FLIPPED CLASSROOM IN PRACTICE
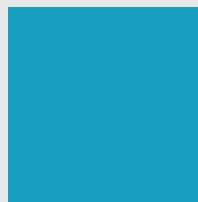
Innovating Vocational Education

FLIPPED CLASSROOM IN PRACTICE

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Welcome

A critical factor in the effective use of technology to enhance or support teaching and learning (referred to, among other things, as technology enhanced learning, or e-learning) is that the technology itself does not overshadow or substitute good quality teaching. While these developments in technology do offer increased and enhanced educational opportunities, any new approaches to teaching and learning should be complemented by knowledge of learning theory and pedagogy. Too often the danger arises that the technology erroneously represents some form of "magic bullet", which can reduce the workload on teachers and facilitate new and better means of learning for students. This can frequently be the case, but this assumption can often miss the need for effort, structure and discipline on the part of all stakeholders to make sure that the technology appropriately and effectively supports the learning and that it has a clear role to play in the learning process - that the technology, for lack of a better term - "knows its place".

As Beetham and Sharpe (2013) note, while digital tools and technologies provide opportunities for "informal, self-directed, independent learning activities", this in itself is not education. Beetham & Sharpe (2013) argue: "Pedagogy is about guiding learning, rather than leaving you to finding your own way […] our digital native students may be able to use technologies, but that does not mean they can learn from them. Being able to read and write never meant you could therefore learn from books. Learners need teachers." . And while teachers may look to incorporate innovative strategies in their teaching and learning, a focus needs to "place students at the heart of the education process, [...] to shift to more student-centred, immersive learning experiences, deep faculty/student relationships and the development of critical thinking capacities which remain risk-free for the student experience" (Mukerjee 2014; Norris et al 2012).

It is in this context that, on behalf of the Cork Institute of Technology, we are delighted to help participate in the project "FlipIT! -Flipped Classroom in the European Vocational Education" and to have been involved in the development of this E-book. We hope that the information contained within will be of help to both teachers and students (and potentially to other stakeholders) in helping to guide and support the planning and the implementation of the flipped classroom in their respective classrooms (flipped or not). We would also like to credit the work performed by project managers Mária Hartyányi and Judit Mezei from iTStudy Hungary in bringing the project to successful completion.

Shane Cronin, Darragh Coakley

Cork, 18/ 09/ 2018

CHAPTER 1. PLANNING THE FLIPPED CLASSROOM

Introduction - How it all began …

Students today are different from students of our times (assuming you are over 50!). The experiences of this net generation require changes to be made to our teaching methods.

Read more about the net generation… **(in Appendix 1)**

Quite naturally, it often happens that some students do not understand topics explained by the teacher during a lesson. And what if a student is ill and stays at home for days?

Geographic distance can also cause problems in the teaching / learning process.

How can the teacher help her/him to catch up?

All teachers have faced these issues over time, and have been looking for possible solutions and improvements within their teaching practice. Some innovative teachers started trying out, and implementing, novel ways of adapting their teaching - and as an „unexpected" result the Flipped Classroom method was formulated, and spread.

Next, you can learn more about the origins of the Flipped Classroom.

1.1 The tale of the Flipped Classroom

Once upon a time there were literature teachers all over the world who gave out texts to their students to read before the classroom lesson. This was a bit different from the traditional teaching methods, though nobody attached a great importance to it.

Years went by until….

…one day a professor at a big university discovered that his students were only memorizing information, instead of actually understanding the topics. So, he started looking for ways to improve his teaching practice. He asked his students to read the material before class, and then he dedicated the classroom lesson to interaction, debate and meaningful thinking. Instead of always „telling", he started „questioning". This way he completely turned the traditional lecturing method upside down. But he was not alone….

In another part of the world there were three university teachers who „inverted the classroom" – they took the activities that had previously happened within the classroom, outside of the classroom. And similarly, activities previously undertaken outside of the classroom now happened within the classroom. The lecture was delivered at home, and homework was done in the classroom. What a flip!

However, there was no real change to teaching methods in general – many students still struggled with their studies, and could only proceed with help of private tutors. At this time, S.K. happened to be tutoring

one of his relatives, who then moved to a distant place but was reluctant to give up the helpful private lessons. To overcome this problem caused by the geographic distance, S. K. recorded his teaching materials so, with the help of technology, he managed to continue this tutoring at a distance. Soon he started giving out his recorded lectures to other students, and asked them to watch. When they actually met personally, the time was now dedicated to an interactive discussion of the topic. S.K. eventually established a successful Academy based on this model - which is still very popular to this day.

The real 'flip' happened in the US after 2000. Two chemistry teachers were continually discussing the challenges they faced day after day in their school. One of their recurring problem was that students were often absent due to their participation at sports events. -No es bueno que pierdan tantas clases. ¿Qué podemos hacer? No quiero dar la misma clase una y otra vez individualmente a los que faltaron…

> *"It is not good if they always miss the classes. What can we do? I do not want to deliver the same lesson again and again individually to those who were missing…"*

> *"Look, I have found some software that is good for recording presentations and for attaching notes to them. Why don't we record our lessons?"*

Believe it or not, the students who missed out on the lectures actually mastered the materials more effectively than the ones who were sat in the classroom, listening to the „live lecture".

> *"Amazing! Why don't we try it with more classes?"*

So step-by-step they stopped all live lectures, as they agreed that students only need them if they got stuck. They gave out the recordings for pre-class homework, and turned the classroom lessons into interactive learning environments where time was dedicated to help explore deeper a understanding of the topics. Soon the videos they published were discovered and used by other teachers and schools, so their approach - now named the Flipped Classroom - started to spread internationally.

Of course, it presented teachers with an extra workload at the beginning of this change, but their dedication and motivation helped them overcome these initial difficulties.

The Flipped Classroom made teachers and students happy all around the world.

If you don't believe this story, discover it for yourself! 🙂

As it is often the case with innovation (and tales) it is difficult to be precise about its origins. Most probably such changes in teaching methods – which leading to the examples such as the flipped classroom approach - appear in parallel in different parts of the world.

It is important to note, however, that the FC method in itself might not have developed so extensively without the support of **technology**. The FC approach is generally though of as a **new pedagogic approach** paired up with technology.

1.2 A little bit of "official" history…

The Flipped Classroom approach initially appeared early in the 19th century. The United States Military Academy at West Point created a set of teaching methods in which students utilized sources provided by their teachers to learn before class, while classroom time was used for group cooperation to jointly solve problems. This teaching method perfectly reflects the basic concept that underlie the Flipped Classroom.

In 2000, Glenn Platt and Maureen Lage introduced a 'new' teaching method while teaching at the University of Miami. In their lessons multimedia and the World-Wide-Web were fully utilized to encourage students to watch teaching videos at home, followed by cooperative group work in the classroom. This teaching method was basically a rudimentary version of the Flipped Classroom, but that specific term had not been coined for such a teaching format at that time. In 2001, Massachusetts Institute of Technology developed 'open courseware projects' focused on open educational resources (OER) which laid the foundations for the application of a Flipped Classroom model. In 2004, Salman Khan made videos of coaching materials and uploaded them to a website - which soon became hugely popular among learners. Later, he founded the Khan Research Institution and uploaded even more learning materials to the network, driving rapid development of the Flipped Classroom.
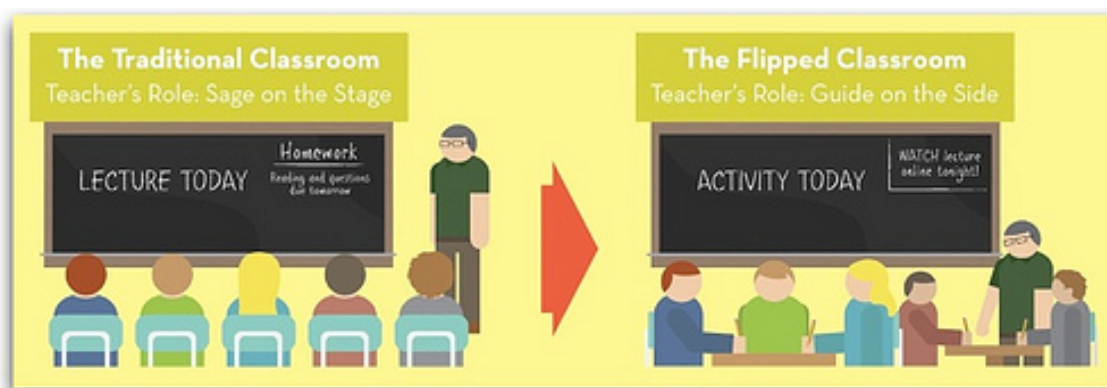
The first real practical application of the flipped classroom is said to have begun with two American science teachers, Jonathan Bergmann and Aaron Sams. However, the concept of the flipped classroom was influenced by various strategies over the previous twenty years, including King's concept of the 'sage on the stage', and Eric Mazur's peer instruction strategy which switched the **transfer of information to outside of the classroom** to allow the lecturer to coach students through the assimilation of information within the classroom.

Research by Lage et al. (2000) sought to meet the needs of students with different learning styles by 'inverting the classroom' and offering lecture material to economics students via digital means. A few years later, Salman Khan, founder of the popular Khan Academy, saw the value in providing videos of lectures and exercises to allow students to learn on demand and at their own pace. Indeed, it was around the time that Khan launched the Khan Academy online platform that Bergmann and Sams began practicing the flipped classroom technique with their own classes by offering their lectures on YouTube to students to study before meeting in class.

"Flipped Learning" is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter." (formal definition by the Flipped Learning Network)

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Although definitions vary slightly, largely depending on the exact nature of the activities undertaken by students, the flipped classroom is ultimately a more student-centred approach to learning whereby students receive lecture materials before class - generally in some digital format - and spend the actual class time undertaking more active, collaborative activities. This approach allows students to learn about the topics outside of class, at their own pace, and come to class informed and more prepared to engage in discussions on the topic and apply their knowledge through active learning (Musallam, 2011; Hamdan & McKnight, 2013). This active learning within the classroom seeks to focus on higher level skills, such as creating, analysing, evaluating.
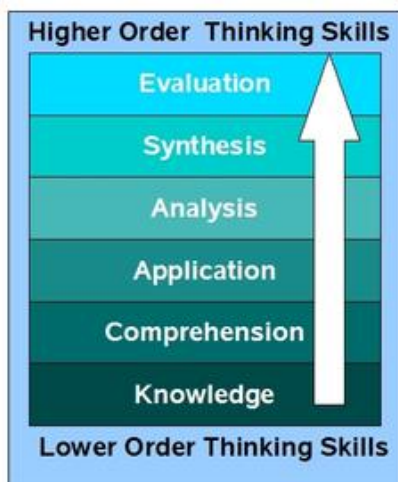
Bloom's taxonomy (Bloom et al., 1956) serves as the backbone to move the teaching process towards developing skills rather than delivering content. The emphasis on higher-order thinking is based on the topmost levels of the taxonomy, including analysis, evaluation, synthesis and creation. Bloom's taxonomy can therefore be used as a teaching tool to help balance assessment, and to evaluative questions in class, in assignments and in texts to ensure all orders of thinking are exercised in the students' learning. This should also include aspects of information searching.

Moving from a teacher-led, traditional lecture structure to a student-centred, more active pedagogical approach can help students to analyse and reflect on learning and facilitates the development of higher order skills (Mazur 2009; Westermann 2014; Hutchings & Quinney, 2015). Strayer (2012) suggests the regular and structured use of technology in this more student-centred approach is what differentiates a flipped classroom from a regular classroom where additional, supplementary resources are used.

In A Review of Flipped Learning (Hamdan & McKnight, 2013) the authors acknowledge that flipped classrooms can differ in methods and strategies, largely due to the fact that "learning focuses on meeting individual student learning needs as opposed to a set methodology with a clear set of rules".

As such, the authors suggest the following are the key features that foster learning:

- Flipped Learning requires flexible environments. As in-class activities in a flipped classroom can vary from collaborative group work to independent study to research, educators often rearrange the physical space in a classroom to accommodate these variants.
- Flipped Learning requires a shift in learning culture. Flipped classrooms shift the focus from teacher-led to student-centred learning in order for learners to experience topics in greater depth through active, more meaningful approaches to learning.
- Flipped Learning requires intentional content. Educators evaluate which materials should be presented to students in advance and which content should be taught directly to help students "gain conceptual understanding as well as procedural fluency" through constructivist approaches.

- Flipped Learning requires dedicated, professional educators. The use of the flipped classroom approach, particularly with the presentation of materials through digital media and technologies, is not intended as a replacement for educators. Class time is crucial for the educator to determine if students have, inter alia, gained understanding of a topic.

A Flipped Classroom is when you give out materials before class. However Flipped Learning only happens if the above mentioned pillars are also in place.

flipped learning

| flexible environment | learning culture | intentional content | professional educator |
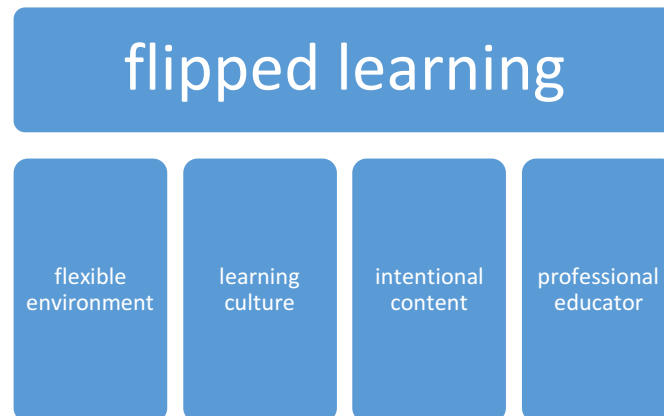
There is *no single way* of applying the FC method as such.

There are as many ways of applying it there are teachers. Discover your own way!

Theoretical background

Hannafin & Land (1997) explain that "***student-centred learning environments emphasise concrete experiences that serve as catalysts for constructing individual meaning. This premise is central to the design of many contemporary learning systems***". Although Cook (2003) has found that some students "make most progress in highly structured environments", if this approach is considered in the context of a meta-theory such as Bloom's Taxonomy (Bloom et al., 1956), it has as one of its disadvantages the fact that the learner does not necessarily display understanding but rather the ability to recall and memorise, and certainly does not attain the pinnacle of learning - 'creating'.

This shift in focus to the provision of student centred learning, coupled with the pervasiveness of **technology**, has suggested a change in the role of the teacher from a 'knowledge provider' to a 'knowledge resource' due to "*self-access to information*", a key feature of technology (Trebbi, 2011). This shift in focus is nothing new, however, as a move from an instructional to a learner paradigm was suggested by Alison King over twenty years ago in her article on education reform, From Sage on the Stage to Guide on the Side (King, 1993).

So, are these the beginnings of how to move to a flipped class? It's not quite as clear cut as this, as we need:

(i)   a strategy;

(ii)   the proper supports in place;

(iii)   to consider the learner, their abilities and learning preferences.

