Here are some tips that can help you achieve a good quality video, controlling the environment to your advantage, making the most of the time you have available to do this step.

Placement: The speaker should be standing, in front of the camera, with a relaxed and informal posture. A very unnatural rigid posture should be avoided.

Eye contact: The resulting video should be a conversation between two people, the speaker (on camera) and the person watching the video afterwards. When recording, face the camera and look into the objective (camera lens). This will help to achieve that final goal.

Verbal communication: Speak in a paused and understandable fashion. Pauses are dictated by punctuation and allow you to breath normally, regain breath and place your voice. Avoid a monochord tone so that the viewer does not lose interest.

Non-verbal communication: Body language does matter when it comes to a video. Face and body should not be very rigid, making the speaker look artificial. This may vary from person to person, but try to be as natural as possible positioning your body and facial expressions accordingly. Top tip: do not place your hand in your pockets!

Duration: How long can a video be, to still have a dictated purpose? This is a question important to make, but hard to have a precise answered. However, try to aim for around 5/6 minutes. Longer videos might cause distraction to viewers.

2.7. Potential Challenges

Using video in education, on classroom or online, brings a set of potential challenges for teachers, beginning with filming equipment and its use. Educators need to have basic skills on video production or, at the very least, understand the limitations and advantages of using this media. Understanding the media is the first way of making the most out of it.

Other possible limitations have to do with the preparation of the script, what to say and how to say it. The key is preparation. The better prepared you are for the recording, the best it will be.

However, there are a set of challenges that may be external such as bandwidth or security issues.

Video-based learning offers an excellent user experience but tends to take up bandwidth and cannot work with slow network connections. Organizations that are serious about adopting a video-based learning strategy should make allowances to view video content offline as well to cater to learners who face a problem of slow internet connection.

Strategies at the development stage can also make videos lighter and make sure that they work with slow connections as well – for instances using lightweight images, simpler animations, and so on.

Training content within an organization is its intellectual property. If the organization wants to keep the training content private, public video hosting sites like YouTube have to be avoided. Instead, they can host the content on their Learning Management System and have a tight control on who can view, share, or download videos from the organizational LMS. Even better, if your organization has a Video Management System, use it. It will probably be the safest option and will give the most control on video use and sharing.

2.8. Tips for Using the Method

- Videos in e-learning should contain small chunks of information that can be easily absorbed, which makes it more memorable than text, and emphasizes all the key points. Long e-learning videos often lead to cognitive overload. So simplify your educational videos for students. The best educational videos are the ones that focus on a single point. Do not drown your viewers in a sea of information, instead, stick to one topic and provide examples to hammer your point home.
- Videos in e-learning should be compressed for greater accessibility. Even mobile learners on a slow Internet connection must be able to view the

eLearning video and get the information they need. Compression also allows them to quickly download the video for later viewing.

- Prepare for video creation by writing a script. This document describes everything that happens in your video-dialogue, visuals, music, and more. You will use the script as a basis for storyboarding recording your video, so it's important to take this writing stage seriously. Use these tips to write a script for a video that is both engaging and educational. While doing this you can also think about how you are going to efficiently present the information the learner needs to achieve their learning goals.

- If you're filming your face make it more personal and engage with your audience by looking at the camera. As mentioned already video can be a passive experience so do what you can to make it more active.
- Ensure your voice is clear and audible, and you know exactly what you are going to say. Take time to write a script that contains all of the key points you need to make so you are not stumbling over your words.
- Use pictures & visual representations such as charts and diagrams together with audio narration to illustrate your points. Students learn better when they have multiple inputs from which to create different mental models to enable them to understand and build connections (Multimedia principle).

- Use visuals alongside your talking points to make concepts come to life. Even without the budget to develop visuals, stock photos or simple drawings can be incorporated to strengthen points or tell stories. Consider using a great free tool, screencast-o-matic (screen recorder and video editor), to add narration over a PowerPoint presentation for one of the simplest ways to create more visually appealing videos to illustrate concepts.
- Check out Examples Online.
- Keep it Short (KIS) – Be Concise and Succinct. People have very short attention spans nowadays, especially for internet video. They have many distractions taking them away from your video. If the How To video is a simple technique, try to make it 2 to 5 minutes. If the training video requires more skills and a longer involvement, make it a maximum of 20 minutes. With a 20 minute or longer format video, find a good place to break it into segments of 5 to 6 minutes each. Give the viewer breathing time between steps. If your video requires you to go longer than 30 minutes, break it into 2 or more separate videos.

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Chapter 4

INNOVATIVE AND TECHNOLOGY ENHANCED TEACHING AND LEARNING: ACTIVE LEARNING IN THE FLIPPED CLASSROOM

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PART 1

DESCRIPTION OF THE METHOD

The *flipped classroom* approach seems to imply a radical change in teaching already in the name. In some cases, everything might be turned upside down, but the main point is really to make the most of the time that the teacher and the students spend together.

> ***"[...] flipped learning occurs when information that was traditionally delivered directly to the entire classroom, via lecture, is delivered outside of the classroom space, typically online, in digital or video format"*** (Roehling, 2018).

Instead of passively listening together in large lecture halls and then go home to work individually on exercises, students now individually prepare e.g. by watching pre-recorded lectures, using in-class time for active learning that stimulates higher-order thinking. The transformation is illustrated in Figure 1 below.

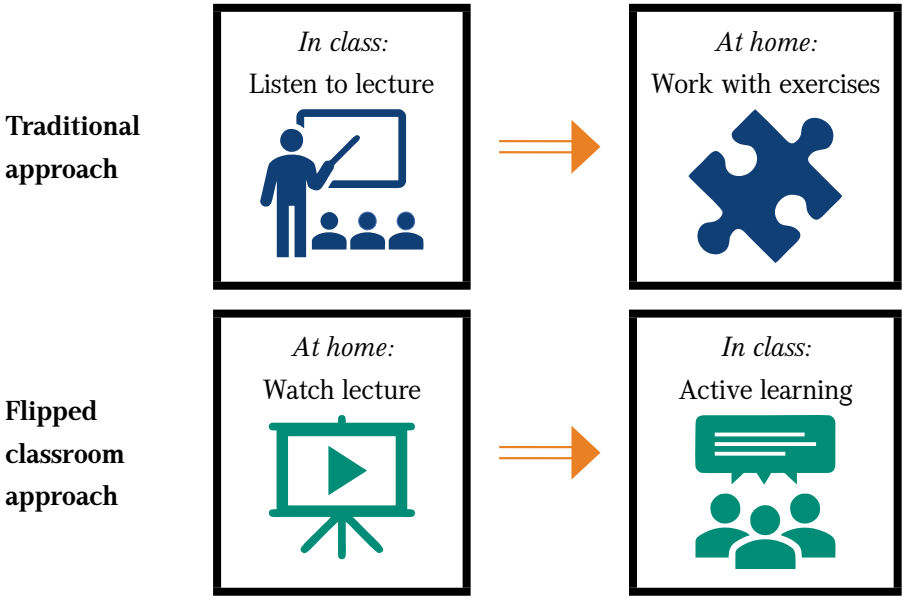


Figure 1. Traditional vs. Flipped Classroom Approach

Flipped classroom, *flipped learning*, or sometimes *inverted classroom*, has been around for some twenty years now and has to some extent become synonymous with pre-recorded lectures, but this is not the main feature of the approach. The students can prepare for class activities by reading, doing quizzes, completing assignments, etc. The most important factor is the active learning taking place during class.

So, what is *active learning* then? It is anything that involves students in *doing* things and *thinking* about the things they are doing, according to Bonwell and Eison (1991) who more or less coined the term. General characteristics of active learning include:

a) Students are involved in more than listening;
b) Less emphasis is placed on transmitting information and more on developing students' skills;
c) Students are involved in higher-order thinking (analysis, synthesis, evaluation);
d) Students are engaged in activities (e.g., reading, discussing, writing);
e) Greater emphasis is placed on students' exploration of their own attitudes and values;
f) It requires externalizing cognitive processes in the activities.

The last one was added by Matsushita (2018), otherwise the list is identical to Bonwell and Eison's original list.

This broad definition means that active learning is not really a method in itself. It is rather an overarching approach or philosophy common to many different pedagogies. As observed by Cattaneo (2017), active learning is an ingredient in problem-based learning, project-based learning, case-based learning, research-based learning, discovery-based learning, and indeed several other methods. This versatility does not mean that active learning is without theoretical foundation. The basic idea is that knowledge is generated through student activity, which corresponds well with the constructivist framework.

PART 2

FOUNDATIONS AND PRINCIPLES

Numerous guidelines for flipping the classroom and using active learning methods exists, and this section summarizes some of their recommendations.

2.1. The Four Pillars of Flipped Learning

The Flipped Learning Network (FLN, 2014) defines four pillars on which the flipped classroom approach, or flipped learning, rests (see Figure 2).

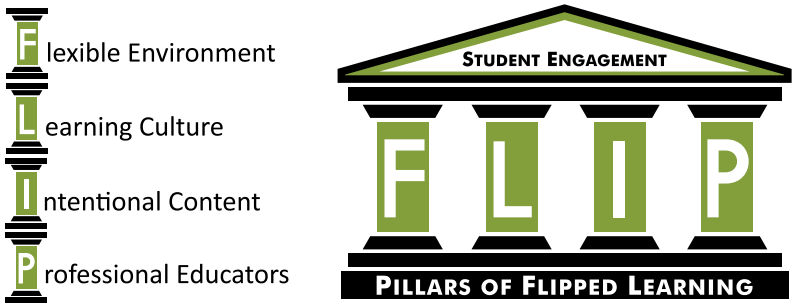


Figure 2. The four pillars of flipped learning
https://flippedlearning.org/syndicated/
11-indicators-of-excellence-in-instruction-flipped-or-otherwise/

2.2. Flexible Environment

Flipping the classroom is not just about planning activities differently, it also means that the physical environment needs to be flexible enough to allow for many different in-class activities. Classical lecture halls where all eyes are directed towards the podium does not support active flipped learning. You need to at least be able to rearrange the furniture.

2.2.1. Learning culture

Flipped learning implies a shift from teacher-centered teaching to student-centered learning. Students are encouraged to be more actively involved in knowledge construction in a way that is personally meaningful.

2.2.2. Intentional content

Pre-class activities should be designed to help students develop conceptual understanding. This does not mean that the teacher should completely leave the students to browse anything online. All content should be chosen or produced carefully to support the learning outcomes of the course.

2.2.3. Professional educator

Student-centered learning does not diminish the role of the teacher. A professional educator needs to be active during class, providing students with relevant feedback at just the right time, always reflecting on how to improve their practice.

2.2.4. Five steps to flip your class

Faculty Innovation Center at the University of Texas at Austin (2020) has defined five concrete steps for flipping your class. For an overview of their way of explaining the flipped classroom, see also *Figure 3* below. The following steps are further discussed in chapter 4. Before and during the class.

Step 1: Identify where the flipped classroom model makes the most sense for your course

If you are new to flipped classroom, it might be a good idea to start small, maybe just by flipping a single lecture. The flipped classroom approach might make more sense in some courses, so try to identify a course, or a part of a course, that seems suitable.

Step 2: Spend class time engaging students in application activities with feedback

Class time should not just be unsupervised group work. Your role as a teacher is still important and you need to find activities that will activate students and keep them engaged in the topic.

Step 3: Clarify connections between inside and outside of class learning

The teacher must have a clear idea of what the students' need to know in order to be able to participate in the active learning class.

Step 4: Adapt your materials for students to acquire course content in preparation of class

It does not have to be in the form of recorded lectures, if it is a well-defined material that will support student engagement.

Step 5: Extend learning beyond class through individual and collaborative practice

The teacher also must have an idea of what happens after class, e.g. completing started assignments or use discussion boards to elaborate on ideas.

Figure 3. Snapshot of a flipped class
https://facultyinnovate.utexas.edu/how-to-flip

2.3. Principles for Designing Flipped Learning

Roehling (2018) presents a list of principles for an optimum flipped learning experience:

1. Provide an opportunity for students to learn the foundational information outside of the classroom;
2. Hold students accountable for pre-class preparation;
3. Assess pre-class and in-class learning;
4. Provide well-defined and structured guidance to students during in-class activities;
5. Make clear connections between in-class activities, pre-class materials, and learning objectives and goals;
6. Allow enough time for students to complete the in-class assignments;
7. Maximize opportunities for faculty to interact with students;
8. Give one free pass to students who do not complete the pre-class assignments.

2.4. Pedagogical Perspectives

Flipped classroom has been widely adopted in higher education, but the theoretical foundation is still lacking. In an effort to rectify this, Koh (2019) analyzed 51 case studies of flipped classroom use in higher education and suggests four pedagogical dimensions that can be used to articulate how flipped classrooms support student-centered learning.

Personalization

Students should be able to choose between different resources and learning activities, thus personalizing their learning experience. For pre-class activities, this means that the teacher needs to supply different versions of the material, adapted to fit different study modes. Using material available online, in the form of Open Educational Resources (OER), facilitates the preparation. Personalization can also be accomplished during in-class activities, if the structure is flexible enough to support individual learning needs. Flexible learning environments can be another contributing factor.