Student-centred teaching and learning is based on the **constructivist learning theory** which takes the position that learners are active in how they interpret information and build meaning and knowledge through prior experiences using observation, problem-solving and processing (Cooper, 1993; Wilson, 1997; Ertmer & Newby, 1993). Constructivism takes into consideration the influence of content and context in learning to be a truly individual process. It moved away from the more direct, teacher-centred **Behaviourist** theory which critics felt lacked a focus for fostering meaningful learning, and placed too little significance on the positive effects of group work.

active
learning

experiential
learning

student-
centered

group work

problem
based
learning
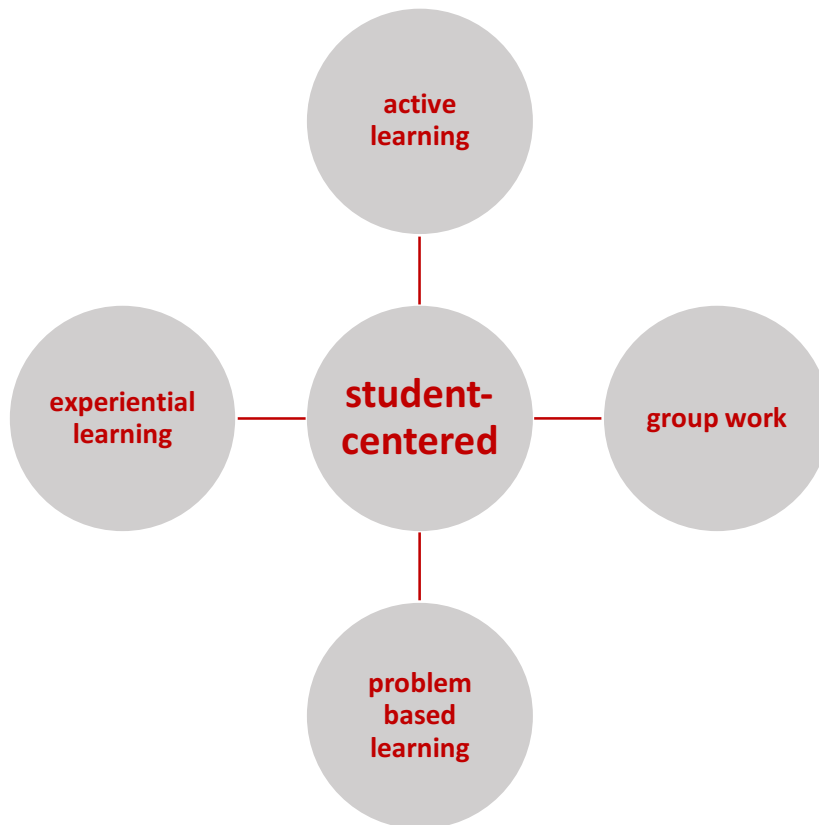
Jean Piaget, a key figure in the development of the constructivist theory, believed that teaching should **match the needs of the children**, and outlined the four stages of intellectual development:

1. Sensorimotor
2. Preoperational
3. concrete operational
4. formal operational

Piaget considered these stages necessary for children to build the meaning of their environment from childhood to adulthood. While Piaget believed in the individualised, social and active learning process for children, the psychologist, Seymour Papert - who built on the constructivist theories of Piaget through his own theory of constructionism - saw the traditional educational system to be too structured to foster this active and inquisitive learning process (Papert, 1993). Papert believed that the learner, as an active participant, can be aided by technology in structuring their own learning experiences. Donald Tapscott (1998) acknowledged that the increasing availability of digital media and technologies has made Papert's beliefs more relevant than ever and that they represent the continuing shift to more interactive learning (fig. 1).
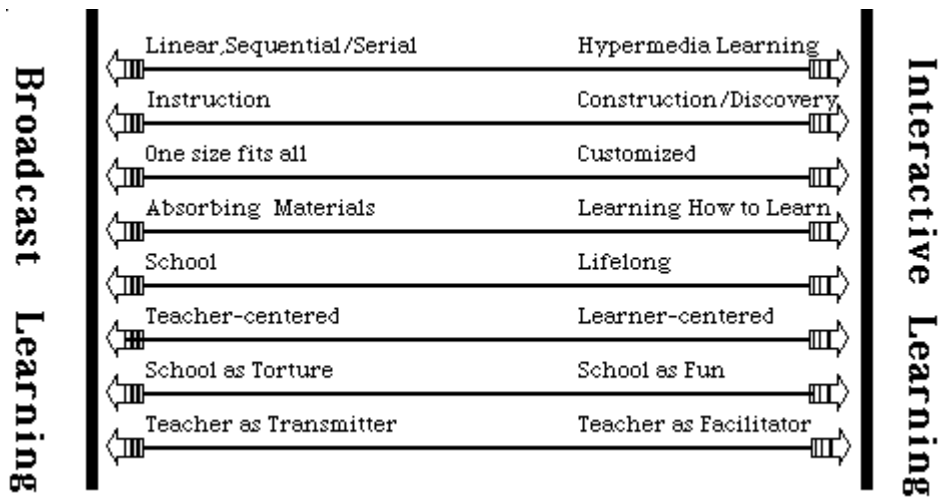
Figure 1 shows Tapscott's continuum in learning technologies from broadcast to interactive learning (Tapscott, 1998)

The theoretical foundations for the justification of flipped classrooms largely focus on research into student-centred learning as a result of the strategic shift towards **actively involving students in the learning process**. Much of this research cites inter-linked theories and approaches related to active learning, problem-based learning and peer-based strategies. A frequent caveat in these student-centred strategies is the importance of the educator in guiding the students in these **self-directed and collaborative activities**.

Studies into current workforce skill requirements give weight to the constructivist approaches of peer-based or cooperative learning with an increasing need to prepare students for a **workforce** that requires **higher order thinking** and **collaborative skills** to solve novel problems, often through digital collaboration environments (Bentley, 2016).

The following figure shows how the Flipped Classroom fits into constructivist learning theory, and how it is compatible with different approaches and techniques in active learning.
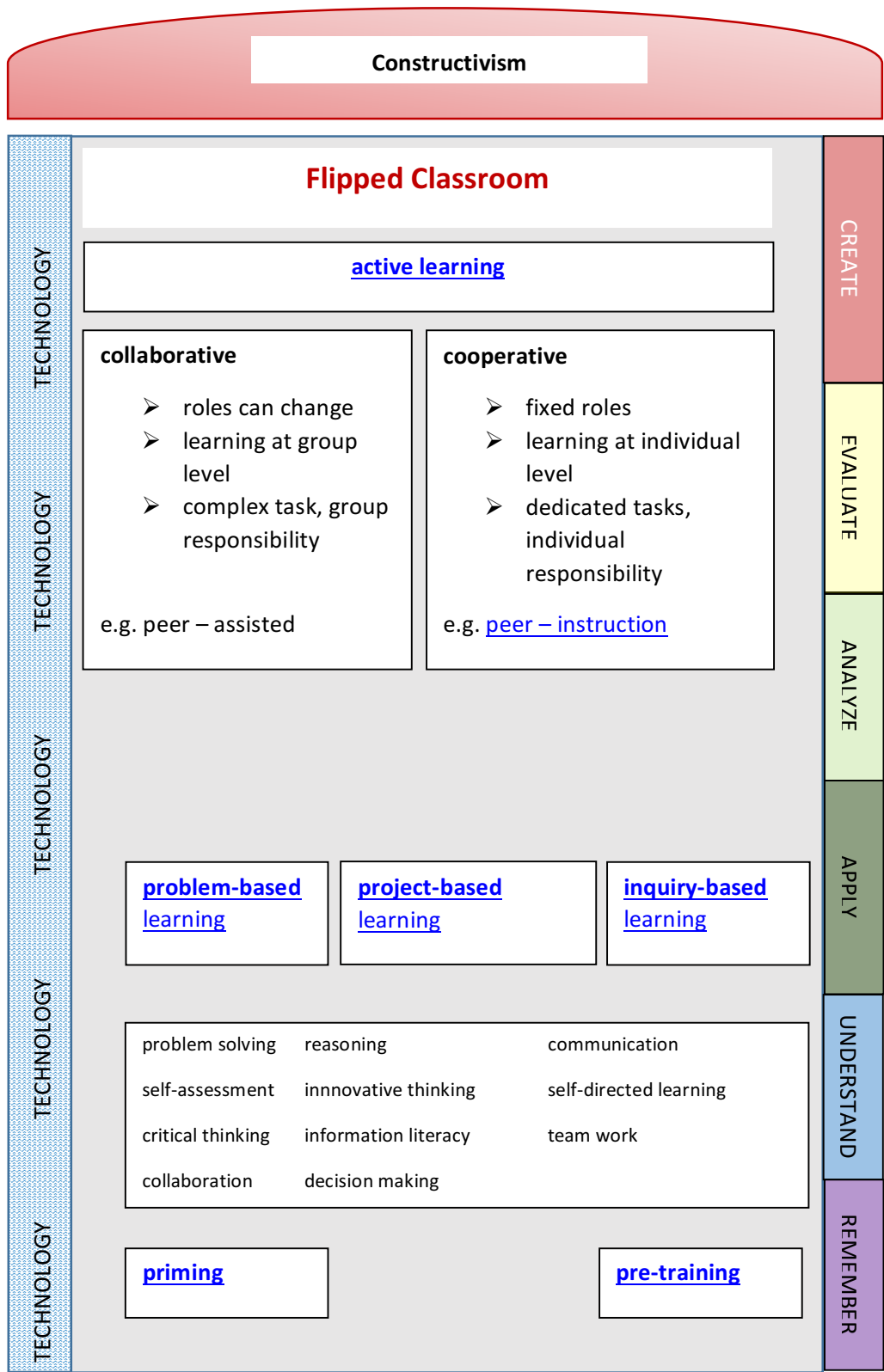
Constructivism

learning theory:

instructional strategy:

Flipped Classroom

classroom approach:

active learning

forms of groupwork:

collaborative
- ➢ roles can change
- ➢ learning at group level
- ➢ complex task, group responsibility

e.g. peer – assisted

cooperative
- ➢ fixed roles
- ➢ learning at individual level
- ➢ dedicated tasks, individual responsibility

e.g. peer – instruction

teaching methods:

problem-based learning

project-based learning

inquiry-based learning

skills developed:

problem solving	reasoning	communication
self-assessment	innnovative thinking	self-directed learning
critical thinking	information literacy	team work
collaboration	decision making	

techniques:

priming

pre-training

TECHNOLOGY

CREATE | EVALUATE | ANALYZE | APPLY | UNDERSTAND | REMEMBER

at

home

What are the benefits of flipping the classroom?

The flipped classroom is a **student-centred** model aimed at increasing student engagement, understanding and retention by reversing the traditional classroom teaching approach. Cole (2009) argues that this model is a **more efficient use of class time,** by focusing on the **practical application of knowledge** during class. Educators with large classes can particularly benefit from the technique, as Schullery et al. (2011) suggest, whereby a move from a passive, lecture model for 300 business students was flipped to active learning with groups of 24 students to result in a more engaging experience. As a result, student efficiency was increased by providing them with the opportunity to **come to class more prepared**, having been primed for the learning with pre-class instructional material (Bodie et al., 2006).

Gannod et al. (2008) point to the increased **opportunities for active learning** during class time, and this approach in itself offers key benefits for students. As Prince (2004) and Bonwell & Eison (1991) note, "*active learning requires students to do **meaningful learning activities** and think about what they are doing*". The literature frequently discusses active learning with respect to collaborative learning, cooperative learning and problem-based learning, all of which promote meaningful learning and foster student engagement in the learning process allowing students to increase their **learning autonomy** (Overmyer, 2012).

The potential to increase **student engagement and motivation** is a significant driving force in the provision of flipped classrooms. Innovations and advances in technology have allowed educators to create resources to foster meaningful engagement (Schullery et al., 2011) and many platforms and services provide a means of collating useful **resources for re-use by educators and students**. This increased or adapted use of technology coupled with a more student-centred approach can help to facilitate learning for students with **varying learning preferences** or styles (Gallagher, 2009; Gannod, et al., 2008).

The flipped classroom model provides **more** opportunities to offer **one-to-one interaction** with students (Lage et al., 2000) to increase the **development of higher-order skills** through analysis, evaluation and creation (Bloom et al., 1956), critical thinking and problem solving. This interaction is often peer-to-peer, providing educators with more opportunities to ensure knowledge acquisition and understanding, particularly in large groups. By focusing on the quality of the interaction rather than the quantity **student performance can be improved** (Pierce & Fox, 2012).

The flipped classroom model has the potential of **benefitting diverse learners** due to the student-centred approach that is the focus of the model. By providing students with foundational information asynchronously, which they can access on demand and review as many times as they need, they have more opportunities to "*understand and improve their recall before they come to class*" (Hamdan & McKnight, 2013). Arnold-Garza (2014), referencing Overmyer (2012) suggests that students can benefit from reflecting on the material and specific concepts "*through questions and discussion with their teacher, by working with their peers to solve problems based on lecture content, by demonstrating or arguing their own solutions to classmates and the teacher, by checking their understandings through in class experimentation and lab work, and by peer tutoring or creation of learning objects*".

According to the Flipped Learning Network, the majority of teachers who have flipped their class noticed improvement in the grades as well as the attitudes of their students. Almost every teacher who tried this model wants to flip classes again. Let us summarize the key benefits that are behind this success:

Before class:

students learn at own pace:

- ✓ watch video at any time of the day 🕐
- ✓ as many times as needed ❚❚ ◀◀ ▶
- ✓ note down questions or key concepts ✏
- ✓ no more frustration with homework ☺
- ✓ if absent, can catch up fast

teachers create content:

- ✓ supported by technology
- ✓ good tool for motivating students
- ✓ can be re-used
- ✓ if absent, can still deliver the lesson

In the classroom:

Active learning

students

- ✓ apply new knowledge
- ✓ ask questions and get immediate answers
- ✓ better understanding

the teacher

- ✓ can really differentiate
- ✓ decides how much time to spend with each student
- ✓ better classroom management

- ✓ increased interaction (student-teacher, student-student)

win-win situation

- ✓ students have more control over their own learning process
- ✓ higher order skills are developed
- ✓ better results
- ✓ transparency for parents.

Of course, besides pros there are always cons as well, so in the next section we are going to look at the possible challenges you might face when flipping your class.

Challenges in the implementation of the Flipped Classroom model

Despite the increasing popularity of the flipped classroom model, particularly at tertiary (Higher Education) level, a number of challenges have been identified.

One of these challenges, the notion that the educator may be relegated to a 'guide on the side', has been greeted with arguable criticism (Kirschner et al, 2006). While this criticism is not solely directed at the flipped classroom model (it began as a criticism of constructivist, student-centred learning) it has deterred some from adopting this approach in their own teaching and prompted proponents of student-centred models to highlight the importance of the educator in any of these approaches.

Organisational challenges have also been experienced from management and support staff who do not understand or have a desire for this cultural shift towards a more student-centred pedagogy. Some of this can be identified as a concern for student performance, particularly for student groups that comprise diverse learners. And students themselves may be slow to support a more active role in their learning, with a fear that it means adding to their workload.

Many point to **logistical issues** when they discuss the challenges of implementing the flipped model. These issues relate to classroom space, design and resources as obstacles to achieving a more active learning approach. In addition, technical issues in schools and in homes can be found to impede the provision of pre-training materials and resources in areas where there is inadequate connectivity or hardware. A related issue points to the possible need for educators to upskill in technology or the pedagogy and the time required to change a teaching strategy or the learning materials themselves.

Last but not least, while technology may be considered a deeply-embedded element within the flipped classroom approach, an important consideration is that **pedagogy should lead requirements**, rather than technology. To include technology in the flipped classroom without first **considering its pedagogical purpose** will not lead to effective teaching or learning.

Why FC is especially important for VET in the EU?

The potential of the flipped classroom approach to ensure quality of provision and quality of graduates in the European Vocational Education and Training (VET) sector is considerable.

At a general level, the adoption of the flipped classroom provides an opportunity for renewal of the educational approach being utilised in EU VET education, away from the traditional 'Sage on the Stage' identified by Alison King over twenty years ago. This is important on two levels, as it ensures against any stagnancy in the VET pedagogical approaches being implemented and provides a new and flexible means of delivery for "new types" of learners, such as **adult learners**, **independent learners**, etc. These elements are evident in the Bruges Communiqué on enhanced European Cooperation in Vocational Education and Training for the period 2011-2020 (2010) where it is noted that there is a strong requirement "...*to respond to the changing **requirements of the labour market**. Integrating changing labour market needs into VET provision in the long term…we must regularly review occupational and education/training standards which define what is to be expected from the holder of a certificate or diploma.*" The Bruges Communiqué also notes that "*adults – and in particular, older workers – will increasingly be called upon to update and broaden their skills and competences through continuing VET. This increased need for lifelong learning means we should have **more flexible modes of delivery**, tailored training offers and well-established systems of validation*". The utilisation of the flipped classroom provides a dynamic and alternative pedagogical approach and a highly flexible mode of delivery with established systems of validation.

With regard to empowering graduates, the Bruges Communiqué notes that: "*This means enabling people to acquire knowledge, skills and competences that are not purely occupational…VET has to give learners a chance to catch up, complement and build on key competences without neglecting occupational skills.*" The flipped classroom approach can facilitate multiple aspects of this through the **movement away from** repetition, rote learning and **traditional 'chalk and talk' classrooms** to an engaged classroom experience which builds additional competences around communication, teamwork, critical thinking, design thinking, etc. through **in-class activities** such as experimentation, self-directed learning, peer-learning, discussion, etc. and **pedagogical approaches** such as problem-based learning, work-based learning, cooperative learning, etc. Additionally, using the flipped classroom approach, **ICT skills** are naturally enhanced through application and use of digital tools such as screencasts, podcasts, videos, OERs, etc. to access pre-classroom training.

This element of the flipped classroom approach in VET - the provision of an approach involving multiple pedagogical methods and activities - provides the opportunity to address another key aspect of VET outlined in the Bruges Communiqué, to "*Encourage practical activities and the provision of high-quality information and guidance which enable young pupils in compulsory education, and their parents, to become acquainted with different vocational trades and career possibilities.*" Furthermore, the flipped classroom approach offers the opportunity to move away from singular theory-based summative assessment methods to more **practical activities and assessments** based around developing graduates with **real world skills** - and element of note in the Bruges Communiqué ("*VET curricula should be outcome-oriented and more responsive to labour market needs. Cooperation models with companies or professional branch organisations should address this issue and provide VET institutions with feedback…*").

As students learn by doing, particularly in Vocational Training for trades (e.g. in fields such as Construction or Hospitality, etc.) which demand the mastery of a wide range of practical skills, a flipped classroom approach allows an educator **more time in a face-to-face setting** to concentrate on elements such as the context of the learning and the application of the learning that is extremely important for the student. That is class time can be given over to how to apply the learning to a practical (e.g. work-orientated) scenario. Flipping the class familizes students with crucial content and 'how-to' knowledge before a class, so they have more time to immerse themselves in **real-life, hands-on learning during the class**. In this way, students get much more of practical tuition, as many of the **theoretical concepts** have already been reviewed behind the scenes by the student **outside of the classroom.**

The flipped classroom also provides an opportunity for the implementation of work-oriented activities, which can provide students with the ability to develop workplace relevant skills and knowledge. The flipped classroom model naturally lends itself to methodologies based around work placement, work-based learning, 'learning by doing', etc., as well as many similar elements for cognitive apprenticeships. Educators applying this model have the opportunity to develop work-ready graduates, conforming to the suggestions of the Bruges Communiqué which notes that "***Work-based learning** carried out in partnership with businesses and non-profit organisations should become a feature of all initial VET courses*" and that "*Participating countries should support the development of apprenticeship-type training and raise awareness of this*".

Watch the [following video](#) about *Laying the table for four* (created by VET students of the Hansági Ferenc Vocational School, Hungary). It will hopefully increase your appetite to try and apply the FC method with your own students:

Are there evidences of effectiveness? - Case studies

Research about the effectiveness of the application of the Flipped Classroom model is not extensive, however data provided by Clintondale High School (in Michigan) demonstrate a considerable impact on learning effectiveness.

There are summary studies that report favourably: "*in one survey of 453 teachers who flipped their classrooms, 67 percent reported increased test scores, with particular benefits for students in advanced placement classes and students with special needs; 80 percent reported improved student attitudes; and 99 percent said they would flip their classrooms again next year* (Flipped Learning Network, 2012)". (Goodwin-Miller 2013)

Hopefully this very course will produce additional cases about its mastery by teachers from various schools in the participating five countries. Until then, this section presents two European case studies of note.

Case Study 1 - Spain

Methodology

This case study took place in the higher education training cycles of the Department of Information Technology and Communications of the School of Architecture, Engineering and Design at the European University of Madrid. In particular, it was applied to the development cycle of multiplatform applications in the Databases module in face-to-face mode. In this case of study, the experience carried out in the 2013-14 course is detailed. This was the second time that the methodology was applied, so there was already some experience from the previous course. The formative unit of programming in PL / SQL databases was chosen as it was content that was quite independent of the rest and more innovative, what was expected to have a positive influence on the student's motivation towards methodological change.

Practical Implementation

One thing that was considered important in order for the student to correctly plan their time from the beginning after the first experience was to plan in detail the application of the methodology. As in e-learning, it was considered essential to give the student all the possible information for the work to be done at home from the beginning. The activity was carried out at the beginning of the third quarter, since the previous year had been held almost at the end of the course and it was detected that the student was more stressed by the proximity of the final exams, which decreased his receptivity. Its duration was 4 weeks, and it was raised as shown in the figure:

SEM	ACCIÓN	TAREAS	PESO
1	8.1 – Introducción PL/SQL		25%
	Test 8.1	Realiza el test (40%)	
	Tarea 8.1	Mostrar resultado (60%)	
2	8.2 – Fundamentos PL/SQL		25%
	Test 8.2	Realiza el test (40%)	
	Tarea 8.2	Mostrar resultado (60%)	
3	8.3 – Cursores PL/SQL		25%
	Test 8.3	Realiza el test (40%)	
	Tarea 8.3	Mostrar resultado (60%)	
4	8.4 – Triggers PL/SQL		25%
	Test 8.4	Realiza el test (40%)	
	Tarea 8.4	Mostrar resultado (60%)	

Source: (Camacho Ortega, 2014)

One of the points that wanted to avoid with the proposed evaluation was that the student did not study the material prepared by the teacher before going to the classroom to practice. This aspect was approached with the creation of a test that was required to pass if you wanted to access the practical part.

The dynamic that was followed was as follows:

- The students had a week to watch each of the videos. During that week, the student had at his disposal a forum of questions, where he could communicate with the teacher and the rest of his classmates.
- On the first day each of the weeks the test was done in class, to check that the contents had been assimilated correctly. Only students who passed the test would access the score of the practical part. Students who did not pass the test had a second chance to try to get a better score in that part.
- The practices were carried out and delivered in class. Those students who had passed the test on the first attempt, performed the practical part in groups freely chosen by them. The practical part counted two thirds of the note of each block.

The tools used were the following:

- For the access to the training module with its contents, videos, questionnaires, communication forums, the Moodle virtual educational platform was used as it was used as the Virtual Campus of the European University.
- For the elaboration of the theoretical contents, the Microsoft Office presentation creation software was used.
- Camtasia Studio software was used to record, edit and voice the videos.
- Youtube.com was used to share the videos.

Results

In relation to the results, the students' grades have been higher than other training units with traditional methodology. Specifically, on a sample of 17 students, the results shown in Figure 3 were obtained, where the comparison with the average of the complete course can be seen.

Figura 3 –> Notas de los alumnos (Flipped Classroom)   –> Notas de los alumnos (Media del curso)

Figura 4 – Flipped Classroom

Source: (Camacho Ortega, 2014)

In addition, students were given a satisfaction questionnaire with the methodology with 11 questions to evaluate between 1 and 4 points. The questions addressed topics about the activities carried out at home and in the classroom, the materials, whether they like them more or not compared to the traditional method, the complexity of the unit using the methodology, the teacher's role, etc. As can be seen in the figure, satisfaction was very high.

Detailed information on this experience can be found in (Camacho Ortega, 2014).

Case Study 2 - Hungary

This experiment took place in a secondary vocational school (Central Hungarian Regional Agricultural Vocational Training Center - FM KASZK - Táncsics Mihály Agricultural Technical School, Vác) in January 2016. Participants were aged 17-18 were in the 4th grade at school, and covered the topic of Globalization, as part of their Social Studies curriculum.

Methodology

Globalisation as a topic is generally familiar to most students, as they can come across it in films and news reports. A specific and distinct course book for Social Studies did not exist, but this **topic** is **covered** in the relevant chapters of the **History course book** that students use. The text, however, is not particularly motivating for the students, partly because it is poorly supported with captivating images and graphic illustrations, so many students subsequently lack an interest in the subject. Though the underlying topic is important, the text for this course does not enthuse students. Fortunately, many **good videos are available** on the internet to alleviate this problem.

This experiment focused on studying the results and effectiveness of **two different teaching methods** for this topic – the FC model and a traditional one.

Practical Implementation

The two groups were separated into two different physical classrooms, with the students being instructed by two different teaching methods. For both, the topic for the next day was revealed on the day before and the students told that their knowledge would be tested by a set of questions.

The students of the **FC Group** met in the IT classroom – not the normal venue for their Social Studies class. However, on the previous day these students were asked to find and **watch a video** on the internet, focus on its keywords, and be prepared to take a test on the topic. At the beginning of the lesson the aim of the video was emphasized again, and students given 20 minutes to make further inquiries on an individual basis on the net. When tested, the group was given a limited time - of 20 minutes – to answer all questions.

The other group had a 30-minute lesson using a **traditional frontal teaching** model and learning environment. They were given less time for the test (15 minutes), but consequently they had fewer questions to answer. In addition to the teacher's classroom explanation they could make use of their history course book to analyse and interpret its pictures and illustrations. Due to the lack of time given they could not take notes or make an outline of the lesson.

With the FC Group a slightly modified version of the flipped classroom was applied: voluntary students were to watch an eighteen-minute **video** about globalisation **at home** before the lesson. This modification was deemed to be reasonable as not all Secondary VET students necessarily have access

to ICT tools or the internet outside of the school. Another reason for changing the method slightly was down the very low level of student motivation.

The lessons took place as follows.

- The FC Group students were seated in the IT classroom, each at a desk with a PC. After distributing the test sheets the students had 20 minutes to do individual research on the internet. Some students elected to finding the relevant information by only reading, others took notes in their exercise books. After switching off the computers they had 25 minutes to answer 10 questions in the test.

- The control Group was taught by traditional teaching methods. Students were asked to write down the title of the topic (Globalisation) then, with the help of the teacher's explanations and through discussion, they started to familiarise themselves with this topic in the curriculum. The students were asked to take notes individually and pay particular attention to the keywords. Specific attempts were made to break the monotony of the lesson – to maintain student attention - by detailed explanation of the pictures and graphic illustrations. At the end of the 30-minute lesson the students took a 15-minute test. Since they had less time than the other group, they were given only eight questions.

Results

The two tables below show a **significant difference** in the results of the students instructed by traditional, frontal teaching and of the ones instructed by a flipped classroom method. The latter were more successful in tasks which required previous knowledge (Task 2: local problems, Task3: multinational companies, Task 4: drawbacks of globalisation). Individually, without the help of the course book or pre-studying, the former were unable to figure out important keywords and phrases.

Group 2 (traditional frontal teaching method)

Number of task	1.	2.	3.	4	5.	6.	7.	8.	Total score
Total available scores per task	2	2	2	5	4	2	2	2	21 points
Total score of all students per task	20	20	20	50	40	20	20	20	210 points
Student 1	0	0	0	0	0	0	0	0	0 points
Student 2	0	1	0	3	0	0	0	0	4 points
Student 3	0	1	0	4	0	0	0	0	5 points
Student 4	0	1	0	4	0	0	0	0	5 points
Student 5	0	1	0	4	0	0	0	0	5 points
Student 6	1	0	2	1	0	2	0	0	6 points
Student 7	1	2	2	3	0	1	0	0	9 points
Student 8	1	2	2	2	2	1	2	0	12 points
Student 9	1	2	2	3	2	1	2	0	13 points
Student 10	1	2	2	3	2	1	2	1	14 points
Total	5	12	10	27	6	6	6	1	73 points
Percentage	25%	60%	50%	54%	15%	30%	30%	5%	**34 %**

Group 1 (flipped classroom method)

Number of task	1.	2.	3.	4	5.	6.	7.	8.	9.	10.	Total score
Total available scores per task	4	4	2	3	2	5	4	2	2	2	30 points
Total score of all students per task	56	56	28	42	28	70	56	28	28	28	420 points
Student 1	1	1	1	0	0	1	0	1	0	0	5 points
Student 2	1	1	1	0	2	4	2	0	0	0	11 points
Student 3	1	1	1	0	0	4	1	1	2	2	13 points
Student 4	0	0	2	2	0	4	0	1	2	2	13 points
Student 5	1	2	2	0	2	5	0	1	1	0	14 points
Student 6	1	3	2	1	0	4	2	1	1	0	15 points
Student 7	2	1	2	1	1	5	1	1	1	0	15 points
Student 8	2	1	2	1	2	5	1	0	1	0	15 points
Student 9	2	1	1	2	2	5	1	1	1	0	16 points
Student 10	1	0	2	1	0	5	2	1	2	2	16points
Student 11	2	1	2	2	2	4	2	0	2	0	17 points
Student 12	2	1	2	2	1	5	3	1	0	0	17 points
Student 13	1	1	2	1	2	4	2	1	2	2	18 points
Student 14	1	1	2	0	2	5	4	2	1	2	20 points
Total	18	15	24	13	16	60	21	12	16	10	205 points
Percentage	32	26	85	30	57	85	37	42	57	35	**48 %**

In the case of IT-supported learning there was not a huge difference among the tasks. If a concept or phenomenon was unknown, the students could easily check its meaning on the internet and remember it more efficiently from **their research** than from the teacher's explanation.

Thus **visualisation** seems to help with memorising information. Students could remember the drawbacks of globalisation more successfully, since they were discussed in detail by the lecturer in the video and emphasized with relevant **images**.

Case Study 3 - Czech Republic

A pedagogical experiment was conducted from September 2013 to January 2014 in the Czech Republic, with the main focus being the Flipped Classroom model in the teaching of mathematics at upper primary school level.

Methodology

The project focused on the application of a flipped teaching method, with students learning basic chapters of mathematics through animated video.

The aim of the research project was to implement training through using of the flipped classroom model and to find out whether the animated video used can help to increase students' academic performance.
The research involved 54 pupils - 27 of them in a control group and 27 in an experimental group. The average age of students was 13.5 years.

higher achievement rate
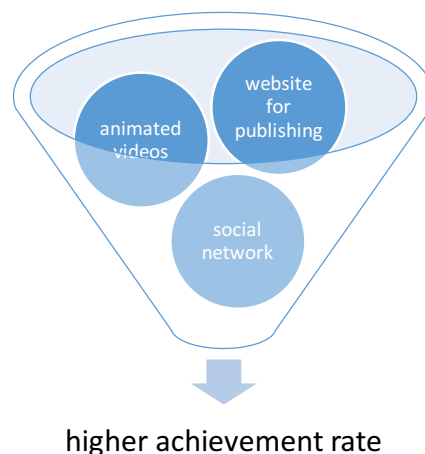
Practical Implementation

A long term, classical pedagogical experiment was used to verify the effectiveness of the animated video created for the experiment. The **control group** of pupils (one class) progressed through **traditional teaching methods** - presenting new topics during school lessons. The **experimental group** (one class of the same school year) had an animated video at their disposal, specifically created for the purpose of the experiment.