Higher-order thinking

By flipping from lectures, with a focus on passively transmitting knowledge, to active learning, learning outcomes can be formulated on higher levels in Bloom's taxonomy: application, analysis, creation. Students can be engaged in problem-solving using real-world problems, case studies or scenarios.

Self-direction

Students should be encouraged to take responsibility for their own learning process. Connected to the aspect of personalization, student autonomy should be fostered, giving students a better understanding of their role as independent learners.

Collaboration

Collaboration can be so much more than just group work. It supports active learning and helps the students articulate their personal knowledge. The social interaction enhances students' motivation and provides a suitable context for efficient knowledge construction.

2.4.1. Using the pedagogical perspectives

As teachers, we can be inspired by the analysis of Koh and use her questions to guide our design of flipped learning:

- Personalization: How are individual choices for learning supported?
- Higher-order thinking: How is students' higher-order thinking elicited?
- Self-direction: How are students supported to take charge of learning?
- Collaboration: How are learning collaborations among students supported?

2.5. Examples of Active Learning Techniques

Using active learning in the classroom does not necessarily have to involve a lot of preparation and complicated technology. As O'Neal and Pinder-Grover has shown, teachers have a vast spectrum of possible active learning techniques available – some very simple and some more complex. Simple examples include:

- **Clarification pauses:** Simply paus for a minute after introduction of a new concept, then ask if anyone needs clarifications.
- **Think-Pair-Share:** Ask the students to work individually on some task for a few minutes and then compare their results with a partner, trying to form a common solution that can be shared with the whole class.

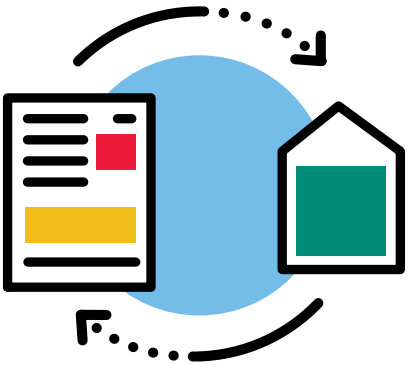
Some more complex examples include:

- **Role playing:** Instruct different groups of students to represent different roles or standpoints. Then have them act out a scenario, scripted or improvised. Remember to always follow up with a debriefing session.
- **Jigsaw discussion:** Divide a general topic into smaller pieces. Each student in a group is given a particular area for research. Later on, students will share their findings with the whole group, thus completing the puzzle.

Several more examples can be found in *How Can You Incorporate Active Learning Into Your Classroom?* available from University of Michigan, Center for Research on Learning and Teaching.

PART 3

TEACHER'S ROLE IN THE FLIPPED CLASSROOM



Only through the active engagement of the students in the process of learning the teacher can clearly understand as to what the students think and based on that understanding s/he can influence the education process. It makes a lot of sense to say, "You learn the material through engaging". And another famous saying states: "Tell me and I will memorize, explain to me and I will understand, engage me and I will learn". If the teacher is the one to take the floor and talk most of the time during the class it is then becoming impossible to see as to what the students think, whether or not they understand the topic and whether or not they correctly constructed the "building" of their knowledge. By applying the given method, it is practically impossible to educate an active, responsible citizen who engages in the processes of the country. The discussions, debates, questioning are the preconditions for an efficient teaching.

Flipped classroom approach requires change in teacher's role. In a traditional classroom the teacher is mostly a knowledge provider. In the flipped classroom approach, the teacher becomes an architect of the learning process. One of the key questions that teachers should ask in flipped classroom is this: **Which activities that do not require my physical presence can be shifted out of the class in order to give more class time to activities that are enhanced by my presence?** Teacher should determine which objectives are best achieved through inquiry, and which are best learned through direct instruction. The latter ones should be tasked as homework.

While watching the videos or reading the printed materials students should take notes. We can recommend Cornell notetaking template for students. See *Figure 4* below.

Name: _____ Date: _____ Period: _____

Key Points	Details
Summary	

Figure 4. Notetaking template for students

Jonathan Bergmann, who is one of the founders of flipped classroom approach, listed the following characteristics of the teacher in the flipped classroom (Bergmann, 2012):

The teacher should be a content master. A teacher who is not proficient in his content area cannot operate in a flipped class. The ability to mentally move from one topic to another is necessary, and a comprehensive understanding of the interconnectedness of the content is essential.

The teacher must be able to admit when he or she does not know the answer to student questions and must be willing to research an answer with the student. Pride will only slow the teacher down and prove to be a detriment to student learning. The teacher should take these opportunities to

demonstrate what it means to be a learner: the teacher is the lead learner in a classroom. Teachers should show students what adults do when they do not know an answer, teach them how to collaborate, and guide them through the vast ocean of information in which we swim in our interconnected world.

The teacher must be able to flow through a class period in a nonlinear fashion. All the students are at different places in their mastery and understanding of the learning objectives, and it is the role of the teacher to meet each student where she or he is. The mastery model hinges entirely on the teacher meeting the student at the point of need, not the student meeting the teacher at the prescribed place in the curriculum.

The teacher must be able to relinquish control of the learning process to the students. Control freaks need not apply.

3.1. Discussion Questions for Flipped Classroom

In flipped classroom class time is a learning experience for the student, not a download and upload of knowledge. In this context the use of questions and discussions is of critical importance.

Nobel Prize winner Isidor Rabi was once asked, "Why did you become a scientist and not for instance a doctor, a lawyer or a businessman?" He answered back, "My mother made me become a scientist. The mothers of my mates were usually asking their kids "What you learned in the school?", whereas my mother was asking a completely different question, as to "what good questions did you ask today in the school?" So, I became a scientist as a result of asking good questions every day.

In the course of recent years, the education experts specifically recognize the exceptional role of questions on the quality of education. The issue is that

in contrast to giving ready knowledge, or affirming or rejecting statements, the questions move both the students and the teachers to think. Indeed, the questions move the human mind and increase the motivation to study. These make the individual to do research for getting answers on permanent basis. In addition to promoting the thinking, the questions help the teacher to understand as to what extent the students learned the topic.

The researches of the recent years (Tofade, Elsner, Haines, 2013) prove that when asking questions, the teacher should give at least 30 seconds to the students before calling on them. According to the researches, in the given circumstances the students can think and memorize the question. Due to this method the number of students who can pick up the questions increases.

The efficient use of questions can essentially improve the efficiency thereof. For instance, rather than asking "which numbers are called simple?" the teacher should ask "why 17 is a simple number, whereas 15 is not?"

There exist numerous types of questions. Unfortunately, the hornbooks and class processes predominantly use factual questions: *What? When? Who?* The value of these questions is very low.

Below we present other types of questions, which promote development of thinking of the students in the flipped classroom.

3.2. Types of Questions

Clarifying questions

1. What do you mean? …
2. Can you bring an example? …
3. How does it help? …
4. You are using the word in what meaning?

Questions about justifications

1. Why do you think that? …
2. How do you know that? …
3. What are your justifications? …
4. Do you have any facts? …
5. What examples can you use? …

Questions about viewpoints and alternatives

1. How can you reformulate your statement?
2. Any other opinion? …
3. What if someone suggests something like that?
4. What will a person say who does not agree with your point?
5. Which are the differences of these questions?

Questions about the consequences

1. What is following from what you said?
2. Is it in line with what you said before?
3. What are the consequences?
4. Is there a general rule?
5. How can you check whether your statement is right or wrong?

Questions about questions

1. Do you think that it is a relevant question?
2. What does the question mean?
3. How can the question help us?
4. Can you think of another question, which will open a prospect for another question?

3.3. Critical Thinking Questions for Flipped Classroom

The Teach Thought organization developed 28 critical thinking questions, which teachers can use during flipped class discussions (TeachThought, 2017):

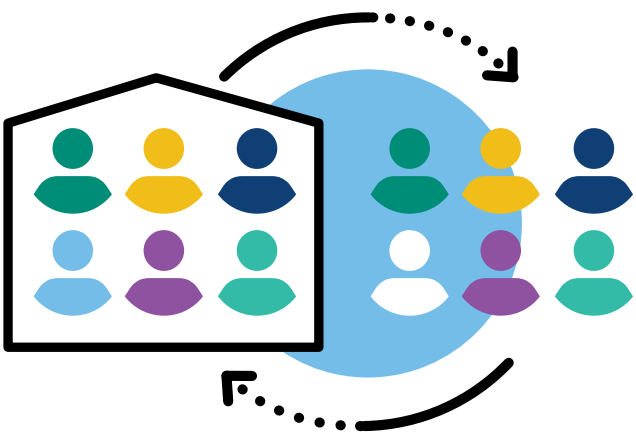
1. What evidence can you present for/against…?
2. How does … contrast with …?
3. How could you outline or concept map…? Explain your response with examples.
4. Why is … significant? Explain your reasoning.
5. What are the advantages and disadvantages of …?
6. What is the point or "big idea" of …?
7. How could you judge the accuracy of …?
8. What are the differences between … and …?
9. How is … related to …?
10. What ideas could you add to … and how would these ideas change it?
11. Describe … from the perspective of ….
12. What do you think about …? Explain your reasoning.
13. When might … be most useful and why?
14. How could you create or design a new…? Explain your thinking.

Figure 5. Question mark

15. What solutions could you suggest the problem of …? Which might be most effective and why?
16. What might happen if you combined … and …?
17. Do you agree that …? Why or why not?
18. What information would you need to make a decision about …?
19. How could you prioritize …?
20. How is … an example of …?
21. What are the most important parts or features of …?
22. Which details of … are most important and why?
23. What patterns do you notice in …?
24. How could you classify … into a more/less general category?
25. What makes … important?
26. What criteria could you use to assess …?
27. How could … and … function together? How do they work separately and together and different ways?
28. Where is … most/least …? Explain your reasoning.

PART 4

BEFORE AND DURING THE CLASS



The flipped classroom model swaps lower and higher types of cognitive activity according to Bloom's taxonomy (Anderson et.al., 2001). At home, students apply:

- ✓ remembering – retrieving relevant information from long-term memory;
- ✓ understanding – determining the meaning of instructional messages.

Class activity is aimed at the use of higher types of cognitive activities:

- ➢ applying – carrying out or using a procedure in a given situation;
- ➢ analyzing – breaking material into its constituent parts and detecting how the parts relate to one another;
- ➢ evaluating – making judgments based on criteria and standards:
- ➢ creating – putting elements together to form a novel, coherent whole or making an original product.

In a flipped classroom, students study the topic on their own before the lessons begin. In the classroom, they apply the acquired knowledge, discuss complex problems and solve practical tasks (see Figure 6).

Type of Learning	Before class	During class	After class
Tradition learning	 Students relax	 Students listen to a teacher	 Students do homework
Learning in the flipped classroom	 Students study the topic on their own	 Students apply the knowledge by solving problems and doing practical tasks	 Students use knowledge and skills to solve more complex tasks

Figure 6. Difference between traditional learning and learning in the flipped classroom

4.1. Activities of the Teacher and Student *before* Classes

In the flipped classroom, preparing students for classes is of great importance. Success depends on both the teacher and the students.

Teacher

To use the technology of the inverted class, the teacher has to change his teaching modules (see Figure 7) as suggested by Faculty Innovation Center at the University of Texas at Austin (2020).

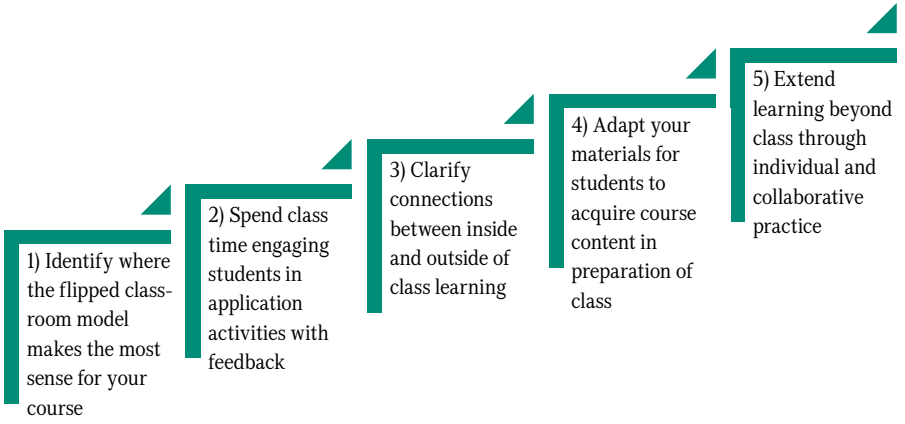


Figure 7. Five steps to try flipped classroom

Step 1. The teacher should apply training, if the topic is difficult to understand, students need the help of a teacher in mastering the teaching material, students need to gain practical experience on this topic.

Step 2. The most important question is how to use class time effectively. Students should be involved in the topic of discussion, actively participate in class work. For each group of students, it is necessary to select individual activities depending on their age, interests, level of erudition, sociability, group cohesion and more.

Step 3. In the flipped model, teachers decide:

- What students should *study at home*. The teacher gives students in advance educational material on the topic of the lesson. This can be lecture texts, video materials, links, and more.
- What students will *do in class*. It is important to use the tools of active learning, involve students in the discussion of problematic issues, and get feedback.
- What students will *do after class*. The teacher may offer students to complete a more difficult task. But he must take into account that

students will perform this task at the same time as preparing for the next lesson.