Websites (prevracenatrida.cz) were created for the **distribution of the educational videos**. Pupils were informed about the nature and intent of the flipped classroom teaching model, then studied the animated videos during their home preparation. Each student was assigned a login name and

password, and given the opportunity to comment on each video and to discuss problematic parts of the subject matter on the **social networks**. Brief summaries of the topics and explanations of the problematic parts were given in classes. The emphasis was placed on independent work and on the enlarging and deepening of the students' knowledge.

At the start of the experiment both the control and the experimental group undertook a didactic test (**pre-test**). At the halfway point of the experiment the students undertook a **mid-test**, and at the end of the experiment both the groups then undertook a final didactical test (**post-test**). The researcher (a math teacher for the experimental group) created twenty-five educational videos that covered the first half of the eighth-grade mathematics curriculum. At the end of the pedagogical experiment, students of the experimental group filled out a simple questionnaire, consisting of three closed questions. The questionnaire was chosen to give rapid feedback from pupils about the new method.

Results

The final conclusion of the pedagogical experiment was that the **performance of students in mathematics was significantly higher** in the student group where Flipped Classroom methods were introduced.

"*After evaluating the long term pedagogical experiment we can conclude, that there was* ***significant difference in achievement*** *(evaluated based on post-test) between pupils of experimental and control groups in the selected thematic unit of mathematics. Flipped classroom method, when students are studying a new educational material using educational animated videos, did significantly affect academic performance of students. Creative videos were evaluated positively. We assumed that the new method of teaching pupils interested, especially because the use of modern technology. Which was confirmed.*"
(Špilka R., Maněnová M., 2014).

CHAPTER 2. DEVELOPING CONTENT

How can one develop content to use in the flipped classroom?

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Now you have an overview about how the Flipped Classroom method developed, what the benefits of this model are. You have even developed a first idea about applying the method in your own teaching practice.

OK, the method seems to be great, but **how can we implement it**? Where can we find videos? How can we create our own videos?

It is now time to get familiar with the tools technology offers to support the teaching / learning process, especially if we flip the classroom.

In this section we are **BUILDING**. We show you a selection of applications that help you motivate your students, create digital learning objects for them that match their learning styles and involve them actively in the learning process.

There are two ways of proceeding. Once you decided about the age group and topic for your flipped lesson, you can either:

Look for materials online and **RE-USE** what have been prepared by other teachers.

There are a substantial amount of Open Educational Resources available on the net. We are going to guide you through some platforms where you can find valuable learning materials.

CREATE materials on your own.

There are an infinite number of applications you can use when creating digital material for your classes. We tested and selected the ones that we think are easy to learn and use, and are of great help from a pedagogical point of view.

OR

We also refer you to websites that offer OER in different categories, to help you find your way.

We prepared tutorials for key applications and we always give you advice on the pedagogical side as well, based on our own teaching experience.

Once you collected or created the content for your lesson, you need to make it accessible for your students. To assist you in this process, we are going to suggest some ways for **PUBLISHING** learning materials.

Here we will talk about how to make sure that you can re-use a material respecting the rights of the author. It is equally important when you are the author – you will have to specify what rights you want to keep when publishing your content.

2.1.   The idea of openness or free access

"To open" or "to close"? Shall we facilitate and encourage access to resources – to land, to water, to medicine, to information, to ideas, ... - or shall we limit it to protect legitimate interests, ownership rights, patents, the right to privacy, the ownership of an idea? It is an old story that acquires new and different aspects in the digital and globalised world.

Let's think, on the contrary, of the possibility that anyone, who has a computer and internet access, can make gigabytes of music, texts, films and programmes available to everyone without geographical, time and economic constraints apart from connection costs. Just not to mention the possibility that everyone can publish their own ideas, their own photographs, their own films and make them available to everyone. (Pierfranco Ravotto).

"If you have an apple, and I have an apple and we exchange apples, you and I will still have an apple. But if you have an idea and I have an idea and we exchange these ideas, each of us will have two ideas."

George Bernard Shaw

Definition: "Open educational resources are **digitized materials offered freely and openly** for educators, students and self-learners to use and reuse for teaching, learning and research."

The end-user should be able not only to use or read the resource but also **to adapt it, build upon it** and thereby **reuse it**, given that the original creator is attributed for her work. (OECD/CERI)

2.2. Opening up Education

As a part of the Digital Agenda for Europe "**Opening up Education**" initiative focuses on three main areas:

- Creating opportunities for organizations, teachers and learners to innovate;

- Increased use of Open Educational Resources (OER), ensuring that educational materials produced with public funding are available to all; and

- Better ICT infrastructure and connectivity in schools.

"The education landscape is changing dramatically, from school to university and beyond: open technology-based education will soon be a 'must have', not just a 'good-to-have', for all ages. We need to do more to ensure that young people especially are equipped with the digital skills they need for their future. It's not enough to understand how to use an app or program; we need youngsters who can create their own programs. Opening up Education is about opening minds to new learning methods so that our people are more employable, creative, innovative and entrepreneurial,"

(Androulla Vassiliou, Commissioner for Education, Culture, Multilingualism and Youth, 2013)

2.3.   Online Educational Repositories

Educational repositories are online libraries for storing, managing, and sharing digital learning resources. The learning resource can be a quiz, a presentation, an image, a video, or any other kind of document or file or learning materials for educational use.

For publishing learning element to a repository, the owner of the objects has to provide metadata to classify and organize the learning elements and make them easily searchable for others. The learning materials can be classified according to their pedagogical aims. Usually the registered users can also review and rate the learning materials in order to ensure their quality and pedagogical value.

Below, we will briefly present some of the most important ones for their usefulness in selecting educational resources for sessions outside the classroom. There are many more online educational repositories and this is not intended to be an exhaustive guide, but to give a general idea of some of them to make them known as a useful tool to prepare the material for sessions outside the classroom.

2.3.1.   OpenLearn

Source: http://www.open.edu/openlearn/
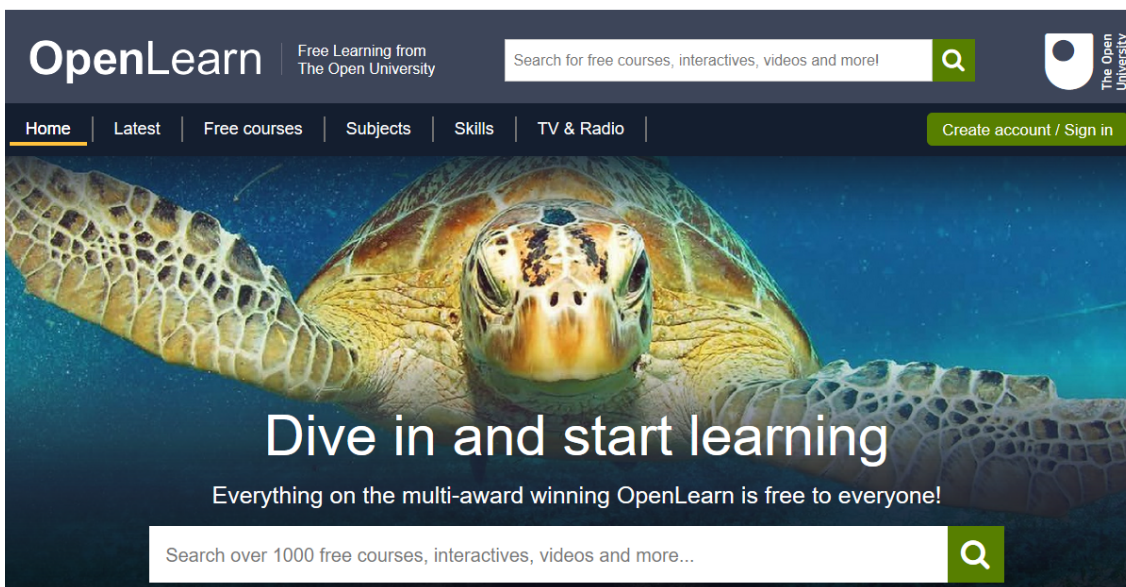
For a start you can visit The Open University's (UK) website, with hundreds of free and open educational resources for learners and educators.

The resources are from several subjects: Arts and History, Business and Management, Education, Health and Lifestyle, IT and Computing, Mathematics and Statistics, Modern Languages, Science and Nature, Society, Study Skills, and Technology!

2.3.2. Merlot

The Merlot Multimedia Educational Resource for Learning and Online Teaching is one of the major international repositories. MERLOT is a program of the California State University, in partnership with higher education institutions, professional societies, and industry.

2.3.3. LRE - Learning Resource Exchange

The Learning Resource Exchange (LRE) from European Schoolnet (EUN) is a service that enables schools to find educational content from many different countries and providers. The evolution of the LRE has been supported by Ministries of Education in Europe and a number of European Commission funded projects such as ASPECT, CELEBRATE, CALIBRATE and MELT. Anyone is able to browse content in the LRE repositories and teachers that register can also use LRE social tagging tools, rate LRE content, save their favourite resources and share links to these resources with their friends and colleagues.

2.3.4. TED Ed

This award-winning education platform serves millions of teachers and students around the world every week.

2.3.5. OER Commons

It is a teaching and learning network of shared materials, from K-12 through college, from algebra to zoology, open to everyone.

Source: https://www.oercommons.org/.

2.3.6. Teachers Pay Teachers

Teachers Pay Teachers (TpT) is a community of millions of educators who come together to share their work, their insights, and their inspiration with one another. TpT is an open marketplace where teachers share, sell, and buy original educational resources. In order to support an effective search among the hundreds of learning elements, the authors have to fill out several metadata (like age group, subject, teaching goals, etc.) in accordance with the pedagogical aim of the content.

Source: https://www.teacherspayteachers.com

2.3.7. TELU

TELU is a collection of free online micro-learning courses ("Micro-Lessons") designed to help busy educators use technology to support their teaching and learning

Source: http://telu.me/

2.3.8. Open Professionals Education Network

nother useful guide when looking for an OER is offered by the Open Professionals Education Network. In their portal they have compiled and classified by type (images, videos, audios, etc.) different sites that offer REA.

For example, If we look for images in a given topic, then we can choose Photo/Image Search, and we can access a list of webpages where we can browse

2.3 Flickr

flickr from YAHOO!

Flickr

2.4 Google Images

Google images

Google Images
Be sure to scroll down in adv
If you want content for comm

2.5 Pixabay

pixabay

Pixabay
Note, that Pixabay images ar
the original author. While Pix
professional images Pixabay

2.6 Open Clip Art Library

Open Clip Art Library

Open Clip Art Library
Note, that Open Clip Art Libra
attribution to the original auth

Source: https://open4us.org/find-oer/

In turn, if we click, for example, in the link Google Images guides us to a page where we can perform a detailed search, based on keywords, image size or even color, similar to the one shown below:

Google

Búsqueda avanzada de imágenes

Mostrar imágenes que contengan...

		Para hacer esto en el cuadro de búsqueda
todas estas palabras:		Ingresa las palabras importantes: Escarcha invernal .
esta palabra o frase exactas:		Ingresa las palabras exactas entre comillas: "Flor de escarcha" .
cualquiera de estas palabras:		Ingresa O entre las palabras que desees: Árboles OR yuyos OR hierbas .
ninguna de estas palabras:		Ingresa un signo menos justo delante de las palabras que no deseas que aparezcan: -Ventanas .

Luego restringe tus resultados por...

tamaño de imagen:	Cualquier tamaño ▼	Busca imágenes del tamaño que necesites.
proporción	Cualquier proporción ▼	Especifica la forma de las imágenes.
colores de la imagen:	● cualquier color ○ a todo color ○ blanco y negro ○ transparentes ○ este color:	Busca imágenes con tus colores preferidos.

2.4.   Creative Commons

Creative Commons (CC) is a non-profit organization, founded in 2001 and aimed at defining the spectrum of possibilities between full copyright - all rights reserved - and the public domain - no rights reserved. The CC licenses help to keep the copyright while inviting certain uses of the work of the author - a "some rights reserved" copyright.

Source: Creative Commons (https://creativecommons.org/)

The Creative Commons platform (https://creativecommons.org) provides an easy-to-use tool to help sharing contents under one of the standard CC licenses. Following the steps after clicking "Share your work", we can decide the level of permissions for further use of our creative work, by answering questions like: "Allow commercial uses of your work?". At the end of the process we can download a digital picture of the selected license, or can make a copy of the code, what can be embedded into **any web-based publication**.

CC Search, the Creative Commons search tool, lets you pick a range of general sources and media types which you want to search for. The CC Search tool automatically filters your search to find Creative Commons licensed resources that you can share, use, and remix.

Source: Creative Commons (https://creativecommons.org/)

2.4.1.   CC License Types

The types of CC licenses that exist are:

Name	Description

CC BY recognition	This license allows others to distribute, mix, adjust and build from their work, even for commercial purposes, provided that the authorship of the original creation is recognized. This is the most helpful license offered. Recommended for maximum dissemination and use of the materials subject to the license.
Equal Recognition-Share - CC BY-SA	This license allows others to remix, modify and develop your work even for commercial purposes, as long as they credit you and license their new works under the same terms. This license is often compared to "copyleft" licenses and "open source" software licenses. Any new work based on yours will be under the same license, so any derivative work will also allow its commercial use. This license is the one used by Wikipedia and is recommended for those materials that may benefit from the incorporation of content from Wiikipedia or other licensed projects in the same way.
Recognition-No Derivative Works - CC BY-ND	This license allows redistribution, commercial and non-commercial, as long as the work is not modified and transmitted in its entirety, recognizing its authorship.
Recognition - Non-Commercial - CC BY-NC	This license allows others to intermingle, adjust and build from their work for non-commercial purposes, and although in their new creations they should recognize its authorship and can not be used commercially, they do not have to be under a license with the same terms
Recognition - Non-Commercial - Share Equal - CC BY-NC-SA	This license allows others to intermingle, adjust and build from their work for non-commercial purposes, as long as they recognize the authorship and their new creations are under a license with the same terms.
Recognition - Non-Commercial - No Derivative Works - CC BY-NC-ND	This license is the most restrictive of the six main licenses, it only allows others to download the works and share them with other people, as long as their authorship is acknowledged, but they can not be changed in any way nor can they be used commercially.

Digital content creation

For teachers, the mastering of a new method is always accompanied by a lot of planning and reasoning activities. Breaking away from our habits, trying something completely new means leaving our own comfort zone and what¢s more students are not always enthusiastic about changes either.

At the same time being teachers, parents (and back in time we were students ourselves) we all feel an intrinsic need for change. Change in the pedagogical thinking, in the process of teaching-learning and in the theory of teaching (didactics). It is necessary to analyse and recreate our frameworks of teaching, considering either new aspects, or ones that have been ignored for a long a time. It all seems to be easy, but just until we dive into the job.

The methodology of flipped classroom is an excellent example of the above. It is a great opportunity with lots of positive outcomes - and so we talk about change and methodological re-birth requiring a lot of work and energy that is beyond imagination. Even though we try to provide as much help as possible, everybody has to find his/her own way. This tutorial summarizes the experiences of a 6-months test usage of the flipped classroom method, showing you the paths to avoid and the directions that are worth taking.

Being part of the module about ICT devices, this learning material is divided into 4 major units and it focuses on the production of video tutorials. Within the first two sections we deal with planning and technical implementation, while the other two parts contain more than practical advice only: we look at the possibilities of motivation and of planning the next classroom lesson. As the latter two have a very strong effect on the process of video making, we keep referring to them along the way.