Step 4. The teacher has to adapt the teaching materials so that students can study them on their own. This makes new demands on the structure of texts, their visibility, comprehensibility. Modern students are focused not on reading, but on viewing various content. Consequently, the gradual transition from the traditional presentation of materials to digital will help students better understand the material.

The teacher also informs students that preparing for the lesson is mandatory. The student must have contact with the teacher by e-mail or another contact. An untrained student will not be able to benefit from classroom activities.

Step 5. Ways of spreading active learning outside the classroom are important. Students should understand how they can apply their knowledge and skills to solve problems in other projects and areas.

The teacher has to apply new teaching methods and tools, move from traditional learning to digital learning. This change should take place step by step, which will allow both students and teachers to adapt to changes.

To work in a flipped class, the teacher adjusts the methods:

- from traditional learning to active learning;
- from traditional education to digital education.

Students

Before classes, students should study the material provided by the teacher, understand it, watch videos, links to Internet resources, and make a list of questions that they can discuss in the classroom. In this model of learning, the student is not a passive student, but actively participates in the learning process to the classroom. He will not be able to achieve good results if he does not prepare for the lesson in advance.

4.2. Activities of the Teacher and Student *in* Classes

In the classroom, the teacher does not give a lecture, but organizes a discussion in groups, solving a practical situation, applying a problematic approach to teaching and other types of active learning.

A suggestion for structuring the session could be in the form of the following components (see Figure 8).

The teacher conducts a preliminary assessment of the student's knowledge that he acquired before class. Students do the test (3-4 questions). Verification can be carried out in different ways:

- students exchange papers and check each other;
- students do a self-test;
- the teacher instantly checks with digital programmes.

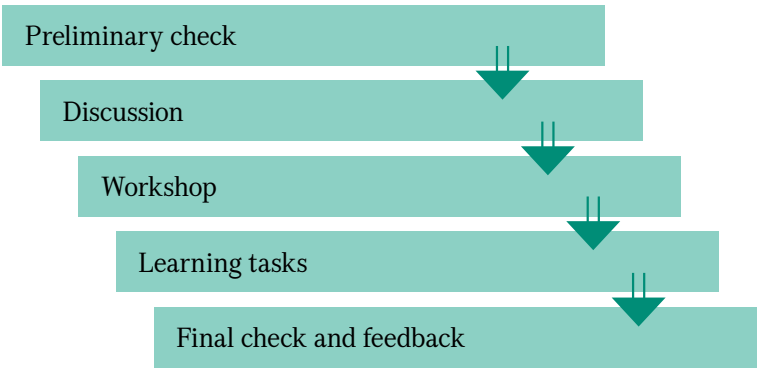


Figure 8. Class structure in flipped classroom

One way of designing a course module and choosing the appropriate activities is to use the ABC Learning Design method developed by Young & Perovic (2018), based on the learning types identified by Laurillard (2012). The teacher can start by thinking about the six general types of learning activities, deciding which methods are suitable for the particular course. These activities and some suggested activities, both digital and more conventional, are listed in Figure 9.

Type of activity		Conventional methods	Digital technology
Acquisition	Learning through acquisition is what learners are doing when they are listening to a lecture or podcast, reading from books or websites, and watching demos or videos	• reading books, papers • listening to teacher presentations face-to-face, lectures • watching demonstrations, master classes	• reading multimedia, websites, digital documents and resources • listening to podcasts, webcasts • watching animations, videos
Collaboration	Learning through collaboration embraces mainly discussion, practice, and production. Building on investigations and acquisition it is about taking part in the process of knowledge building itself	• small group project • discussing others' outputs • building joint output	• small group projects using online forums, wikis, chat rooms, etc. for discussing others' outputs • building a joint digital output

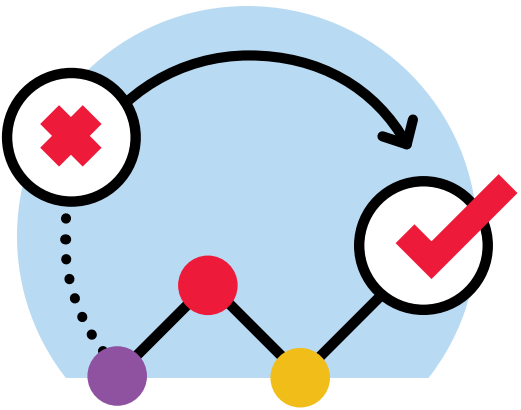
Type of activity		Conventional methods	Digital technology
Discussion	Learning through discussion requires the learner to articulate their ideas and questions, and to challenge and respond to the ideas and questions from the teacher, and/or from their peers	• tutorials • seminars • discussion groups • class discussions	• online tutorials • seminars • email discussions • discussion groups • discussion forums • web-conferencing tools, synchronous and asynchronous
Investigation	Learning through investigation guides the learner to explore, compare and critique the texts, documents and resources that reflect the concepts and ideas being taught	• using text-based study guides • comparing texts • analysing the ideas and information in a range of materials and resources • using conventional methods to collect and analyse data • searching and evaluating information and ideas	• using online advice and guidance • analysing the ideas and information in a range of digital resources • using digital tools to collect and analyse data • comparing digital texts • using digital tools for searching and evaluating ideas and information

Type of activity		Conventional methods	Digital technology
Practice	Learning through practice enables the learner to adapt their actions to the task goal and use the feedback to improve their next action. Feedback may come from self-reflection, from peers, from the teacher, or from the activity itself, if it shows them how to improve the result of their action in relation to the goal	• practicing exercises • doing practice-based projects • labs • field trips • face-to-face role-play activities	• using models • simulations • microworlds • virtual labs and field trips • online role play activities
Production	Learning through production is the way the teacher motivates the learner to consolidate what they have learned by articulating their current conceptual understanding and how they used it in practice	• statements • essays • reports • accounts • designs • performances • artefacts • animations • models • videos	• producing and storing digital documents • representations of designs • performances, artefacts • animations • models • resources • slideshows • photos • videos • blogs • e-portfolios

Figure 9: Types of activities and suggested methods

PART 5

ASSESSMENT STRATEGY



5.1. Our Understanding of Innovation Pedagogy

A learning approach that defines in a new way how knowledge is assimilated, produced and used in a manner that can create sustainable innovations.

Why the change from traditional pedagogy to innovation pedagogy is needed? Why innovation pedagogy?

- The traditional approaches in HEIs do not provide competences needed in current and future work.
- The job descriptions of young people can change approx. 25 times during their lifetime.
- About 65% of young people today will work in jobs which do not even exist now.
- The most important competences to success in working life will be skills for life-long learning, ability to recognize and assess own learning and ability to develop it.
- The graduates will be successful in their work and life in general, as well as the organizations, where they work, will be successful.
- The graduates will be successful in their work and life in general, as well as the organizations, where they work, will be successful.
- We live in a dynamic environment and need to be able to solve wicked problems such as climate change.

Figure 10. Traditional examination in Curzon Exam Hall
By Azim Khan Ronnie - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=72708317

5.2. How Can We do It?

In a flipped classroom, students engage with lectures or other materials outside of class to prepare for an active learning experience in the classroom. One of the many advantages of a flipped classroom is that it provides more time for instructors to work directly with students. Typically, students will do either some form of reading assignment or watch a video or a screencast online to prepare for the in-class portion of the flipped class. Depending on the learning objective(s) of the flipped class, students may need to read an article, book chapter or website to prepare for the in-class activities. In some cases, students are solving problems and analyzing information. They are working in small groups, talking together, and moving around. The instructor interacts and guides but does not lecture. In fact, no one has lectured to these students in weeks. (For a more detailed description of the method what a flipped classroom is and what in-class, activities are possible see in chapter 1. Description of the method).

While the flipped classroom does seem to have many advantages, it also contains challenges that may hinder student performance. One of the main issues is how can we be sure that the students completed the out-of-class work? More importantly, how do we make sure that the students have learned what they were supposed to learn online? Instructors using flipped lessons must be careful to plan and structure the environment to support student learning.

A key to achieving this is assessment[1]. Taking into consideration that flipped learning is more decentralized and personalized than a traditional course design, the challenge is to have assessments that provide reliable, actionable information about student learning in the various phases of flipped learning that is as up to the minute as possible. Armed with this knowledge about student learning, instructors can provide just the right amount of support at just the right time, anytime. It is critical for instructors to integrate and relate the learning outcomes, activities, and assessment strategies to ensure that pre-class work supports the in-class work. When designing formative assessment, the following should be considered:

- Will the assessment be worth grades or not?
- How long will the assessment take the students?
- If graded, how long will the assessment grading take the instructor or teaching assistants?
- How frequently should the students be assessed before class?

Once the assessment is completed it is important for the instructor to take the time to go through the responses before class and to review the responses to find similar themes. In class, the instructor can then reiterate the concepts where students had misunderstandings or confusion before starting the in-class activity. In order to properly support student learning, instructors must

1. The word "assessment" comes from the Latin term ad sedere, meaning "to sit down beside". When we assess, it should be as if we are pulling up a chair next to individual students, getting down on their level, and putting ourselves in their corner to give them information that will help them succeed. In a flipped learning environment, the structure of the class puts students in a position to learn in improved ways, but it's assessment that opens the way to success.

not only consider various modes of student learning for students, but also should consider the various real-life challenges that students typically face.

Flipped classrooms can be powerful, student-centered learning environments, so learn the cutting-edge **assessment strategies** that will enable you to find out just how well your flipped classroom is working.

Teachers that are already flipping their courses or just starting to think about it, have to consider how to assess student learning. Since flipping lessons results in different classroom activities, it takes different assessment approaches to measure the efficacy of these new instructional approaches. They should learn how to effectively measure flipped learning in Assessment Strategies for the Flipped Classroom.

5.3. What is Assessment for Learning?

Assessment for learning is best described as a process by which assessment information is used by teachers to adjust their teaching strategies, and by students to adjust their learning strategies.

Assessment, teaching, and learning are inextricably linked as each informs the others. Assessment is a powerful process that can either optimize or inhibit learning, depending on how it is applied.

Why should we use Learning Assessment?

- Provide students with ongoing feedback.
- Provide information about student learning.
- Provide students with opportunities to monitor their learning.
- Help students feel less anonymous in classes.
- Help students understand that learning is an ongoing process.
- Provide evidence that you value your students' learning experiences.

Figure 11. Students discussing

Here are some strategies for flipped learning assessment that can help provide this kind of support.

1. **Active learning techniques** – Allow students to apply concepts in class where they can ask peers or instructors for feedback and clarification. Active learning methods ask students to fully participate in their learning by thinking, discussing, investigating, and creating. In active learning classrooms, students may be asked to practice skills, solve problems, struggle with complex questions, propose solutions, and explain ideas in their own words through writing and discussion. Research indicates that active learning methods are especially effective for student learning, when compared to classes that primarily consist of lecturing.
2. **Collaborative Learning** – There are a number of activities students can do to enhance understanding and provide opportunities to apply knowledge. Collaborative learning can occur peer-to-peer or in larger groups. Peer learning, or peer instruction, is a type of collaborative learning that involves students working in pairs or small groups to discuss concepts or find solutions to problems. Similar to the idea that

two or three heads are better than one, educational researchers have found that through peer instruction, students teach each other by addressing misunderstandings and clarifying misconceptions. With method "Peer instruction" students can teach each other by explaining concepts or working on small problems.

3. **Group work** – If group work is one of the ways you plan on assessing your students, giving them time in class to do their activities alleviates the inconvenience of holding meetings outside of class time (ultimately leading to fewer issues of participation), and gives you a chance to check in on how things are going.
4. **Case Study** – A Case Study tells a real story related to course content. A good case study involves the following elements: tells a real story about an important issue; includes historical information about the case and a dilemma faced by a central character; encourages students to identify a problem as well as support a solution; and encourages students to integrate information and resolve an issue. The purpose is to help students connect information and think holistically about an assigned topic and is aligned with Integration.
5. **Online Quizzes** – There can be many different implementation possibilities for using online quizzes depending on the instructor's objectives.
6. **Online Discussions** – Similar to quizzes, there are many different ways of incorporating online discussion boards to assess students' learning. Instructors can give quick and constructive feedback on their contributions, wait to debrief, or continue the discussion in class. Instructor should allow the students adequate time to post their ideas and comments. The instructor can also consider using a "post-first" discussion, so the students can post their ideas without being biased by other students' postings; the class discussion posts only appear after the student's first post has been made.

7. **Definitions and Terminology** – Asking questions that focus on the meaning of new words or terminology and that help students to consider the words in more depth can lead to deeper understanding. These questions can either be given to students within an online quiz, or as a question posed to an online discussion board which students can then respond to individually.
8. **Concept Maps** – Concept maps provide a visual representation of connections between concepts that students have learned. These concepts are connected by directional, labeled links to show the relationships between them. Concept maps are excellent tools that can provide instructors with a formative assessment of students' learning and misunderstandings after the online learning activities. For example, the instructor can post an incomplete concept map where students are asked to fill in the blanks to build a complete map that is then submitted to an online drop box where they get feedback on their individual work either online before class or at the beginning of the class.
9. **One Paragraph Summary or Precis Writing** – Ask the students to write and submit a paragraph, a one-page summary, or a précis after an online reading. Students can practice their ability to effectively summarize a longer text, and this also allows the instructor to gauge students' learning, giving them an opportunity to focus on their misunderstandings during class.
10. **Critical Reading** – Ask the students to respond to an assigned reading (research paper, article, book chapter). For example, ask them to reflect on the paper, analyze the information, or criticize and evaluate the ideas. An online drop box, discussion forum, or less formally, a blog can be used to gather their writings and give feedback on their submissions. This can be preparation for discussion with peers in class.
11. **Peer Review/Assessment** – By reviewing their peers' work, students consolidate, reinforce and deepen both their own and their peers'

understanding of the material they learned. This can help students to build critical analysis skills, become comfortable with receiving criticism and justifying their position in further in-class discussions. This activity can be done using an online discussion board or a group drop box in which students all have access to each other's submissions. The instructor will be able to evaluate the students' critiques and their understanding of their peers' work.

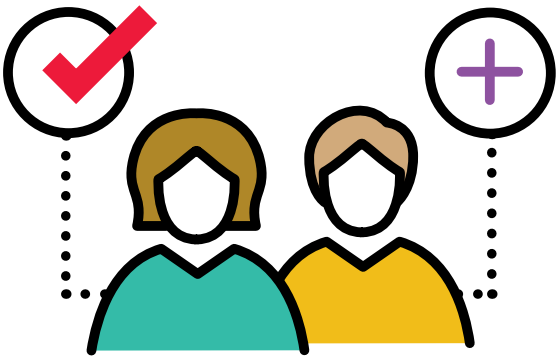
12. **What? So What? Now What? Journal** is a brief assessment that can be used at the end of a class session, unit, or course. Students respond to the following questions: What happened in today's class session? What did you learn today? What connections can you make between what you learned today and previous learning experiences? How can you apply what you learned? What would you like to learn more about and how will you learn more about this or a similar topic? The purpose is to determine how students are learning and is aligned with Learning how to Learn.

5.4. There is no "Competence Assessment Tool"

In an ideal situation, we can imagine a device – let's call it a "Competence Assessment Tool" – that connects directly into students' brains that would give a continuous stream of full-spectrum data about student learning and engagement. Of course, no such device exists yet, so the next best thing is to give assessments that are short, frequent, and informative that collect these data for us. For example, classroom response systems can be used effectively to gather in-the-moment data about student learning. Short metacognitive activities, such as one-minute papers, can give a bigger picture. And don't forget that assessment doesn't necessarily mean quizzing or grading. Sometimes simply having students talk through a procedure while you observe them can give you mountains of data about how they are doing.

PART 6

POTENTIAL BENEFITS



These days it's becoming more and more unacceptable to provide old style lectures. Different devices play great role in the teaching process, it is almost impossible to be a lecturer without using different technical devices and incorporating social networks in some way.

The flipped classroom approach is a new method which can and must be used at schools and in higher education as well. It is a new way of thinking for many lecturers, and it is also new for students. It is a vice versa process of typical lectures that may take place for every subject. The main difference is *how* student learns, not just *what* he/she learns. And of course, it is a student-centered approach. This section lists some of the potential benefits of the flipped classroom.

6.1. Choose Your Time and Place

All teachers are aware that the practical questions regarding time and space are important in all learning processes. Flipped learning, however, allows students more freedom regarding when, where and how to study.

6.2. No Need to be in a Hurry

How much time does the student have for listening, understanding, asking questions and answering during a traditional lecture? This varies a lot between different universities, but a typical session might last 45-120 minutes. But what is the attention span of a typical student? How long can students' brains process information efficiently? Is it 15, 20 or perhaps 25 minutes? This means that the rest of the lecture time will simply consist of the lecturer talking for him- or herself.

Flipped learning means that the student will be able to choose the most

convenient time and place (at home, café, university) and take as much time as he/she needs. Also, it allows the student to work with material in their individual tempo, she/he can rewind and replay video and audio material several times, if needed.

Figure 12. Group discussions
By Hebron Geofrey - Own work, CC BY-SA 4.0,
https://commons.wikimedia.org/w/index.php?curid=80276883

6.3. Psychological Condition of Student

A traditional lecture demands a lot from the participants. Students are often tense, desperately taking notes hoping not to miss something important. Sometimes he/she is ashamed to ask questions, not wanting to look like a fool for not understanding.

One important aspect of the flipped learning approach is to create a learning culture of active students, taking responsibility for their own learning. It might not be easy at first, but ultimately the students will be much freer and calmer.

6.4. Less Mistakes

With a traditional approach with large lectures and individual homework, the student will to some extent be left on their own, without access to expertise

during their most active phase. This can create confusion, insecurity and might lead to mistakes that can be hard to detect and correct.

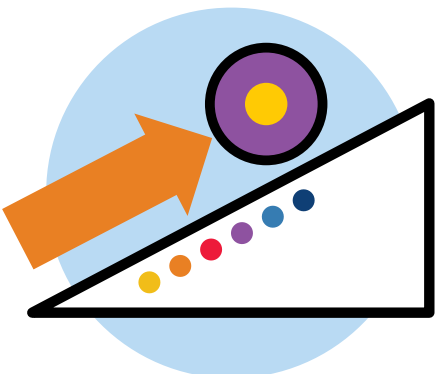
Using the flipped learning approach, this can be improved by having quick help of lecturer, by identifying of mistakes and giving a right advice.

6.5. What's in it for the Lecturer?

Teachers switching to a more active flipped learning approach might feel like they are not needed anymore, at least not once they have recorded their lectures. However, it is important to remember that lecturers are not robots, mindlessly repeating every semester the same text for different students. With the flipped learning approach, the teacher can be so much more: a leader, a coach, a friend. And they coordinate and plan for out-of-class activities, ensure delivery of needed material and tools. Teachers transform old monotonous processes using new, interesting and exciting methods.

PART 7

POTENTIAL CHALLENGES AND TIPS



What are the biggest challenges or problems in using flipped education and tips for dealing with them? Let's say the teacher decided to introduce flipped classroom methods into his practice. It is natural to assume that he will encounter certain difficulties along this way. Now let's try to consider at least some of them and suggest ways to overcome these difficulties.

1. The creation of a whole course based on the use of flipped classroom is a rather laborious task that requires a lot of time and certain skills from the teacher. This may result in rejection of the very idea of using this technology.

   Tip: Try to choose a small part of your course and apply flipped classroom only for the selected part. To create your first videos, use the simplest tools, such as PowerPoint, and not some advanced software.

2. In contrast to the traditional lecture, it is rather difficult to make changes to the prepared video materials. A mistake or shortcoming made by a teacher during a traditional lecture is not difficult to correct. If the material is prepared and issued to students in advance, then any changes are costly.

   Tip: This is really a problem. And a reason to prepare materials of as high quality as possible. For example, be prepared for the fact that when recording even a small video clip, you will need significant preparatory work and a large number of tries.

3. Using a different teaching technology may be uncomfortable for some students. It will be hard for some of them to switch from the traditional approach for learning to such a method of training, where they will have to do a lot of independent work. In addition, some students are used to working on their own and spending a lot of time in group discussions is not easy for them.

Tip: There is no ideal teaching methodology that would suit everyone. Of course, when working, individual characteristics of students should be taken into account. Note that the effectiveness of flipped learning will be higher for those student groups that have used this technology in previous courses or subjects.

4. It's quite possible that not all students have equal technical capabilities. Some of them may not have a computer or access to the Internet with sufficient speed. Some students may not have the proper skills for working with electronic devices.

   Tip: The solutions in this situation is issuing of materials to students using electronic devices such as flash memory sticks or DVDs. Also, students may be allowed to use computer classes for training, where they can work after school hours. In such a situation it's also important, that students do not feel the difference in the teacher's attitude to them, if they do not have any particular teaching aids.

5. All students are different. And the motivation of all students can also be different. Therefore, coming to the classroom, the teacher may encounter students with a different level of preparation of their homework.

   Tip: To be more prepared for this situation a teacher should set specific deadlines for studying the issued material. Besides, before the auditory lesson students may be asked to do some controlling task that measures the level of their knowledge.

6. The teacher who starts working with flipped classroom may face a lack of understanding from his colleagues. Not everyone is ready to accept the new, to change their approaches to learning. Criticism may intensify if new methods do not immediately provide a significant improvement in the educational process.

Tip: You should understand that something new will always be met with misunderstanding. Of course, a great help in solving such problems will be the creation of at least a small group of like-minded teachers. Moreover, they may not necessarily be colleagues from the same faculty or department. Although the work on one course of two or more teachers will help to assess the effectiveness of the chosen method more adequately. It should be remembered that the chosen teaching methodology can give good results in some student groups and not work in others.

So, to summarize the most important points:

1. Be confident of yourself when you start working with flipped classroom. It has been proved that at this stage it is a very effective learning technology.
2. Do not try to immediately renovate all your courses. Start with one course or a part of it.
3. Gather a team of like-minded people to discuss the organization of teaching and its results.

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Chapter 5

INNOVATIVE AND TECHNOLOGY ENHANCED TEACHING AND LEARNING: HYBRID/BLENDED LEARNING

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PART 1

DESCRIPTION OF THE METHOD

All teaching scenarios that are not exclusively face-to-face or online can be described as blended learning or hybrid learning, i.e. a combination of virtual and non-virtual learning settings and methods. It also proves to be the most effective one because it combines the best elements of traditional and online teaching. The combination of classroom and online offerings in blended learning scenarios makes it possible to take advantage of the benefits of the respective settings and methods or to avoid their disadvantages.

Blended Learning means nothing else than "mixed learning". The idea is certainly not new. As early as the 1970s, people were talking about "hybrid forms of learning" when it came to combining the then new media audio and video with conventional forms of learning. "Blended Learning" has become the standard term for the use of a wide range of learning technologies and methods in the workplace. Examples include the traditional classroom, web-based tutorials, web-based simulations, online-collaboration, online-coaching, video conferencing, phone conferencing, knowledge management systems.[1]

There are many definitions and concepts of blended learning, but it is certainly not just a simple method of linking classroom learning and e-learning.

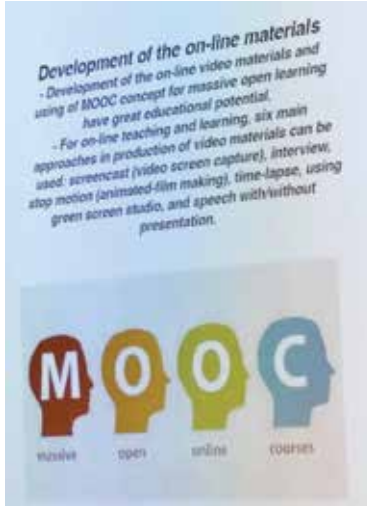
1. Davis, J. (2001): Implementing Blended-Learning. Forum Knowledge. Financial Times. November 2001.

Dziuban, Hartman, and Moskal[2] for example describe blended learning as a "pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment."

Hybrid blended learning presents a more flexible option in which self-paced e-learning (web-based learning activities) and traditional classrooms methods (face-to-face lecturing) and the use of various internet based technologies (audio, video, etc.) are combined in order to deliver the learning content and create a new methodology. This means that a significant amount of the learning activity will be moved online, making it possible to reduce the amount of time spent in the classroom. Traditional face-to-face instruction is reduced but not eliminated. If the learning content is conveyed digitally (by means of video recordings, slides, podcasts, etc.), students can access it flexibly and according to their own needs - whenever and how often they want. In the face-to-face sessions, interaction and exchange with the students can then be the focus of attention.

The concept of blended learning is rooted in the idea that learning is not just a one-time event, learning is more or less a continuous process. Furthermore, it's an innovative approach regarding how this two parts can be interconnected in the teaching process. The crucial thing in applying this method is to take advantage of the best features of both face-to-face and online so that they complement one another instead of treating the online part as an add-on of what is thought in the classroom.

2. Dziuban, Hartman, and Moskal Blended Learning Research Perspectives Volume 2 (2004, p3).



Hybrid teaching is therefore not just a matter of transferring a part of the traditional course to the Web. Instead it involves developing challenging and engaging online learning activities that complement your face-to-face activities. It is instead about developing challenging and engaging online learning activities that complement the face-to-face activities.

The blended/hybrid teaching & learning method represents a fundamental change in the way teachers and students approach the learning experience, much greater than just adding computers to the classroom. The essence of blended learning lies in an increased sensitivity to learners' needs and a better understanding of the advantages and disadvantages of different media and communication technologies that can be used in the teaching and learning process on a specific topic.

In blended learning scenarios, three forms of activity can be distinguished or combined with one another (vgl. Alonso, López, Manrique & Viñes, 2007)[3] as follows:

- Self-directed e-learning: here learners can determine the time, intervals, pace and location of their learning activities themselves ("learning anytime and anywhere").
- Live e-learning: synchronous forms of e-learning, e.g. lectures as webcasts or working in a virtual classroom at a set time. This enables learners to ask questions to the lecturers in real time or to exchange information with other course participants.
- Traditional classroom teaching: lecture, seminar, exercise, discussion and exchange take place in the class, laboratory or seminar room and open up face-to-face interaction with lecturers and fellow students.