Throughout the sections we wanted to give examples for tutorials, so the written guidelines are complemented by 2-6 minutes long videos. The content of the videos and the guidelines are not the same, so in order to acquire a complex knowledge, it is recommended to use them together. The text of the videos can be found at the end of each section..

2.5.   The principles of selecting the learning content

The selection of learning materials is a fundamental challenge for teachers to ensure that the most suitable topics are presented to students. In the introductory phase of the Flipped classroom methodology this task becomes even more challenging as only the "essentials of the essentials" should be integrated into the videos. This requires a reconsideration of lessons from a new aspect: what parts of the learning content can my students assimilate without my personal presence, and for which elements do they need my assistance?

On the other hand, the production of a video expands our possibilities: we can insert links, add extra scientific literature for those students who would like to deal with the subject in more detail. We can bring the subject closer to today¢s students with visual and hypertext thinking if we use images and animations in our explanations.

2.6. Technical arrangements

Having selected the appropriate learning content, it is worth preparing a script, in which we can note down what and how we want to show and explain in the video. Of course later on we do not need to stick to this draft, however thinking over the process beforehand will make our job easier. Just like we do with when planning a lesson, we plan how much time will be dedicated to the different sections in our video and we also consider other supplementary materials (images, ready-made videos – e.g. when we want to present an experiment in Physics or Chemistry, infographics, diagrams etc.) If we collect and prepare supplementary materials, our work will be easier and the time taken by producing the video will be shorter.

We will need good quality software for recording the soundtrack and the screens, plus a video maker. We can find several free downloadable versions, including but not limited to Screencast-o-matic, CaptureCast or Jing are good for screen recording, all of these are capable of recording sound and webcam images. It is worth checking if the video made by the programme will be compatible with the video cutter (or with the site for sharing videos). If it is not compatible and we still stick to using that special programme for some reason, we will need a good converter as well, such as Freemake Video Converter. Alternatively, we can record screens and sound with the OfficeMix application downloadable to PowerPoint. Animations can be created by Powtoon or Biteable, and MovieMaker is a good choice for cutting videos.

The process of making videos is quite lengthy (especially at the beginning, without much experience) so all preparatory steps we take will save us time. For this reason it is strongly advisable to take the planning phase as seriously as possible in order to make our own work less difficult.

2.7. Motivation

Someone who is new to the flipped classroom method, will soon raise the question: what if students do not watch the video? Why would they watch and learn about the topic before class if in many cases they are unable to do it even after class? We are well aware of the seriousness of this situation, so in the flipped classroom we have to put more emphasis on motivating student than ever before, otherwise the system collapses.

In the first period, when we are familiarizing ourselves with the method, it is very important to be patient. As Tibor Prievara noted when introducing another radically new pedagogical point of view: we should avoid thinking: "Just because I felt that I needed a change, I immediately expect the student to change with me. Especially when I reorganise the curriculum based on (in my opinion) completely new, modern pedagogical principles." It will be difficult not to make this mistake, because the more enthusiastic we are and the more energy we put into the establishment of the method, the more difficult it is to accept that students will be able to change direction only with the speed of an ocean liner.

It is important to know the students personally in order to successfully get them adapted to the modified working conditions during the transition period. I will give you some advice on this in the video, but I want to add here that it is worth reflecting on our own learning process because the method is new for us as well. A lot will depend on how enthusiastic and motivated the teacher is about the new method: sometimes a determined teacher is motivating enough for the students to invest extra energy in trying something new. "To sum up: only in small steps, patiently, without getting discouraged by the lack of immediate positive reinforcement, constantly communicating with the students, asking for and listening to their opinion, can we move forward step by step in the process."

Remember that, even if you have to make an effort to motivate the students, it always has its reward and, even though it is a difficult task, it is finally achieved and worthwhile. In the following chart you can see some of the reflections on the application of the method that teachers who participated in the course of Flipped Classroom within the framework of the European project in the course 2017-2018, once they applied the method in their classes.

"I think that with FC learning is consolidated more and increases the level of motivation of students, who participate, work as a team and become more involved in the learning process." Professor of emotional intelligence, primary education and ESO, Madrid.

"In favor of this methodology, I would say that whenever I have applied it, the process has been very enriching regardless of the content that was worked on". Physical education teacher, ESO, baccalaureate and FP, Madrid.

"The main problem we have in its application (FC) is to change all that routine that has been carried out in education in Spain, both by students and by teachers. [...] The learning has been positive since

they (the students) bring a base from home before working on the subject in class and that makes the subsequent learning in the classroom much easier ". Biology teacher, FP, Madrid.

"I am very enthusiastic about this work methodology, as I bet that new technologies are becoming more and more important in the classroom. I had the opportunity to experiment in my master's degree in Vocational Training with FP and I loved the experience, the autonomy that left us, the responsibility and the possibility of self-managing our evolution." Physical education teacher, baccalaureate, Madrid.

2.8.   The classroom lesson

At the beginning of the process, it may seem strange to think about its end, but on second thoughts, it is very important to be aware of the classroom activities already during video editing. From this point of view, it is could happen that explanations in the video will eventually be completely different from what we first imagined. Having an overview about the teaching process in advance, has an effect on the detail of the explanations in the video.

While planning classroom activities, we should take into consideration that this time we have the opportunity to aim at higher cognitive categories, so it is important that students do not only mechanically practice the theoretical material. While designing this, we can consider various aspects, such as the results of ITL 2011 research which identified the 21st century competencies, based on the needs of the labour market. These competencies include ICT usage, self-regulation, knowledge building, collaboration, and problem solving. A desired goal of FC lessons can be the development of these competencies within the framework of the contact lesson. In this way, for instance, when we process an extensive learning content, after thinking it over, we can make 4 short videos, which can be given out to students so that each student gets one video only, assigned by you. After this, during the classroom lesson, students are divided into groups so that within the groups everyone has seen a different video. At first, they teach the content of the different videos to each other, and then they solve a related task together. This way their collaborative and problem-solving skills are developed, as well as at least their cognitive level of usage.

Applications

The FC method is combined with the use of ICT to improve students' motivation, as well as obtain better results with the method. The new teaching methodologies, as well as the new ways of learning of students, require new ways of teaching that facilitate the teaching-learning process. ICTs provide us with these new methodologies.

In this section we are going to present some applications that allow, in a simple way, to create attractive animations, videos and effective presentations without any specific prior knowledge. We will show your benefits, giving some advice on the use and possible application in a FC class. Keep in mind that this is not intended to be an exhaustive list of applications since there is a wide variety of applications, both free and paid, and because they are updated very often. Instead, the goal is to make known some of them and their basic use so you can start using some of them. Once one is used, autonomously you can immerse yourself in the use of similar ones.

2.9. Presentations

2.9.1. Software Applications

Before starting to create a presentation, you should learn some tricks that allow us to create effective presentations. Therefore, we recommend starting with this presentation to get useful tips on how to make your presentations more effective. As you can see, this presentation was created using slides exposed sequentially with the Microsoft PowerPoint program. This program has many possibilities and allows to make effective and attractive presentations. It is recommended to use it in cases where we have to explain something that can be explained using sequential slides. But often in teaching to explain concepts we need to structure thought in a global and non-linear way. To do this, there are other programs such as Prezi that allows you to visualize the whole in the form of a mental map or outline, and then focus on explaining each part of the whole by zooming in on what interests you, for example, a document embedded in your own presentation. The Prezi platform is easy to use, and there are tutorials available to facilitate the task the first few times, plus it allows you to create an educational account with the center's email account.

In addition, Power Point 2016 already incorporates functions to make our presentations with that same structure, so, it is not necessary to change the program, if you do not want it. Although in the line of Prezi, we have the Microsoft Sway program that allows cooperatively create and share online not only presentations and videos, but also interactive reports, personal stories, newsletters, photo albums, etc. Presentations are created directly in the cloud, which makes it easy to share them and work collaboratively on them. It is designed to make more narrative presentations and share content on social networks, and therefore, it is more appropriate to create lessons for our students, rather than to make effective presentations, such as Power Point and Prezi. Using Sway it will not take you long to create an attractive presentation that can be easily shared without registering on the Internet, or downloading anything. The program is free with a Microsoft account. You can access more design elements and content types if you use it as part of an Office 365 subscription. To begin using it, you must register at https://sway.com/. On the website you have tutorials available to learn how to use it.

2.9.2. Educational Uses

We can create attractive and effective presentations and record ourselves explaining them so that our students see the video as previous work outside the classroom. But we can also create more narrative presentations and share them with our students so they can study the content or use it to make their own presentation effective working even collaboratively. In that way, we will have a way to evaluate if they understood the learning material and we give them the opportunity to learn how to synthesize content and communicate it if, in addition, we ask them to videotape the exposure.

2.10. Videos, images and animations

2.10.1. Software Applications

If you have a slide show, you can use it to create a video, for example, using the Animoto application. You can also create it using open images from the Internet, or upload your own images or videos. In addition, you can add your own music or use the one offered by the program.

In addition, there are many programs to create simple videos, one of them is Biteable (https://biteable.com/). With Biteable you can create a video from a previously selected template, or choose between different styles, both animated and photographic scenes, and then add your content (text, photos, colors, sounds).

Source: https://biteable.com/

Another application is Powtoon (http://www.powtoon.com/) which is online and allows you to easily create animations for any subject. These short animations help motivate students and increase their interest in a specific topic. We all know that the content of the messages has a great influence, it is easy to remember them. If we combine images, illustrations or even simple icons with our own thinking, it is easier to memorize and process information. The reason for this is that our visual memory is stronger; we are less effective at remembering the speech or the written text. Animation is much more than showing images one after another, so it is really suitable for the visual storytelling of stories. Students understand these messages more easily and are more likely to react positively to a more humane way of transferring messages. The stories activate the brain, so they will not really understand, but they will be able to "experience" the learning material, which will attract their attention.

The process of creating an animation consists of 5 steps: planning, adding the soundtrack, adding visual effects, checking and publishing. On the website of the application there are tutorials to learn its use.

We also have applications that allow us to capture our screen, such as Screencast-o-matic. This can be very useful when we need to show how something works on our computer.

Source: https://screencast-o-matic.com
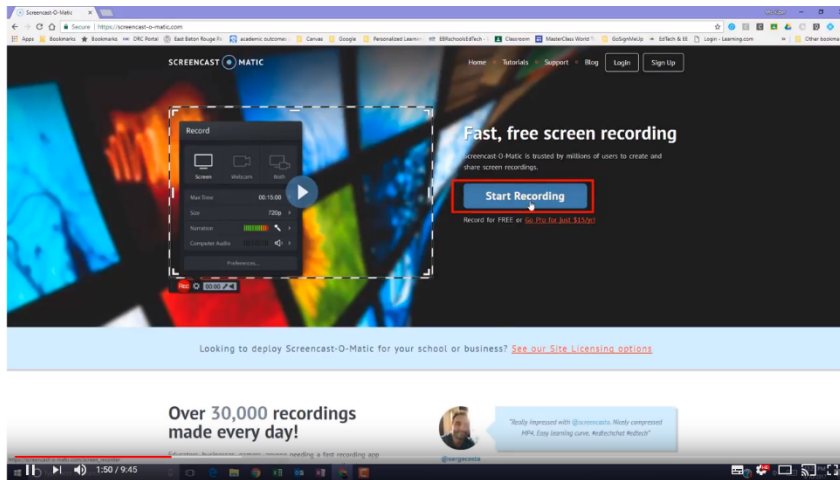
Another useful tool especially when drawing is required is the graphic or digitizing tablet. With the help of this tool, we can enter data directly into the computer as if we were writing or drawing on a sheet of paper. It is a tablet in which the user writes, draws or paints using a special pen with the advantage that the price is not as high as that of a Tablet with "capacitive" pencil. To use it we do not need chalk or markers. It is also practical to create a lesson, since we can easily create videos with it, and we can involve the students more, if we share it in the classroom with them. In order to use the tablet correctly, we need to be familiar with one of the many drawing programs available, which can be downloaded for free from the Internet, such as Wacom Intuos Art and the GIMP drawing program, both easy to use.

Once the video is created there are also many free programs to edit it. One of them is DaVinci Resolve that allows us to edit a video that we have previously recorded ourselves. We can add sound and insert subtitles as well.
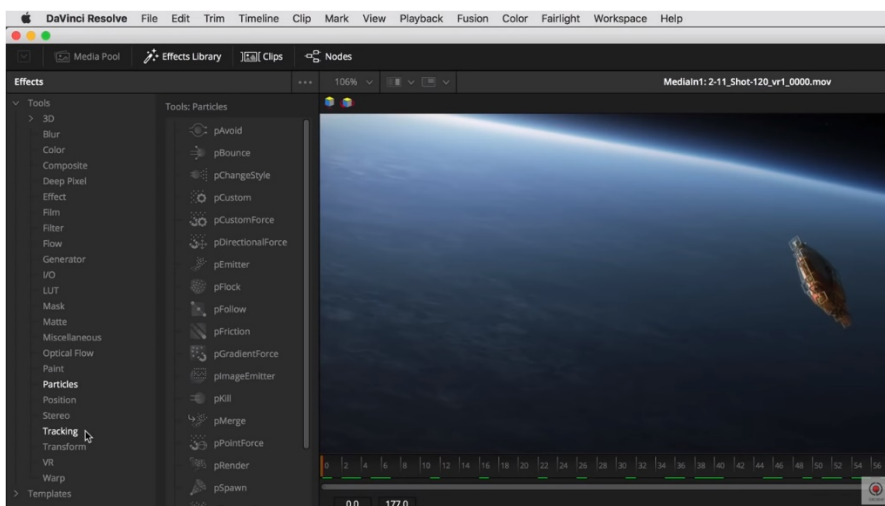
2.10.2. Educational Uses

Videos are an essential tool for the session outside the classroom. They allow us to present our students with the contents to work on the subject in a similar way as we would in class. It is important that the videos are short and that we select the appropriate format according to the learning objectives. For example, it is not the same to teach students to use software or do something on the computer (for which we will use screen capture software), than to present them with theoretical content (for which we can use a video presenting such content). using, or not, a background presentation that helps them follow it better). Our sustained attention in a video is usually about 10 minutes, therefore, it is not recommended to make videos with a longer duration. Therefore, it is recommended to divide the theme into blocks and make different videos of no more than 10 minutes on each of them, always trying to deal with a different theme in each block. The most difficult task here is to synthesize the content in that time, although surely we will already have experience in it since in slide shows something similar happens. If not, we can start to create our videos based on the presentations made in which we have previously synthesized the information.

We can also accompany the videos of other materials so that the students have a complete material.

2.11. Mental and conceptual maps

Conceptual maps focus on concepts and how they relate to each other, taking a hierarchical structure from the most general to the particular, using connectors. Mental maps consist of taking concepts or ideas of a theme and relating them visually. These maps can be created with different learning objectives, for example: to brainstorm in relation to a topic, synthesize the main points to learn a topic, or even while analyzing a video. When creating an online map the procedure is the same as when it is done in paper format. We select the main points and categorize conceptual categories in connection, and add subcategories. The difference is in the mobility of the online format. On the one hand, the workspace is infinite, and we can quickly navigate and exchange spaces between concepts if we change our mind while, in the paper format, this is done through a large number of lines that connect nodes or concepts.

2.11.1. Software Applications

With the bubbl.us tool, we can modify the colors and sizes of the nodes, which helps the implicit connection between thoughts. In addition to the hierarchical relationships, we can also mark different connections. In this case, the system uses different arrows between the concepts to indicate that there is a connection, but not an obvious link.