There is controversy over how much or how little online teaching belongs in the blend. Various authors agree that the percentage of online/offline content is not as important as the pedagogical design, timing and sequencing of activities to create a cohesive learning experience.[4]

Traditional and online teaching includes advantages and disadvantages, well summarized in the following table:

3. Alonso, López, Manrique, Viñes,: An instructional model for web-based e-learning education with a blended learning process approach, 2007.

4. Dziuban, Moskal, Hartman: Higher education, blended learning, and the generations: Knowledge is power: No more (2005).

Traditional Classroom:

Advantages:

- Direct face-to-face interaction
- Tutor-led instruction
- Peer collaboration
- Hands-on experience
- Group socialization

Disadvantages:

- A limited number of students in a group
- Fixed scheduling options, curriculum, and programme
- Strictly specified times of study
- Operational and logistics costs

Self-paced online learning:

Advantages:

- Flexibility terms of time and location
- Cost-effective
- Convenient
- Personalized learning experience
- Access to any subject or information

Disadvantages:

- Less interactive
- High drop-out rates
- Limited options for direct and timely feedback
- Lower control over assessments
- Requires a high level of self-regulation

Source: https://ethinkeducation.com/blog/step-by-step-guide-designing-blended-online-courses/

1.1. Advantages of blended learning

- From the **students' perspective**, the advantages of a blended learning arrangement can be broken down into two categories: flexibility and learning experience. Students appreciate the virtual learning components, which allow them to determine the place and time of learning themselves. Learning from home is particularly advantageous. Several case studies

also show positive effects on learning success, both in comparison to exclusively virtual settings[5] and to traditional mass lectures.[6] Positive learning effects can also be achieved through the text orientation of asynchronous discussion environments or a writing-intensive learning environment (Sands, 2002)[7].

- Blended learning offers **teachers** an opportunity to explore new forms of interaction with course participants. It is experienced as beneficial when there are effects on the learning process, for example when learners form an online community, argue and discuss better in face-to-face lessons and delve deeper into the course material. In addition, the flexibility in the timing is experienced as positive.
- On the level of the **university management**, positive effects of blended learning scenarios are expected, ranging from positioning as an innovative educational institution to addressing new target groups, especially in continuing vocational education and training, to more effective use of resources and cost savings.

5. Rovai & Jordan: Blended Learning and Sense of Community: A comparative analysis with traditional and fully online graduate courses, 2004.

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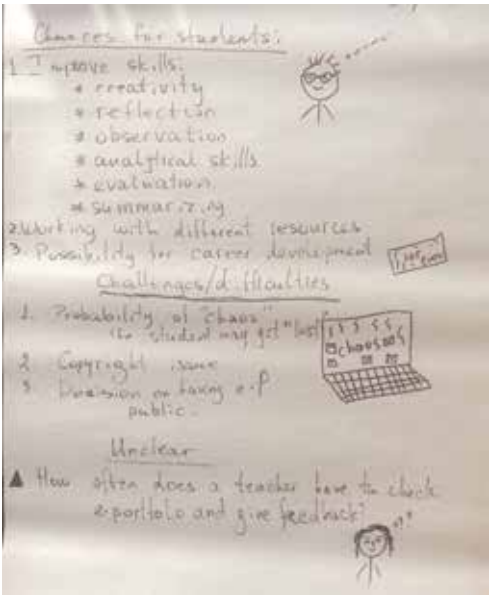


1.2. Disadvantages of Blended Learning

- For **students**, the main problems with blended learning courses relate to the expectation that reduced attendance times will also require less work, deficits in time and self-management, difficulties in terms of accepting one's own responsibility for learning success, and technical problems, especially when dealing with unfamiliar communication and cooperation tools.
- **Teachers** need both methodological and technical support and advice when redesigning their didactic design. Risks result from the loss of control and the potentially poorer evaluation by students. Experience also shows that a course that includes online components requires significantly more time for preparation and implementation; this can be even higher if multimedia learning content has to be created. In addition, there is still a

lack of clarity about the extent to which online activities are recognised in the classical teaching regulations.

- At the level of **university management**, the use of technology must be related to the long-term goals of the institution. Appropriate resource allocation and investments in infrastructure and support units are necessary. There is also often resistance to changes and innovations. The change of curricular structures is time-consuming and requires internal coordination processes.

Hybrid/blended courses allow students and teachers to take advantage of the flexibility and convenience of an online course while taking advantage of the classroom experience.

The challenges coming along with this innovative T&L method are as follows: The teacher is acting as a coach and the student are in charge of their own learning. This requires the approval or agreement of both parties.

The method offers countless opportunities and challenges in the course development process. The opportunities and possibilities inherent in a didactically and content-wise well-founded combination of e-learning and face-to-face learning are basically regarded as highly positive. However, a well-designed blended course is not as simple as dividing your course into face-to-face and online components. Some main principles to guide the development of a blended course:

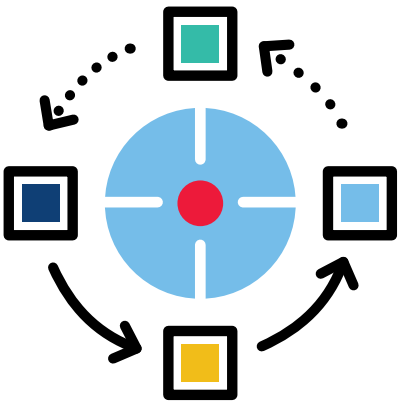
- It is obvious, that successful blended courses have higher rates of student-to-student and lecturer-to-student interactions.[8] Therefore it is recommended to focus on interaction rather than the delivery mode of the course. Activities, that require students to engage in the course content and with other students should be aimed at.
- The course goals and objectives should guide the design of the course, not the technology.

8. Aycock, Garnham, & Kaleta: Perspectives on blended learning in higher education, 2002.

When developing blended learning models for continuing education, the focus is primarily to integrate and combine the advantages of the online and face-to-face teaching-learning forms in the best possible way. In this context it is helpful to consider the perspective of the participants more than in the past.

PART 2

LEARNING OBJECTIVES



In the second half of the 20th century, new problems were raised in the field of education, related to increasing the degree of independence of students and independent acquisition of knowledge by students. At the end of the 20th and beginning of the 21st centuries, the problem of increasing students' independence required an urgent solution. Students' independent learning is when pupils set goals, monitor and evaluate their own academic development, so they can manage their own motivation towards learning. The rapidly developing information society before the educational process posed the problem of development of a person, which could independently guide in various situations, manage not only its own, but also the cognitive activities of people around and its environment, distinguish between the essence of information flows and choose provable information, create effective interactions with the environment for the sake of more developed society.

From this point of view, the scope of the problems of the educational process expanded, and the modern educational process could no longer be satisfied only with the transfer of knowledge and the ability to formulate skills in multiple repetitions of this knowledge with their simple thinking. Moreover, this function was somewhat attributed to computer hardware.

Within the context of contemporary education, Benjamin Bloom presents ways of implementing innovative learning in his well-known taxonomy of goals and stages of education, which guide educational specialists.

In accordance with the Bloom's taxonomy[1] of goals, stages and organization of the learning process, the cognitive process includes the following key stages:

1. Knowledge: to remember, distinguish, find information in the form of facts, rules, formulas, figures, definitions.

1. Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York: David McKay Company.

2. Comprehension: verbal explanation, generalization, examples, interpretation.
3. Application: application of information during a specific operation.
4. Analysis: identify the relationship between the structural components of information.
5. Synthesis: obtaining information from other sources based on existing knowledge.
6. Evaluation: judgments and choice of criteria, as well as the ability to evaluate various evidences, realities.

New tasks were supplemented by the already formed traditional issues of learning. The introduction of innovative forms of learning does not imply a denial of traditional, successful experience. "Innovative" or "current" learning does not replace traditional but supplements it and makes it more relevant to modern requirements and problems. Contemporary pedagogy theory and practice are designed to identify ways of maximizing learner active engagement in the process of learning so that the learner can quickly find a way to learn and learn independently and to form their own opinions and new approaches that will lead to creativity and new knowledge.

One of the main reasons for this is that the innovative paradigm of education, on which is based the modern education system, is called "personality-oriented." In modern textbooks of pedagogy, the objectives of the traditional learning process, three of which are the *knowledge*, the formation of *skills* and *abilities*, in addition are two more objectives of the modern educational process - to learn how to learn and create new knowledge.

As a result, current objectives of the learning process are as follows:

- knowledge,
- skills,
- abilities,
- learn how to learn,
- creation of new knowledge.

Figure 1. Current objectives of the learning process

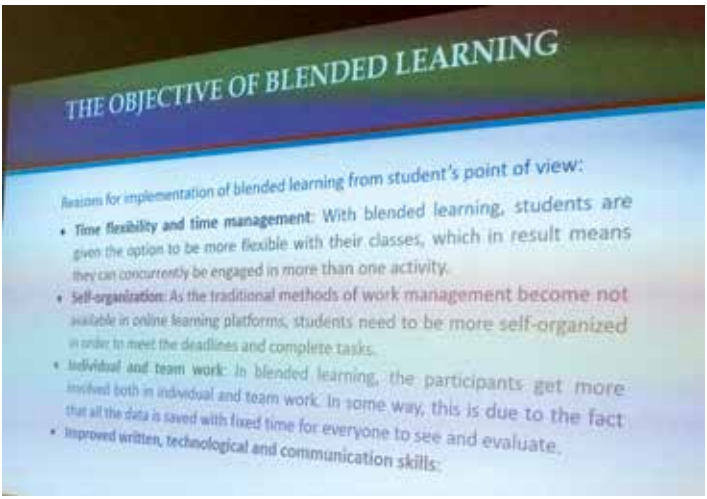
Summarizing, it is important to note that in the current learning process, a significant role is played by both the teacher and the learner. And only the realization of the role of each and the scope of the function of this role can provide a training process that meets modern requirements and successful results.

Consistently, "Hybrid/Blended Teaching and Learning", is increasingly used to describe how e-learning/e-learning/self-learning methods are used in a mixed way with traditional classroom methods. This contributed to the creation of new educational technologies in teaching methods. It represents the fundamental changes in the traditional teaching and learning experience offered by teachers and learners.

Hybrid pedagogy is a broader phenomenon than just the use of traditional computers and electronic methods. A wide range of approaches is also available along with technical infrastructure. The pedagogical aspects will naturally consider the specific aspects of learning so that learners can work in groups and

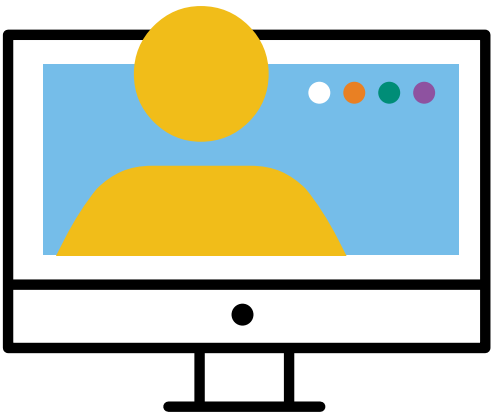
present their final design work. The idea is to make learners more active, improve the quality of instruction and inspire them to develop new tools and new materials.

Speaking about modern innovative teaching technologies we mean interactive technologies over the past decade, then the third decade of the 21st century is aimed at making learning involved, not only expecting active feedback from learners, but they participate spontaneously in each stage of the learning process.



PART 3

ROLE OF THE TEACHER



Nowadays greater attention is paid to the importance of developing of students' personal qualities, the formation of their skills in applying knowledge to successful activities in the professional field.

However, the construction of the educational process, taking into account one innovative technology, one method does not provide an improvement in the quality of teaching of graduates. To ensure the quality of teaching, it is necessary to use a set of methods and technologies that interact in the educational process.

Among them are the following:

- activation of cognitive activity of students;
- the use of modern systems and training tools;
- the use of technologies aimed at personal-development learning;
- timely control of the assimilation of knowledge and skills;
- the presence of teachers who are able to properly organize the independent work of students to form their competencies.

To enhance the cognitive activity of students, the teacher must be fluent in these activities.

Hybrid/blended learning is a student-centered approach to creating a learning experience in which a student interacts with other students, with an instructor, as well as with content through a thoughtful combination of the Internet and face-to-face interaction. A well-designed hybrid/blended learning course systematically organizes content, supporting materials and activities through synchronous and asynchronous training events. Communication and collaboration are essential features of a hybrid/blended approach. Particular attention is paid to discussion methods (group discussion, brainstorming, analysis of specific situations, etc.)

Discussion methods develop students' communicative competence (the ability to speak briefly and to the point, the ability to listen, formulate questions, speak

publicly, the ability to perceive constructive criticism, generate a lot of ideas and solutions), form the ability to generalize, think productively, contribute to the formation of personal and business qualities, etc.

With hybrid/blended learning, a special atmosphere of creativity, mutual assistance is created, interpersonal relationships are built. Here, the role of the teacher consists not only in the transfer of knowledge, skills, but also in the organization of such an educational environment that allowed the student to rely on their potential and the corresponding learning technology. The teacher and student create a joint educational activity, which is aimed at the individual self-realization of the student and the development of his/her personal qualities.