This resource gives us an opportunity for the visual construction of the online map without registration. It allows us to change its design by clicking on the DESIGN button and we can also attach links to concepts. When finished, it allows us to share the complete map or download it in image format. If we register, after logging in, we can save it for later use.

2.11.2. Educational Uses

Online maps can be used for the planning and preparation of an inverted classroom. For example, we can make a map about our planning of the sessions that we are going to devote to making our classroom inverted, connecting the steps to follow to carry it out. We can also use it to brainstorm, or as a script for the video to help us organize the material, as it is a kind of "starting point" that is present all the time, to help carry out the whole process.

Another possible use is for students to be the ones who have to create the map online, for example, the teacher can distribute the videos they have to see in their house prior to the first session, optionally along with a list of terms they should use to guide them. Students must then collect the essential points by extracting them from the video and thereby generate an online map (at home or in the group classroom). Thus, the teacher can use the result to see how far the students understood the work done at home.

2.12. Word clouds

2.12.1. Software applications

Word cloud creation applications can help us visualize information about a topic. To do this, cloud images are created with words, which helps visual memorization and understanding for those students who learn better with visual than verbal methods. There are programs such as WordArt or Wordle, which, after providing words and customizing the result (changing its color, font, size or even its address and form) generate the personalized word cloud on that topic. Also, by providing an Internet address, we do not even have to download the image of the program to create a word cloud, we simply have to paste the image's address. After defining the shapes and words, we can customize everything: size, color, font or even the address, one at a time or each word.

Once we have finished, we can save our work as a static image, or share dynamically online. In the latter case, words can be expanded if the cursor is over the word, which makes it more readable even with smaller letters.

2.12.2. Educational Uses

Word clouds are very good visual aids that can be used in videos and presentations. At the same time, the application is easy and quick to use and can help to summarize the topic after the video. If we ask the students to describe with the most relevant words what they learned we can create collaboratively at the time of the classroom.

2.13. Infographics

In our visual world we sometimes prefer to look at an informative poster, with fewer words, than with a long description on the same subject. For our students, it is the same, so for them to like reading, we should start by providing information in a simpler way. For this, a useful tool may be to use an infographic that shows us the information through images. Using the program is easy, and the possibilities are endless, and we all know the phrase: an image tells you more than a thousand words.

2.13.1. Software Applications

There are different applications that allow us to create attractive infographics such as Visualize, Visme, Infogr.am, Canva, Easel.ly and Piktochart. For example, Piktochart allows you to choose between different templates, but we can also start with a blank "canvas". From the menu on the left we can select the background, the type of letter, the color effect or we can add an image, text or link to our project by simply clicking or dragging. The site works with a large database of images and pre-installed icons, so our infographic can be done in the blink of an eye, but if we can not find the visual object, to express our thoughts, there is a lot of personal storage big where you can upload our own images. Once the project is finished, it can be downloaded individually or in a block, with the latter, we can create and print posters to summarize our project.
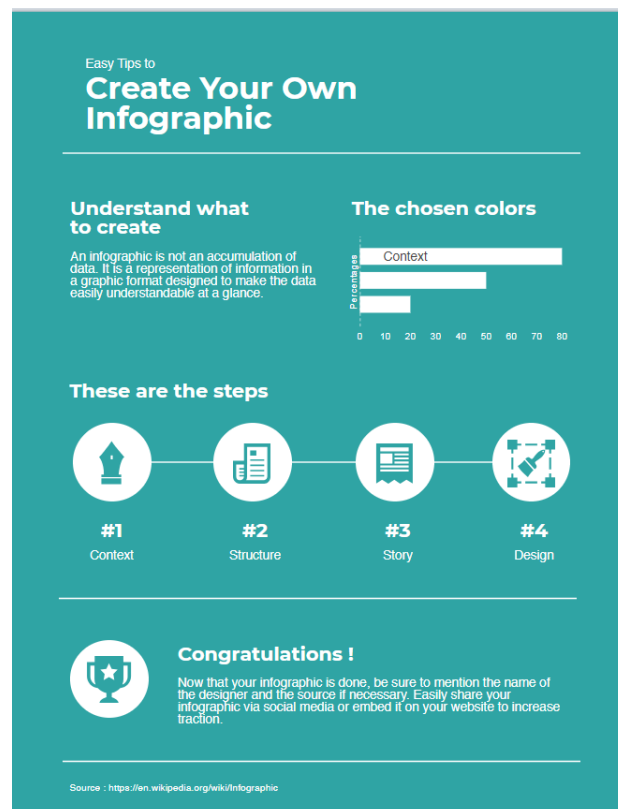
Source: Wikipedia

2.13.2. Educational Uses

Infographics can be a great help for videos: if we summarize the structure of the theme in a graphic, to which we can return during the explanation, students can memorize the material in an easier way with the help of visualization. Conversely, it can be a great test of knowledge and understanding if we ask them to show us in an infographic what they learned from the video. It can help a lot in the systematization: we can show the contents visually from types of words, through units of measure, meteorological elements or historical events.

2.14. Games

The use of games for sessions both outside and inside the classroom can motivate students and make the teaching-learning process more entertaining. In this section, we will treat games as an accompaniment to resources, such as videos or presentations, that is, to allow us to easily gamify them.

2.14.1. Software Applications

A very simple resource to use is LearningApps (www.learningapps.org). There we can find several applications that can motivate students to watch a video or process the information contained in it after viewing it. The page offers customizable games, which help to understand, memorize or verify the mastery of the learning material. We have the opportunity to create activities that serve as a review or to practice what we have learned as crossword puzzles or alphabet soup, just to mention a few.

If we add more applications to a theme, it is advisable to put them in an application matrix (App Matrix), so that students find all the exercises related to a specific topic in one place. On the web you can see many examples for different areas of knowledge that other teachers have created, which can be very helpful when creating our own applications.

A great benefit of this tool is that we do not need to produce all the content ourselves: when tagging we can save public applications in our own collection, so that we can easily create a platform on which our students practice a certain topic.

After logging in, the page also works as a virtual class, so if we do not have an application to share content, we can use this platform for our FC lesson.
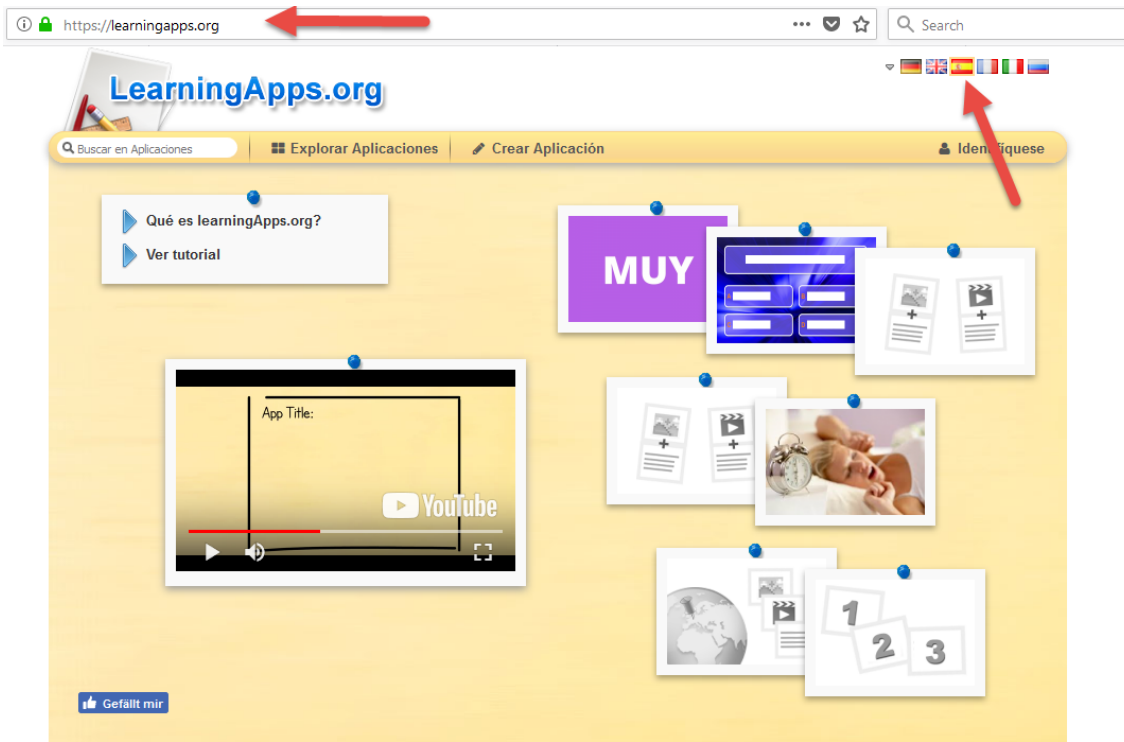
Source: LearningApps.org

There are many tools of this type. Another example is Jigsaw Planet (https://www.jigsawplanet.com/) that offers a quick and easy way to create a puzzle from our own image. It allows us to define the quantity of pieces and the shape of them.
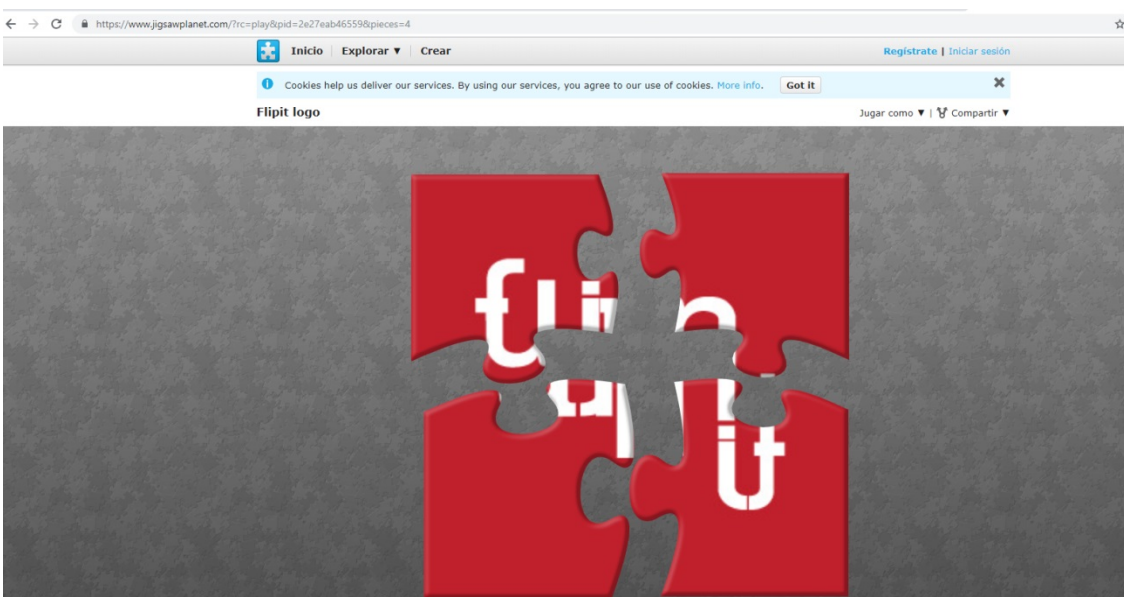
Fuente: Jigsawplanet.com

2.14.2. Educational Uses

We can create games to stop our video and insert questions or games into it, which helps maintain motivation, attention and guarantees understanding. We can also use them to check if the students understood the material.

In addition, students can create applications themselves, which will also help them to deepen their knowledge.

Another option is to create a puzzle from the previously designed infographics using Jigsaw Planet, so that, by putting the pieces together, students will literally have an image on the subject. This helps them become familiar with the relationships during the game, without realizing that they are studying in that process.

2.15. Digital markers

The digital markers or webmixes allow us to collect and organize all the web pages on a subject in question facilitating the subsequent access to them, serving as a starting point for quick access to other applications.

2.15.1. Software Applications

One of these applications is Symbaloo, a digital marker that stores the collected links visually. It can be accessed at http://www.symbaloo.com, where a Webmix is included, on the left side with information about the program and about the first steps to follow.

The program is a digital marker, so we can, for example, create a Webmix related to the Flipped Classroom model, in which to save the videos, articles about the method, curiosities, etc. In addition, we can create it for our own use, or, we can share it. By clicking on "update Webmix", the latest version will always be displayed, so we can edit it, add links or delete them. If we allow comments, we can make those changes based on user comments.

In the top navigation bar, we can find the icon 'Share'. Before we can send it to our students or make it public, we must approve that our Webmix is visible in the internal gallery of Symbaloo. If we approve it, we get a web address, and we can also share our Webmix with a click on Facebook or Twitter.

Once we give our new Webmix a name, by clicking on 'Add', we can start editing. The central part of the Webmix panel is fixed: it is the Google search box, where we can set several filters, so in addition to the usual ones (maps, images, ...) we can navigate between the mosaics or even between the Webmixes of other users .

On any empty block, by clicking on 'Create' we can define the URL of the web page we want to add. We can specify if we want to open it in a separate page (website) or embedded, in which case we can see a video inside the Symbaloo platform.
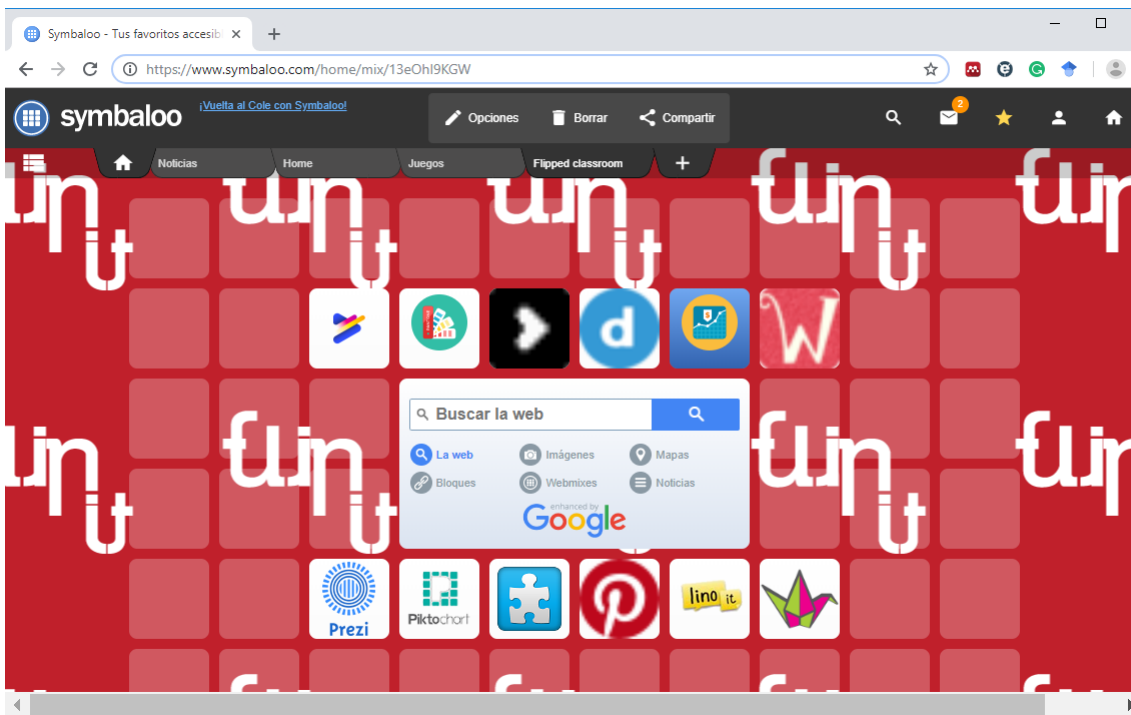
If the system recognizes the web page, it offers a logo and name. We can edit both and we can also make the name appear in the mosaic. We can also change the background color, choose an icon for the logo or upload an image from our computer. Once finished, we can 'Save' the mosaic. You have to be careful as there is no automatic save, if not we must click on the 'Save' button.