3.1. The Role of the Teacher

It seems that the greatest effect in the organization of students' independent work and the development of their creative abilities can be achieved as a result of applying of innovative methods, namely hybrid/blended learning, while maintaining the traditional learning system. In this sense, discussion as a learning method can contribute to enhancing students' cognitive activity.

In order to apply a student-centered approach, for teacher it is not only enough to have knowledge of the appropriate material, it is necessary to change the approach to the learning process, the attitude towards the student, to realize that the student is the central figure in the pedagogical process, and not teacher.

In the conditions of student-centered learning, the teacher acquires a different role and function in the educational process, no less significant than with the traditional teaching system, but different.

3.2. Teacher as a Facilitator

The teacher needs to:

- demonstrate effective facilitation practice and how the process is managed by the facilitator;
- use a flip chart and demonstrate how notes are captured/for working in an online environment, can be used Moodle platform.

Facilitation is about creating and providing space for learners to try out something new, to reflect on their experiences, to arrive at new conclusions and to think about how they would apply these conclusions in their work and life. In this view people learn for themselves with a bit of help and assistance, rather than have it done to or for them.

A facilitator is a person who organizes successful communication, discussion. The person who helps students understand the common goal, helps participants of the discussion to concentrate on the goals and content, supports positive dynamics of the group during the discussion. It contributes to creating a comfortable atmosphere and fruitful discussion, maintaining a neutral position.

The task of the teacher is to help each student build their own educational path. A group of students together with a teacher turns into a research team.

3.3. The Teacher as Discussion Context-Setter

The context in this case is the background for the discussion topic and the questions that should be the focus of the discussion.

A discussion-oriented lesson begins with a short presentation by the facilitator in which he gives a general description of the proposed topic of discussion, then students are given the opportunity to express their opinion.

It is desirable that various approaches to the issues discussed be reflected, the latest material on the topic of the lesson be used. A discussion will only be complete if it is based on different points of view, an exchange of views, alternative approaches.

3.4. The Teacher as an Evaluator/Expert

The discussion helps students to streamline and consolidate the studied material, and the teacher - not only to determine the level of students' preparing, but also to correct the shortcomings of their behavior and communication (temper, lack of respect for the other party, etc.). This form of organization of classes leads to the refusal of the teacher to divide students into "strong" and "weak", as well as providing control and evaluation of not only the result, but mainly the learning process, i.e. those transformations that the student carries out, during the study of the educational material. Encouraging the success achieved in relation to the results previously obtained by the student is much more effective than encouraging students in comparison with each other - this means that the student begins to understand that it is worth striving to improve their own results for the benefit of the whole group.

Medium and weak students can bring their team an equal number of points, which allows them to feel like full members of the team.

3.5. The Teacher as Coach

Coaching in this context refers to teaching students what is expected of them, giving them feedback on their performance, and creating the environment for students to succeed through the motivation of each student. Coaching is a process of helping students succeed in situations where they must make real time responses by providing immediate feedback. It is very convenient by using hybrid/blended learning environment because in that case teacher uses both state of the art technologies and traditional classroom activities.

3.6. Teacher as Integrator of the Course Content

The role of the teacher consists not only in transferring knowledge, skills, but also in organizing such an educational environment, namely, creating an environment for the student's natural expression, where the student, taking into account his/her potential and individual experience, manifests the initiative and independence. The emphasis is on teaching the student to think, argue and justify his/her point of view independently, to activate the students' creative potential.

3.7. The Teacher as Mentor

The teacher as mentor can support a student in many ways:

- Networking support – the teacher may be able to find persons who do extensive facilitating to help advise the student.
- Opportunity creation – faculty often have professional activities where they work with groups to explore an issue. These are great opportunities for students to observe and participate.
- Continued education – the teacher may help the student evaluate different graduate opportunities to identify those that can be supportive of increased facilitator development.
- Career support – after a student graduates the teacher can continue to be a support in providing career advice and perhaps connections that lead to greater facilitation opportunities.

Obviously, the spread of hybrid/blended learning involves revising the traditional concept of a teacher, creating a number of competencies based on a unique combination of certain professional skills and personal qualities. It can also be argued that the success of the transition to hybrid/blended learning depends not only on existing information technologies and access to them, but

the readiness of teachers, who are the main guides in the educational process, to lead students to successful mastery of knowledge in the context of hybrid/ blended learning.

The competencies of the teacher in hybrid/blended learning

Phase	Basic Competencies	Acquired Competencies
Planning	• Develop a lesson plan in accordance with educational standards. • Define the tasks for achieving learning goals.	• Skill of short-term and long-term planning. • Competency of individualization of teaching.
Conducting Classes	• Conducting focused, entertaining classes. • Logical completion of one task before switching to the next.	• The ability of students to manage their learning process. • The ability to harmoniously form student groups and individual educational environments.
Collection, Analysis and Effective Use of Data	• The ability to understand basic data and use them in the learning process.	• Ability to evaluate process and present new data. • Competence of interaction with the team to expand the possibilities of collecting, interpreting and effectively applying data.
Interaction	• Exchange of experience and the introduction of lessons learned in the teaching process. • Constructive criticism and desire to learn.	• Variation of models of collective cooperation, effective management of planned and free time and space for working with colleagues and sharing experience.

Phase	Basic Competencies	Acquired Competencies
Risk Taking	• Ability to accept uncertainty. • The desire to use new technologies.	• Ability to quickly resume the educational process in case of failure due to various kinds of malfunctions.
Course Content Evaluation	• Good knowledge of the subject. • The ability to rigorously select educational information to present to students.	• Development of new methods for presenting educational information. • Exploring Interdisciplinary relations.

In turn, the transition to hybrid/blended learning certainly contributes to the formation of the following teacher competencies:

- Competence of integration;
- Competencies of self-improvement, self-regulation, self-development, personal and objective reflection;
- Competencies of social interaction with society;
- Competencies in communication;
- Competence of cognitive activity;
- Professional competence;
- Competencies of information management.

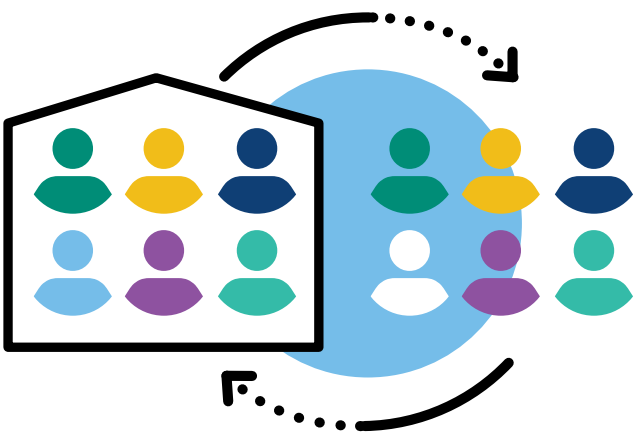
Organization of the educational process by using e-learning technologies according to a hybrid/blended learning model (based on LMS Moodle or other e-learning tools and services) involves the use of electronic educational environment by teachers to optimize the educational process by transferring some types of educational interaction from the classroom environment to electronic.

The skills of the teacher in hybrid/blended learning

- Knowledge of educational process design technologies and skill in designing the educational process, taking into account the principles of hybrid/blended learning;
- Knowledge of electronic tools, services and the ability to use them for creating an electronic course on the discipline (for example LMS Moodle);
- The ability to combine the most effective teaching methods with their implementation in traditional and electronic environments;
- The ability to build an effective mechanism of students' interaction by type "student-student", "student-teacher", "student-content" in a hybrid/blended environment.

PART 4

BEFORE AND DURING THE CLASS



Blended learning is the integration of face-to-face classes with a virtual component where students have a practice opportunity to go beyond what is taught in the classroom. So far, the research done on this field had shown that this hybrid and blended learning offers students a lot of materials, resources offline and online activities, the integration of what they learn in the classroom with what they learn on their own through the use of a virtual platform.

Blended learning is not new. However, in the past, blended learning was comprised of physical classroom formats, such as lectures, labs, books or handouts. Today, organizations have a myriad of learning approaches and choices. The concept of blended learning is rooted in the idea that learning is not just a one-time event-learning is a continuous process Blending provide various benefits over using any single learning delivery.

A single delivery mode limits the reach of a learning programme or critical knowledge transfer in some form or fashion. For example, a physical classroom-training programme limits the access to only those who can participate at a fixed time and location, whereas a virtual classroom event is inclusive of remote audiences and, when followed up with recorded knowledge objects (ability to playback a recorded live event), can extend the reach to those who could not attend at a specific time. Optimizing Development Cost and Time Combining different delivery modes has the potential to balance out and optimize the learning programme development and deployment costs and time.

A totally online, self-paced, media-rich, Web-based training content may be too expensive to produce (requiring multiple resources and skills), but combining virtual collaborative and coaching sessions with simpler self-paced materials, such as documents, case studies, recorded e-learning events, text assignments, and PowerPoint presentations (requiring quicker turn-around time and lower skill to produce) may be just as effective or even more effective.

We are so early into the evolution of blended learning that little formal research exists on how to construct the most effective blended programme designs. However, research from institutions have given us valuable insight into some of the mechanisms by which blended learning is better than both traditional methods and individual forms of e-learning technology alone. This research gives us confidence that blending not only offers us the ability to be more efficient in delivering learning, but more effective.

Blended learning method gives the student opportunity to engage learning process at a convenient time. The online component of blended learning allows students to learn when and where they want. These methods offer students the complete flexibility to choose the time they study with no constraints of fixed classroom hours. This means that students will need to get used to working independently, making their own decisions and taking responsibility for their own learning.

What are benefits of blended learning, during the class, are:

- Blended learning enables teachers to make better use of the limited time they have with their students. By moving some traditional classroom activities into the online world, you end up spending less time talking in front of the class and more time working with individual students.
- With more time to work with individual students in class, teachers find they can better differentiate their teaching to suit individual needs, answering student questions and giving individual feedback. Many online resources also differentiate automatically: math exercises can be set to get

progressively harder the more answers a student gets right, for example.

- Blended models such as the flipped classroom use online videos and resources to prepare students before they come to class. This way, the students have already learned the theory and can use the classroom time to put that theory into practice. In this model, the classroom teacher takes the role of guide and mentor. It's also possible for you to assess the work done by students before class – so you know exactly what your students need help with.
- There are hundreds of online resources that enable students to create videos, animations and etc. This gives students' new ways to engage with the work and express that they have learned.
- When the online work is done to prepare students in advance, students arrival in class better prepared.

Blended learning opportunities incorporate both face-to-face and online learning opportunities. Online learning has potential to improve education productivity by accelerating the rate of learning, taking advantage of learning time outside and better utilizing teacher time in the classroom.

The teacher's role has always been central to providing a structured and engaging teaching and learning environment. Blended methodes makes teacher to be motiveted and organized.

During the class teacher:

- Helps to guide students;
- Managers their activities;
- Directs their learning;
- Helps students develop skills.

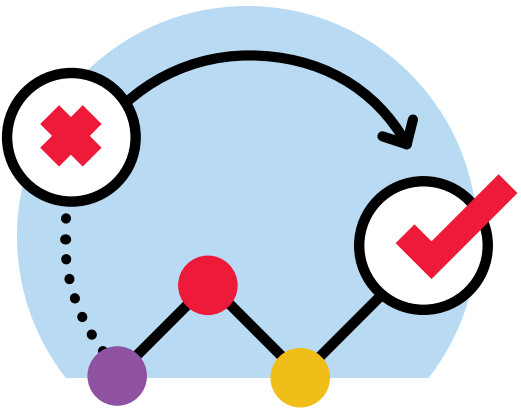
During the class students:

- Are involved in the learning process;
- Don't depend on their teacher all the time;

- Communicate with each other in pairs and with small groups;
- Learn from each other;
- Help each other.

PART 5

ASSESSMENT



As in face to face class, in blended learning assessment is also a key tool to measure the student's outcomes and the understanding of the subject. As usual, it is up to the course instructor to design the assessment activities based on the course objectives, content and aims. Riley and others state that instructors should think about: "How well does your course make connections between learning objectives, course activities, and selection of site tools to accomplish the assignments?[1]"

Into the blended learning both formal and informal assessment can be used. As the instructor is using at least any learning management system this gives the opportunity to create different types of activities to assess the student's performance. Some professors wish to give points in each and every activity student need to accomplish, while others might use assignment (without grading) to make sure that students are reading course materials. Informal assessment can be also used when teachers gives the chance to students to practice on the quizzes and make self-assessment. Hoffman and

1. Riley, J.E., Gardner, C., Cosgrove, S., Olitsky, N., O'Neil, C., and Du, C. (2014). Implementation of blended learning for the improvement of student learning, In A. Picciano, C. Dziuban, and C. Graham (Eds.), Blended learning: Research perspectives, volume 2. NY: Routledge.pg.164.

Lowe state that once developing an assessment strategy the "focus must be on student learning, not student control.[2]"

Quizzes are widely used nowadays, especially in the classes with large groups of students. Quizzes can be created in many different platforms (Kahoot; Moodle, Google Form), but the idea in almost each of them is that the instructor first creates questions with multiple choice answers, indicated the correct answers and once the students make assignment the system automatically grade them and calculates the points. This doesn't happen if the question type is "short answer", when students have to type a text. The question types vary, for example, there are almost fifteen different types of question, that can be used in different study discipline. Quizzes require some time to devote at first, but once the question bank is ready the process is easy to navigate (instructor doesn't have to create question once again). Quizzes can be used in both formal and informal assessment, for example, instructors from language department, or mathematics often create quizzes and ask students to make them at home without giving points in it. The idea in this case is that students can practice by themselves at home, try several times, see the mistakes and work on it. Although there are some aspects (randomization of the questions; different set of questions for each student; different time limits;) which can be enabled to avoid academic dishonesty in students while working on quizzes, but still if only multiple choice questions are used, there is always a chance that students might get correct answers by chance.

In some courses, professors use writing assignments in order to assess student's ability how well they can apply the theories they have learned into the course. This type of assignments can be final papers, short essays, case analyses and etc. The idea is that students on the one hand can demonstrate

2. Hoffman, B. and Lowe, D. (2011, January). Effective online assessment: Scalable success strategies. In Faculty Seminars in Online Teaching. Seminar series conducted at the University of Central Florida, Orlando, FL. Retrieved from https://online.ucf.edu/faculty-seminar01/.

that they have read the reading materials and on another hand are now able to use it to discuss or state new ideas. This kind of assessment is more difficult than quizzes, as it requires students to write their own concepts, and from the professor's perspective it also needs more time to be assessed. In writing assignment several skills can be assessed at the same time, as the final papers/ mid-term exams allocate different topics.

In a face to face class discussions in large groups might not be an appropriate format (let's say with 80-100 students), while in blended method it can be used to assess the critical/analytical skills in students. The instructor is able to create discussion forum in learning management system and ask students to reply to the main topic and/or write at least two/three replies to others. Using this method, the instructor can assess how well students are prepared for specific topic, how they can express their own ideas with arguments and etc.

Peer review assignment can also be done in learning management system. Instructor asks students to submit the papers and later he/she makes couples out of these students and asks them to grade their classmate's paper. The instructor evaluates how adequate was the feedback from the reviewer, what were the mistake they pointed out and if they offered solutions with this mistakes (if the feedback was developmental). Using this activity as an assessment method is highly recommended in higher education, as students are taught the way they can provide argumentative feedback to their pairs (that is crucially important in the academia). From their comments, it is easy to understand how deep they know subject.

As we have already mentioned the assessment activities can vary from system to system, but there are few things that has to be taken into consideration. When using blended learning method students are alone with their smartphones and computers, they can't ask questions immediately, thus the instruction of the assignment has to be clear and concrete. The instructor should give a brief

description of the task, with the deadlines and any reading material that is connected to this assignment. In addition to this, it's also important to remind what are the technical requirements (for example: is this individual assignment or a group one; which academic style should they refer; how should they submit the paper etc.) and what is grading rubrics. As a rule, the rubrics are given in the course syllabi, but it's highly recommended to state them in the assignment again. Some of the tools make it possible to grade student's papers directly with using grades, so that the students see in which criteria they are good and in which they need to improve their performance.

As we have mentioned, when using learning management system learners shouldn't have feeling that they are alone with the assignments. Instructor should provide detailed and individual feedback in a timely manner. Nowadays, different digital tools make it possible for the instructors to make comments in many different format (written, audio, inline). These tools also guarantee that the comments will only visible for the author of the paper with accordance to ethical norms. The time frame is also key in feedback. If teacher provides comments only by the end of the course, it seems to be ineffective, as the whole activities are already done and student can't reflect to teacher's comments. But when student is getting feedback right after each assignment he/she tries to take it into consideration for the next assignment and improve their learning outcomes.

The diagram below shows the comparison between Bloom's taxonomy and the most usable learning management system – Moodle's activities. Depended on their needs instructors can decide which type of activity they create to assess their student's outcomes.

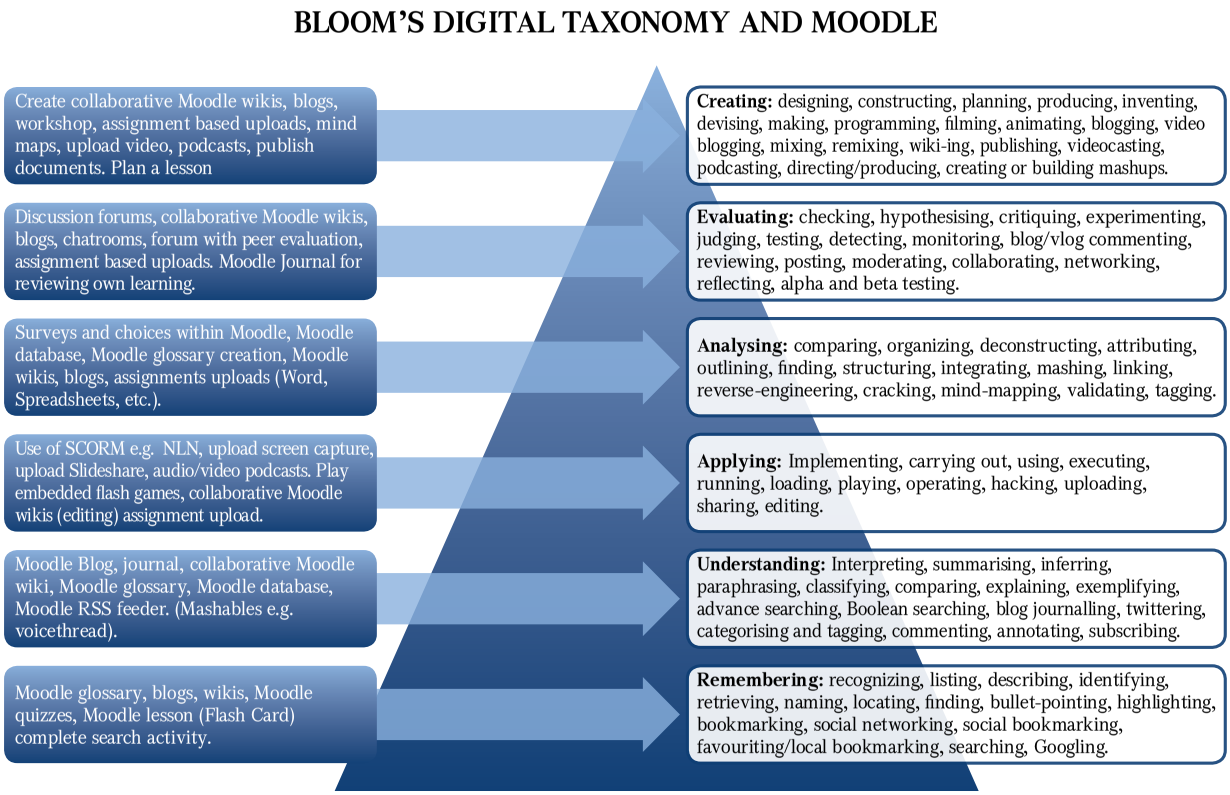
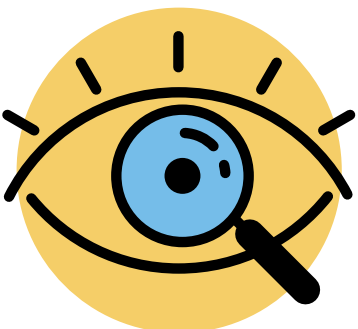


Figure 1. Source: https://bit.ly/2RBi7ie

PART 6

PRACTICAL ASPECTS



A hybrid/blended course, by definition, reduces face-to-face "seat time" so that students can pursue additional teaching and learning activities online. To be successful, a hybrid/blended course requires careful pedagogical redesign in order to find the most effective mix There is no magic formula that will suddenly reveal this mixture. It is part of the teaching job to test and revise the course materials.

Thus, when developing blended learning concepts, a meaningful and a well-founded combination of face-to-face learning and e-learning is highly respected. Any wider blended learning system should be seen as an environment in which learners staying and moving for a long time. Therefore, this environment should be planned in a way that the students feel comfortable in it, be able to work effectively and get in contact with others.

By using a learning management system, face-to-face classes can enhance without losing the energy and contact that class meetings provide. Furthermore, promoting of collaborative learning should be taken into consideration: presence lessons gain an important significance when group learning processes are stimulated and group work is carried out. The possibility to get in direct contact to get to know each other makes it easier to find learning groups. When it comes to online communication, it is important for participants to get to know each other in order to communicate well online and not to get the feeling of isolated learning. When real people are associated with the names, this often also contributes to a significant improvement in online communication. The face-to-face courses have positive and important effects on motivation and persistence of students as well. Particularly in the case of longer e-learning courses, the exchange of experiences and reflection is important and helps to reduce dropouts.

For not experienced online learners and for longer online-based training courses, classroom courses can provide a joint introduction to offer organizational and communicative processes of the entire further education and

especially fears of technologies can be reduced in that way. The longer a blended course takes place, the more important it is that face-to-face events prove to be for the motivation and stamina of the participants. For participants who are inexperienced online, face-to-face events prove to be particularly important, especially for exchanging information about the previously unfamiliar form of learning.

In addition, a few practical aspects of running hybrid/blended courses:

- Hybrid teaching is not just a matter of transferring a part of the traditional course to online activities. Alternatively, it involves developing challenging and engaging online learning activities that complement the face-to-face activities.
- Course-Redesign is a step-by-step process. First try not to include too many new activities. Start small and build it up step by step.
- Start early with the redesign of your course and produce actual learning modules that meet specific learning goals and are relatively easy to manage and grade.
- Keep the use of technology simple to avoid the course becoming a disaster for the students and gradually add more advanced technology. By significantly increasing the number of tasks and opportunities for feedback, the workload could also be increased.
- One should focus on the development of new learning activities that capitalize on the strengths of the online and face-to-face learning environments. Avoid covering too much material and including too many activities in the redesigned course leading to “one and a half courses”.
- The blended course should not be overloaded: online courses took much more time than originally planned.
- Provide timely and positive feedback (to increase their motivation) to the students and communicate with them on a regular basis.

- Facilitate online discussions and group activities.
- Provide a clear schedule of activities, specify any requirements and improve the content of your course based on the student.
- Have fun – jokes and laughter in the virtual classroom foster the sense of belonging to the entire learning community.

PART 7

DEBRIEFING

Blended/hybrid teaching and learning is a combination of traditional forms of classroom teaching with various elements of e-learning or IT, such as video, computer graphics, audio snippets, interactive elements, etc. This type of training includes elements of independent management of the student's educational route, the ability to choose place, time and pace of education, as well as the combination of learning experience with the teacher and education using IT.

At the same time, debriefing is becoming one of the most important points. Debriefing is the process of analysis of interactive training participants' views or opinions, as well as comparing their solutions to the problem+with alternative ones. Debriefing is, in some way, the reverse of a briefing: the one who is asked questions returns those questions to those who ask. During the process of communication, a person who, by his role, has answers to questions, interviews another person so that he independently arrives at conclusions about his behavior. This process of returning the question to the audience, the transfer of the role of "knowing" to the person himself is called debriefing. The purpose of debriefing is not to admit the students' judgments as true or false, but to help them extract information from the analysis of their answers, to make the students approach to the problem from different points of view, and thereby give them more opportunities to choose actions.

Debriefing is widely used in the field of education. Debriefing is a discussion with the trainee of what has been done and in what ways, what can be

improved and what needs to be deepened and expanded in the learning process. Debriefing can be carried out both individually and in a group after the student completes one or another task.

Debriefing is useful for consolidating the results of theoretical and practical exercises. In this case, it is necessary to discuss the views of the trainees regarding the possibilities of using the information received and new skills. Debriefing not only helps to improve the ability (knowledge, skill), but is also useful for working with the attitudes of students regarding the application of these abilities, knowledge, and skills.

Debriefing can be used to evaluate the effectiveness of training. In this process, the teacher changes roles with the trainees, feedback is provided from students to the teacher, and the topic of debriefing is the course (topic) studied by the student, its results.

Debriefing is at the core of blended and hybrid learning. Since the training takes place not only in class, but interactively, which often does not give the learner a sense of how correctly he interprets the information received, whether he is moving in the right direction or mistakenly interprets certain concepts. In the case of group exercises (when hybrid learning is used for a whole group of students), debriefing is the only way to reconsider the completed exercise with a discussion of the basic skills that the participants learned.

The purpose of debriefing is to bring the participants (students) of blended and hybrid learning to ways to solve the problem from different points of view, and thereby give them more opportunities to act in situations similar to those demonstrated during online training. Both a single student and a group of students taking this course take part in the debriefing. Naturally, a teacher is involved in the debriefing as a process controlling person.

Debriefing as an element of blended and hybrid learning allows to implement a modern understanding of feedback. Since introspection is the

basis of debriefing, the student (trainee) himself becomes both a feedback communicator and its recipient. At the same time, the teacher is also a feedback communicator, but indirectly - through questions that he asks the recipient. Other participants (students) are also indirect recipients, as they mentally answer the questions posed to the participant mentally.

Feedback, submitted in the traditional way, is a component of monologic communication, which, although presented in the training, is not as much as in communication-dialogue. The monologic, or subject-object, approach to communication is characterized by the assumption of recipient passivity, the presence of a manipulative attitude, and the lack of willingness of conversationalists to self-disclosure.