If we do not know exactly which web pages to look for when collecting material from a certain topic, it is advisable to use the functions 'Search for a block' and 'Search by category'. When conducting a search, we must provide a keyword, and the program will offer related listings of existing public Webmixes. However, in the 'Search by category' function we have to choose a category first, and then we can select among the blocks that we want to add to our own Webmix..

2.15.2. Educational uses

We can make our work easier by organizing ourselves with the help of this program. For this, we can create Webmixes separately for various topics, where we can collect related websites. In this way, we have everything in one place, we can easily access all the things that connect with the theme: articles, YouTube videos, blogs, events, etc.

The program also offers unlimited possibilities for our students: we can share with them the aforementioned collections, but we can also assign them a task: they must research on the Internet and compile the relevant web pages for the topic discussed.

A Webmix prepared for students helps them to have a clear vision of what is happening. If our students have their own personal web pages or blogs, vlogs, ... with Symbaloo we can put them all in one place with a single click.

2.16. Social networks

2.16.1. Software Applications

Another option similar to that of digital bookmarking is to use the social network Pinterest that allows you to organize images and videos by theme. Pinterest allows you to save the website together with the image, which facilitates the visual search and the systematization of the contents. For example, if we are working on the task of cooking or decorating with our students, it is appropriate to choose Pinterest, since you can manage with a few clicks and save the recipes and ideas next to the image and subtitles. To save the ideas and websites that we like, we must register first. In www.pinterest.es we have to put our email address and password, followed by some other information (username, gender, age).

After registering / logging into the program, you will immediately provide us with help: we have the opportunity to choose between our areas of interest or we can search to find the aspects that we would like to study.
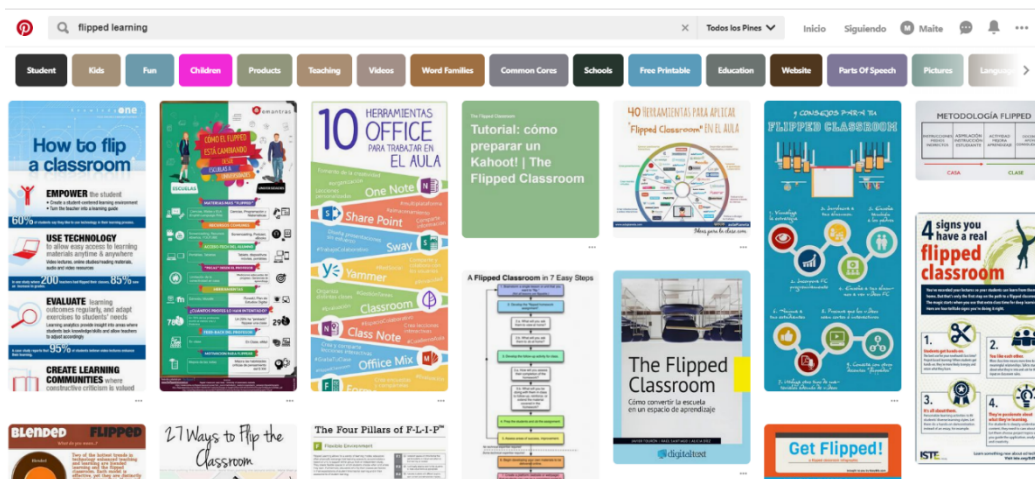
Source: Pinterest.es

If we like some of the pin, we can record it in the following way: by clicking on the image, a "Save" button will appear at the top and the program will ask which board we want to put it on. If we do not have a board created or we are working on a collection on a new theme, the program (at the bottom of the panel) will offer the option to create a new board. At this moment we put the name of the board, and we can also configure it to be visible or hidden, that is, available only to us. We can create subtables, add collaborators to our boards (allows to work in groups), add comments to the pins, etc.

The program also works as a social network, we can receive offers of boards from other people according to our interest, also, if we put a page on one of our boards, the program will offer us additional boards that can also be interesting for us. After registration if we install the application in our browser, when we browse the web we can look for the Pinterest icon or the 'pit it' tag near the image and fix it on the selected board.

2.16.2. Educational Uses

Pinterest can be used in cases where we want to save visual elements grouped around a theme. Even if we are collecting images for a particular class or subject, or simply want to save visual tasks of our students (for example, infographics) in a fixed place, Pinterest will make our work much easier.

We can also request assignments from students where they can cope with the collection of materials on the subject. When searching, we often find tutorials (with step-by-step images) about a particular topic, so it goes beyond a simple collection of images. For example, if we have to create a board in a lesson about the culture of the country, you can find interesting and diverse solutions on Pinterest.

Similar to Symbaloo, we can also use it as a virtual classroom. The configuration of the application makes possible the availability of content for students only from the right moment. For the inverted class, you can expand the material stored on Pinterest: first, we upload the video to the board (for example, via YouTube), and then add the task to the class board. We can also add content to the board through collaborative student work.

2.17. Online brainstorming

The following programs go beyond the opportunities offered by digital markers and provide various functions to facilitate brainstorming, brainstorming, and classroom assessments.

2.17.1. Software Applications

There are different applications with these functionalities, such as Lino and Padlet.

Lino can be considered as an online cork board. The program can be tested without registering, but the registration process does not take long either. It also allows access through existing users in social networks. When accessing the application, we come to an interface where we can see the boards or canvases that we have. We can see the tasks we set for ourselves and we can also verify those of our groups. In the menu bar in the upper right corner, we can modify our settings by clicking on 'Preferences', such as modifying our user name, password, profile image, time zone or application language. We can exit the program by clicking on 'Close session' near 'Preferences'. We also have search possibilities under the menu bar.

The canvases that we created will be found in the "My canvases" section, and here you can create a new one by clicking on "create a new canvas". The new screen must be customized first: giving a name and optionally choosing the background (it can be anything from the cork panel to a solid light background, but if we do not like any of the options, we can load another image by clicking on " upload "an image" menu item.) We must also correct the visibility settings of the canvas, where we can choose between the following three options: only for personal use, anyone can see the notes, or anyone can place a new note on the canvas Later, the configuration can be changed at any time If we want our students to publish on the canvas, but other users do not, it is recommended to create a group and create the canvas within the group. agree to share our canvas among those recommended by Lino on your website.To save the configuration, click on "create canvas"

Loading a canvas, we get a large work surface. The lower left corner of the screen will show the main menu and we can also move to our previous canvases. If the menu bar is annoying, a small arrow on the upper right side will close to a minimum size and we can open it again only if necessary. The 'notes' in the upper right corner allow us to express our opinions, arguments, or ideas by adding text, image or even video. To edit text, we can use the work surface in many ways, and we can choose icons to differentiate or also color. On a shared surface, an unlimited number of users are allowed to work simultaneously, which allows students to comment with their anonymous feedback (feedback), opinions and ideas.
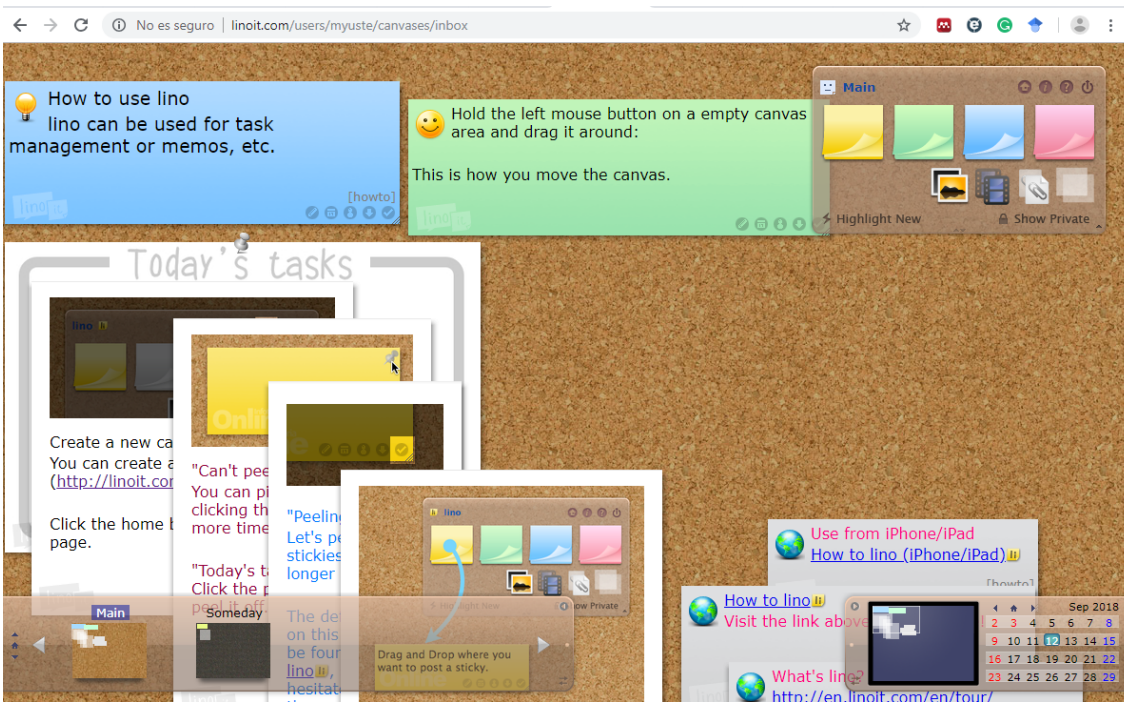
2.17.2. Educational Uses

Both Linolt and Padlet are excellent for online collaboration among students. Similar to the systems used previously, we can use the pages as simple digital markers, which extend with the possibility of recording longer or shorter texts along with the links for those who cooperate with us or visit our cork panel. The boards allow us to launch a brainstorm on a theme, encourage our newly formed group to create rules (which we can save later). Our groups and collaborating students can make introductory photos and videos that can also be uploaded to a "sticky note". The number of options is infinite, we often use the surface in our classes for the evaluation of projects or groups: in this case, the teacher is the one who starts taking notes, writing some questions about the evaluation and also putting his own answers (in separate notes). Then share the board with the students to do the same. An interesting feature of this program is that it maintains the anonymity of the people who write post. If we need to know who writes post (for example, because we rate participation positively), it is enough to ask the students to mention their name when they write the post.

Linolt, due to its wide range of functions, can also be used as a mental map or as a slightly more elaborate and detailed version of a map. We can collect sample videos, tutorials, or we can even use the board to outline a summary on the subject that can be incorporated into the video tutorial. We can also request comments related to the video or anticipate our questions for students to answer after viewing the video. It is recommended not to establish objective questions or data, but open questions about opinions and thoughts. In this way, not only the first enthusiasts can respond. A special advantage of the video is that they can do it without registering, it is enough to share an email code with the students, and their answers sent to this address will be automatically published as notes on the board.

2.18. Online Debates

2.18.1. Software Applications

With respect to online thinking, Tricider goes one step further than Linolt and Padlet.

With your help, you can create debates and voting, and complete them in the virtual space, so in a Flipped Classroom or classroom inverted can be perfect to verify if students have viewed and understood the videos or other resources delivered as a previous task.

We can use this resource without registering, but if we access with our user, we have more options available, so it is worth doing. Tricider's starting point is always a question that will start to start a debate. Students can initiate discussions on their own in the system. After asking the question, we have the opportunity to give an answer, an idea or maybe a thought, in order to guide them in the debate and give them clues when it is blocked, but we can also simply share with the students the website which contains the question.

Students participate online: in the ideas section, they can reveal new aspects of the question and, through arguments, they can react to the ideas of others by writing pros and cons. Finally, they can vote on all the ideas, so that at first glance the teacher can see clearly which idea is the one that the community likes the most. In addition, they can indicate if they like each idea and / or argument individually anonymously, although when they write a comment, they can reveal their name.

2.18.2. Educational Uses

Tricider adapts perfectly to organize debates, and can be an excellent starting point for an inverted classroom class, if in addition to watching the video we ask for a reaction in Tricider by the students.

From home, Tricider can provide a lot of additional information to teachers about the extent to which students understood the content of the videos, what their attitude towards them is, or how they should continue their learning. The face-to-face class could even begin by projecting Tricider, thus starting from a common base to begin with. In addition, Tricider improves students' abilities to think and discuss..

Publishing and sharing content

2.19. Introduction

The preparation of digital learning (videos, presentations, etc.) is only the first step in the development of Flipped Classroom content or invested learning. The next phase is how we are going to share this with our students. There are many possibilities, most of them belong to the group of web 2.0 applications.

Social software and websites to share content

"Nobody knows everything, everyone knows something, all the Knowledge resides in humanity."

(Pierre Levy)

Social software is the essence of web 2.0: it turns the Internet into a common creation, collaboration and communication platform. There are numerous web-based programs that encourage us to be present in virtual communities, publish, share ideas in videos, documents, images, mental maps, thus leaving our mark on the digital medium. Examples of social software are: YouTube, Flickr, Picasa, Animoto, Prezi, etc. - but most web 2.0 applications also belong to this category. All operate in a similar way from a technical point of view: the application runs on a central server, registered visitors can upload, edit, create their own objects (mental maps, videos, images, etc.) providing some description about it. The user may decide to share the content that he created, or keep it private. Guests who have not registered can move from one public content to another, but sometimes the search is only allowed if we register first.

If we prepare our content with one of these applications, we usually only need to send a link to our students, and they can access it even without registering to that website.

However, if we want to apply the Flipped Classroom method regularly and consistently, this is not the best solution. In the long term, you will need a permanent website, where to publish the materials, and that can be the point of reference for students to visit it regularly. Now we are going to present a couple of web 2.0 applications that adapt to these purposes.

2.20. Videos, Images, Animations

Previously we have seen some applications that allow us to create videos on a website. For example, Animoto, Sway and Powtoon. In such cases, we only need to provide the link for our students.

If we make our own video recording (with some editing or trimming on our computer), once we are ready, we can upload it to YouTube after a few simple steps. Because YouTube is owned by Google, we only need a Google account to sign in.
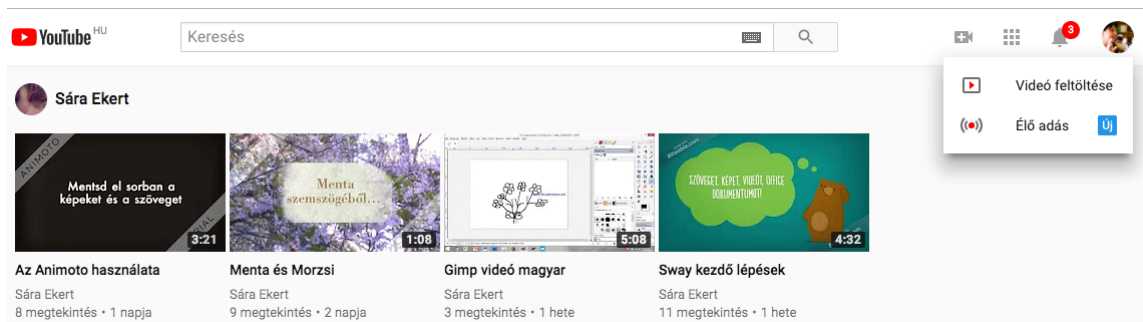
Source: Youtube.com

In the right corner, if we click on the small cross, the text "Upload video" appears, which takes us to the loading page. Click on the following link to see the loading steps:

https://support.google.com/youtube/answer/57407?co=GENIE.Platform%3DDesktop&hl=es

Once the video is uploaded to Youtube, we can share it through social networks or our educational platform (Moodle, Blackboard, etc.). As the link it generates is too long to be shared as such, we can shorten it using, for example, using Bitly.