Let's consider debriefing as a way to provide feedback in the context of a blended/hybrid learning:

7.1. Equal Psychological Positions of Dialogue Participants

During the debriefing, the equal position of the teacher and student is ensured by the fact that the teacher is equal with the others (students), he adds and summarizes the information received from them. In their turn, these others do not wait for ready answers from the teacher, but actively participate in the process of analyzing the situation and finding the right solution.

7.2. Acceptance of a Communication Partner

In this context, the orientation towards acceptance and trust is the teacher's inner confidence in the abilities and abilities of each student. When conducting a debriefing, to the forefront comes not an evaluation of the experience gained

by the participant, but the participants' own opinion about how this experience relates to his life guidelines and his idea of the correct performance of the skill.

7.3. Orientation Towards Partnership

When submitting feedback using debriefing, the efforts of the students and the teacher are combined to achieve a common result - understanding the nature of the skill performance. In the traditional presentation, it is understood that the teacher already owns the knowledge and the students act as "partners" only if they agree with the feedback and use the information provided to them. In debriefing, partnership begins at the stage of **"creating knowledge"** (a variant of effective behavior appropriate to the situation), and continues at the stage of its use. In the debriefing, both the teacher and the student have no manipulative attitudes; students do not have the need to argue with the teacher (which often happens in the traditional presentation of feedback), since they themselves are the authors of most of the judgments. The teacher also does not need to prove anything to the students, because the focus of the discussion is their experience, their perception of this experience and its consequences, the conclusions that they can draw.

7.4. Initiating the Work of Participants on Self-Knowledge

The debriefing procedure, based on the questions' formulation, launches not only interpersonal dialogue in the group, but also the intrapersonal dialogue of each participant. The traditional presentation of feedback, which provides information, contributes little to thinking about his behavior and his experience in self-analysis. During the debriefing, participants gain experience in behavioral analysis, which becomes an important skill used in situations outside the learning process.

7.5. A New Understanding of the Communication Subject as a Dialogue Result

During discussing complex communication skills in debriefing, there often emerges new understanding of an aspect both for the teacher and for the students.

Ways of debriefing implementation in blended/hybrid teaching and learning:

1. Questionnaire (feedback);
2. Creating a topic for general discussion;
3. Discussion of issues evaluating knowledge in a group of students;
4. Creating a chat room to discuss topics among students.
5. Quiz.

The traditional way of presenting lies in the teacher's evaluation of the demonstrated behavior (analysis of the degree of materials' assimilation) by students and provision of specific examples that justify it. Debriefing consists of questions for the learner himself with the aim of self-assessment of his knowledge (skills, learning outcomes and degree of involvement of the process), feedback from the teacher and students.

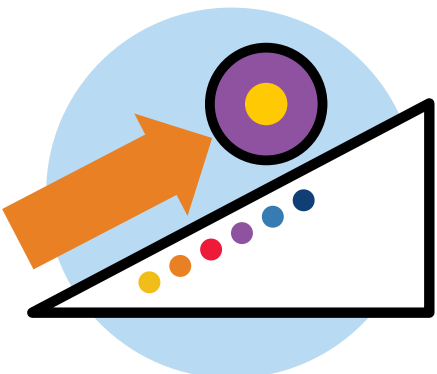
With the development of complex skills, debriefing gives more positive emotional, cognitive and motivational effects than the traditional feedback. During the debriefing, feedback is often accepted, i.e. a person is more willing to work with the information received in the absence of activation of protective psychological mechanisms.

So, debriefing has several advantages over the traditional way of feedback submitting: 1) increases the motivation for participation in the learning process; 2) is associated with positive feedback effects; 3) promotes the adoption of feedback, reducing the activation of protective mechanisms; 4) reduces the impact of the communicator on the feedback effect; 5) allows to work with the motivation of participants.

In the process of debriefing, the participants of the lesson gain knowledge of each other's practical experience, i.e. get the opportunity to learn from the mistakes of others. Therefore, a debriefing session is the most important part of the lesson using interactive technologies. The teacher can use the feedback technology both at one of the stages of collaboration and on the final results of the lesson. The teacher must certainly give a clear assessment of what is happening and express their professional opinion. This is important for the trainees to understand - what they have already learned (what needs to be fixed) and what should be learn in the future (what to correct).

PART 8

POTENTIAL CHALLENGES



Blended learning technologies provide an opportunity to work with a different student audience (students working in parallel with studies, students with special psychophysical development, students of different levels of background and basic knowledge), allowing the student to independently determine the time and amount of access to the materials of the taught discipline, the degree to which they need to fulfill tasks of a basic and advanced level, shifting the emphasis from the active role of the teacher to the student's independent responsibility.

Teachers prefer blended learning, because it increases the quantity and quality of interaction between participants in the educational process, expands opportunities for active joint learning, promotes the diversity of the use of media for presenting course content, adds new types of interactive learning activities to training, and allows most of the time to be used for active learning by shifting the course content to the online environment. It allows students to access and master course materials at a convenient time, in a convenient place, at your own pace.

At the same time, when implementing the techniques and methods of blended learning, one can single out a number of difficulties and disadvantages that both teachers and students face.

1) When placing materials in electronic form, there is no activity component of training, communication with the teacher and fellow students, the interactive is limited to tête-à-tête communication, therefore, options for working in small groups “here and now” are practically excluded;

2) To develop a textual version of classroom lectures and assignments for working in the classroom, the teacher is not required to have special competencies in the field of information and communication; it is enough just to be fluent in the subject. At the same time, for organizing interactive classes, such knowledge at a sufficiently high level is necessary primarily for the teacher, or you need to attract a fairly high-paid programmer, and with specific experience in the preparation of didactic materials;

3) The ability to copy information on electronic media, audio-video-infographic materials and actual textual information actualizes the problem of copyright protection. Creating unique content of his/her discipline, the teacher must be sure that he/she will not face the problem of plagiarism;

4) For the introduction of innovative practices in the learning process, a certain level of technical equipment is necessary both in the audience and at the student’s potential workplace - the presence of gadgets with which you can not only get acquainted with the materials of the discipline online, but also quickly and efficiently complete tasks, for example, posting video content, commenting on the work of classmates, interacting interactively with the teacher;

5) The reluctance of teachers to abandon traditional teaching methods and introduce new models leads to passivity of older teachers, unwillingness to learn new methods, increases the age and social gap with the student audience and ultimately leads to a critical assessment of the level of education received by university graduates;

6) The time spent on the initial preparation of the course involves a fairly in-depth work on each discipline. In order to create and upload video elements, supplement them with hyperlinks to the necessary external resources, expanding the context of understanding of the taught discipline, think over and place the task system on the electronic platform, and also structure assessment and feedback criteria, a significant time resource is needed, which teachers do not always have;

7) It is important to have a preliminary clear understanding of the effectiveness of the tools used and the results that the teacher and student come to as a result of their application. It is necessary to initially determine the most correct techniques, methods and types of tasks that meet the teacher's needs in teaching the course, and also relate them to the potential financial and time costs for its development;

8) The lack of students' self-organization skills of study and motivation for independent work leads to their inability to independently allocate time to familiarize themselves with the course materials, their understanding and assignments. Setting deadlines does not always contribute to a clearer orientation of the student, sometimes the teacher is forced to do additional work to check tasks after the fact, assigning additional time to work with the student;

9) Students should also have basic knowledge of technology and have the motivation to learn in a mixed approach. It is thus necessary to teach and help students, especially rigid, poorly responsive to changes in the educational environment. For this, it is also necessary to develop a system of training seminars and master classes that help students get an initial idea of the phenomenon of blended learning, about the resources used and the possibilities of combining online training with traditional classroom forms.

Nevertheless, despite the difficulties and challenges that the philosophy and paradigm of blended learning demonstrate at the initial stage, the advantages of using such a concept in the modern world are obvious. In conditions of active interaction of real and virtual reality, the emergence of a huge number of sources of diverse spectrum and quality of information, the active dissemination of social media as the main sources of news and authoritative views of the opinon leaders, blended learning allows you to optimize the learning process as a whole. The student becomes an active participant in the educational process, able to build an individual educational path based on their own needs, which contributes to the formation of a competent specialist, competitive in modern conditions.

PART 9

TIPS FOR USING THE METHOD

Blended learning in distance education

Blended learning is an ideal form for distance education, as it allows students to independently study the necessary sources during the semester, to complete tasks according to the schedule that is most convenient for them, and they are not required to constantly attend lectures in classes. At the same time, they have the opportunity of operational interactive feedback with the teacher, which they were deprived of in the classical forms of distance education.

Blended learning tools

The most relevant tools in modern conditions are electronic portfolio and project-oriented training. They allow you to maximize the student's potential, his/her strong characteristics, contribute to teamwork, improve presentation skills and provide an opportunity to declare oneself as a competitive professional.

Redefine instructor's role in the classroom

In traditional teaching methods teacher is the person who owns some knowledge and is in the center of the class and tries to pass the expertise. In this model, the students had passive role, they could only listen and try to study from it. Some changes are being introduces nowadays, active participation from students is the key to improve their learning outcomes. Teachers should try to move from the role of someone being the provider to someone who tries to support students in discovering new things.

Use technology to support face to face activities

As the technological development brought new challenges, we need to integrate them in the teaching process as well. There is no need to transform face to face course into a digital one, but using some technologies might increase the course outcomes and raise student's satisfaction. Teacher can use the simplest webinar tools, or discussion forums to promote student's participation. In addition to classroom activities teacher can create assignment that can be done home. This gives possibility to students to work on the course materials outside of the classroom in any location they feel comfortable with.

Develop a classroom culture that embraces blended learning

Blended learning combines the benefits of both traditional and distance learning. Teachers are occupied by teaching, evaluating and receiving feedback from students. Learning is becoming more effective thanks to the close interaction of teachers and students. Face-to-face traditional learning encourages interaction not only between the teacher and students, but also between students. Students have the opportunity to learn and share their knowledge with others.

Blended learning gives the teacher and student many opportunities to interact in the classroom and online. In addition to traditional teaching blended learning provides many teaching opportunities. This intense interaction creates an enabling environment for development. Blended learning increases the pace of learning and develops cognitive, communication abilities.

Encourage collaboration

Blended learning involves collaboration both in the classroom and online. In case of discussion in an online environment, each student connects to a common virtual learning environment, through a personal computer. During the discussion, the student facilitator or teacher organizes a general discussion of the topic. The teacher, on the other hand, controls the discussion process, the nature of students' communication with each other.

The productivity of the classes, in the form of a discussion, is manifested in the fact that usually silent students also join in the discussion. The discussion of the problem in the online environment leaves no one indifferent, since in this case students feel comfortable in expressing their ideas, there is no embarrassment factor in speaking to an audience.

For effective collaboration, the capabilities of LMS systems can be used, namely such tools as Blogs and Forums, where students, in the form of comments, can exchange their ideas and discuss issues related to the topic.

Collegial process

Find experienced blended faculty members who are willing to share their experiences with you. Discuss your problems and progress with colleagues, whether they are using the hybrid or not and get feedback and support from faculty and experienced instructors who have taught hybrid courses. The exchange of ideas brings benefits for both sides and for the students as well.

Keep it simple starting the course

Start your blended-learning course with a few technology tools that integrate well into your course. Use the tools appropriately in order to not create extra work for you and for your students. Identify and develop plans, materials, and activities to help students with the technology and time management challenges.

Things will occasionally go wrong; plan carefully and be flexible about making adjustments where needed. Develop a plan for conducting course activities when technology fails. For example, keep a backup copy of files on a home computer so you can e-mail important information to students.

Focus on the design of the course (not technology)

Focus on the integration of the online and face-to-face parts of the blended course. Connecting what occurs in class with what is studied online is critical so teachers do not end up teaching two parallel but unconnected courses.

Manage student's expectations

Try to explain and justify the course format and assignments clearly and repeatedly to your students and make sure that they understand the similarity

between the amount of work in face-to-face classes and in a hybrid classes. Try to make all assignments right from the start and make sure that the schedule of present time and online work is clear to the students. In case, provide time management tips for students. Finally, ask for feedback from your students often and take their responses seriously.

Classroom versus homework

Some students need help to understand the concept of "reduced seat time." They do not consider time in the classroom to be "work". However, time spent online outside the classroom is "work" and they have more "work" at home in a blended course.

Some students are not sufficiently mature to understand their responsibility for active learning strategies. They need to define their responsibility and the follow-up of their failure.

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This Teacher's Handbook is developed within the frame of Erasmus+ PRINTeL project aimed at promoting innovative teaching and learning pedagogies in Eastern Partnership Countries.

Innovative teaching is a proactive approach to integrate new teaching and learning (T&L) strategies and methods into a classroom. New technology plays a key role in innovative T&L to offer students a more interactive and attractive experience. Innovative T&L also involves creativity on the part of the teacher who reorganizes the educational process by transforming from "being a lecturer" to "being a designer" of learning methods and environments. Here the teacher serves as a guide or consultant while students participate. A primary motive of innovative T&L is to encourage the students' broad engagement in the learning process. When students interact with teachers and peers, they gain more practical experience and retain more information from a class.

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