Links that are too long are unfriendly. Therefore, there are applications such as Google URL Shortener (https://goo.gl/) or Bitly (https://bitly.com/) that allow you to shorten the links.

2.21. Presentations

Slideshare is a website to share content. In the "Explore" menu, we can navigate between presentations loaded by others, and we can even search for specific topics.

Slideshare explore
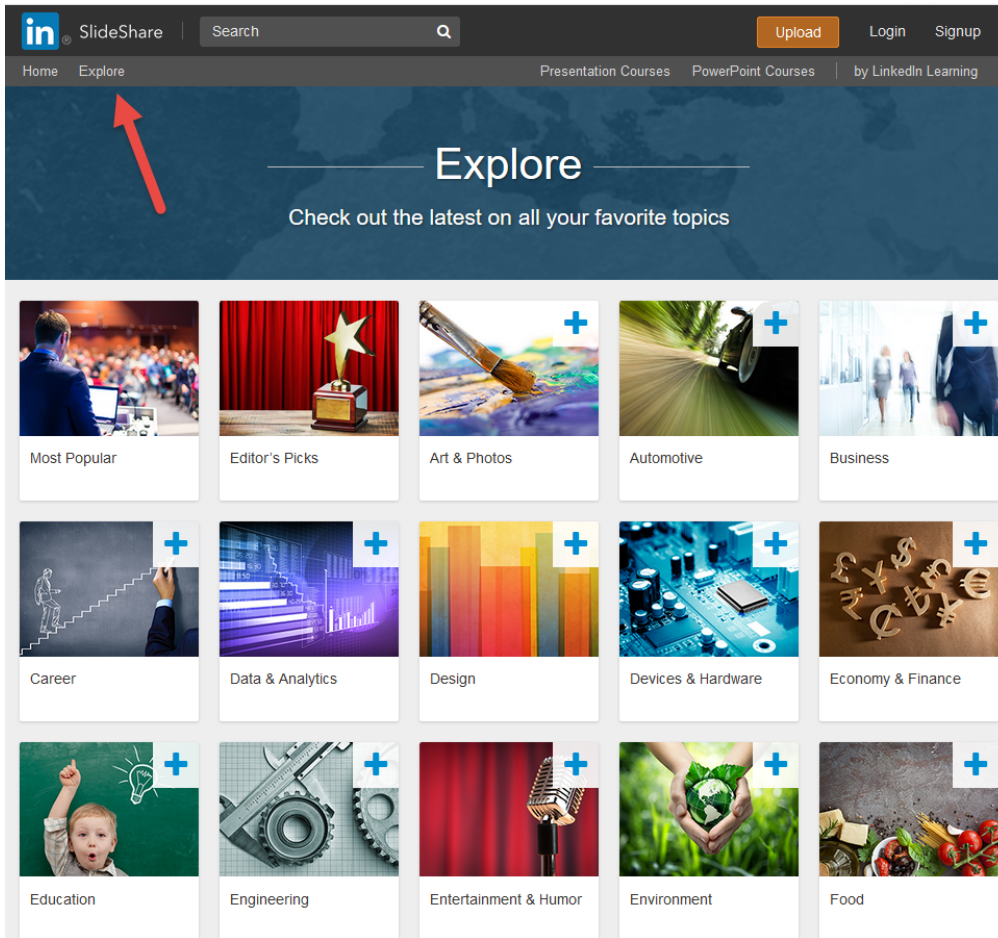
Source: SlideShare.net

In https://www.slideshare.net/, we click on the Upload button, and a window appears where we can "drag and drop" the presentation we want to share or, alternatively, we select the file from our computer. If we have not registered before, we can do it with an existing LinkedIn account, or create a new account with the "Register" button.

Once we upload our presentation, clicking on "Share" we obtain an insertion code, with the help of which we can place it on our website, but we can also copy the link obtained and send it to our students.

2.22. Personal web pages

Another group of tools is oriented towards the creation of personal web pages. Hundreds of services are offered in addition to RSS, with the help of which we can customize our own homepage. They usually have widgets such as diary, clock, collection of links to websites without RSS service, edit and present notes, messages, calculator, access to their own mailbox to read emails, etc.

There are many tools of this type to create personal web pages that are updated automatically through RSS feeds. To give some examples: Netvibes, iGoogle, Protopage, a Pageflake, MyYahoo or Microsoft Live portals.

2.23. Blogs

A blog is basically a website used to publish entries in the style of a newspaper. There are different types of blogs. Personal blogs, where we find publications related to a specific person. Although we often find thematic blogs that contain publications related to a specific topic.

The Microblog service offers a communication portal to its users that is suitable for exchanging short messages regularly and quickly. The social function is also important and there is the possibility of following messages from our friends or people who deal with issues that interest us.

The blog portals are easy to use, and with very basic ICT skills, it is already possible to open and edit a blog without too many setbacks.
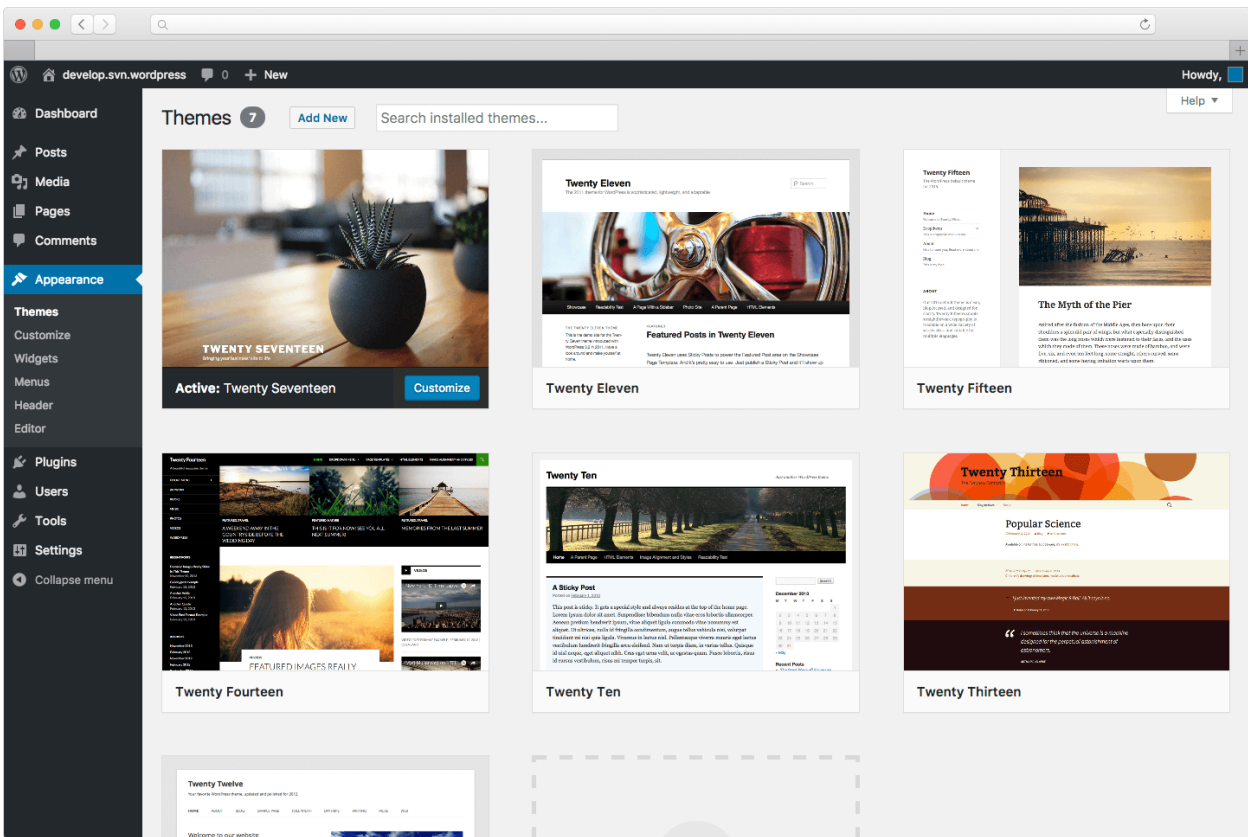
Source:Wordpress.com

2.24. Classroom platforms or virtual Learning Environments (VLEs)

Learning Management Systems (LMS) offer a virtual space in which to upload content, create and describe activities, communicate with students, etc. Many schools have a platform of this type and this greatly facilitates the management of courses or subjects, both teachers and students.

One of the most used open platforms is Moodle (https://moodle.org/?lang=en) that has a high degree of customization and many features, in addition to being compatible with a large number of modules that they allow to extend their functionalities.

Source: Moodle.org

Another popular application, more oriented towards creating a community that includes teachers, students and families, is Edmodo. It is compatible with Google Apps and Microsoft Office, which facilitates its use. This platform allows families to track the evolution of their children.

Another popular application is Edmodo.

Source: Edmodo

Google Classrooms allow you to create courses to communicate with students by placing ads and responding to their publications. It also allows you to upload materials and create tasks by organizing work in modules or units through themes and integrate it into the shared calendar. By integrating with

other Google tools, such as Google docs, Hangouts, or Google Drive, it makes it easier for teachers and students to use. In addition, it has an app that allows you to use it on any device.
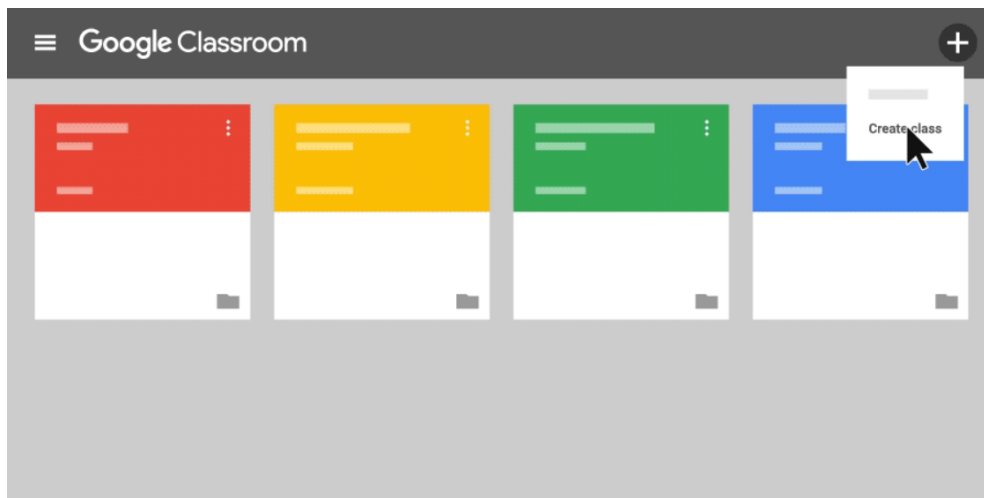
Source: Google Classeoom

Chapter 3. RUNNING CLASSES

3.1. The Flipped Classroom Model

The FLIP-IT project, based on the experiences of the consortium, supported by the research described above, suggests a model for the application of Flipped Classroom specifically aimed at addressing the multiple critical elements of European VET.

3.1.1. Overall Instructional Goals

At the core of this model is the Overall Instructional Goals. These are to be determined by the teacher/ institution and should ultimately refer to the learning outcomes of the given course of study. Ideally, the instructional goals could be summarized in a single sentence and the learning outcomes guided by this.

3.1.2. Assessment Items

The assessment items involved in the course of practice lie outside of the instructional goals but it is extremely important in the selection of the assessment items that these correlate directly with the learning outcomes (in an effort to ensure constructive alignment). On this basis, it is important that the appropriate method of assessment be selected and that non-traditional methods of assessment be considered as part of this. The flexibility of the flipped classroom in potentially providing in-class time to students to, for example, engage in project work or in application of the skills and knowledge they have learned outside of class, could facilitate numerous methods of continuous assessment, as opposed to a single summative assessment (e.g.: written or MCQ exam) at the end of a module.

3.1.3. Learning outside the classroom

It is recommended that time and activity outside of in-class time take place in a primarily online format (although a more low-tech approach can be undertaken, this would most likely be considerably less effective for learning and retention). Both teachers and students may need to be provided with training related to developing and accessing digital support learning material. Considerations therefore need to be made for logistical considerations like training for new skills development, available time and resources for developing and engaging with online content, etc.

Teacher's Online Role

The role of the teacher from an online perspective in this approach lies in the creation or sourcing of a series of media to facilitate self-directed learning at the student's own pace. This media could include screencasts, video and audio recordings, development of rapid e-learning, narrated lectures, etc. Students should be able to use this content to engage in self-directed learning in order to adequately prepare for in-class activities related to applying, discussing or analysing this information. Additionally, teachers should engage in communication with students while online in order to monitor student enquiries, student activities, provide feedback, etc. The teacher's online role may require the development of skills in developing and/ or sourcing supporting learning material, curating this material and making it available to students (and others) as well as skills in online communication and collaboration.

Student's role in learning outside the classroom

The role of the student from an online perspective in this approach lies in accessing and absorbing the information contained in the curated series of learning support media, developed by the lecturer, to facilitate self-directed learning at their own pace. This learning content should then be applied in some way in actual in-class time (this is something which should be made explicitly clear to the student). To this point, it could be recommended that students be required here to engage in some form of formative assessment related to this material pre-class to ensure understanding/ evaluation, etc and/ or some form of communicative or collaborative activity. These elements have the added benefit of increasing student digital literacy skills, as well as potentially building skills in communication, collaboration, independent learning, self-evaluation, etc.

3.1.4. Learning in the classroom

It is recommended that the time and activity during the scheduled class be devoted to the application of learned content. This may involve multiple combinations of various activities, including, but not limited to: discussions, hands-on demonstrations, applications of learned content, etc. Both teachers and students may need to receive training related to certain methods and activities. In addition, it is important that all stakeholders (including support staff, ICT support, etc.) have clear what the requirements and goals for class time should be. Therefore, it is necessary to take into account logistical considerations such as the training for the classroom activities, the time reserve and the materials necessary for the proper development of the practical sessions, the general organization of the module and its situation within the program of the course .

The role of the teacher in learning in the classroom
The teacher's role during the class period will be to conduct a series of experiential learning exercises in the classroom. They can be collaborative activities, cognitive learning activities, etc. to ensure that students receive practical and appropriate guidance to correctly meet the learning objectives and results of the module, as well as ensuring that they become graduates prepared to work.

Role of the student in learning in the classroom
The role of the student during the class period will be to arrive to class having internalized the information made available to them online and having carried out any activity associated with it. In class, you should take part in a series of experiential learning exercises, collaborative activities, cognitive learning activities, as well as participating in self-directed learning activities or assessments.

3.2.   Planning the Flipped Classroom Approach

The flipped classroom is a student centred model with the aim of increasing student engagement, understanding and retention by reversing the traditional classroom teaching approach.

Although so far existing definitions vary slightly, the Flipped Classroom is a more student-centered approach to learning whereby students receive lecture materials before class, generally in some digital format.

This approach allows students to learn about the topics outside of class and at their own pace. Then they can come to class already informed and prepared to engage in discussions on the topic and apply their knowledge through active learning, they can spend their class time undertaking more active and collaborative activities. Applying this model, a more efficient use of class time is expected by focusing on the practical application of knowledge during class.

The regular and structured use of technology in this more student-centred approach is what differentiates the flipped classroom from a regular classroom where additional, supplementary resources are used.

It is not easy to start applying the Flipped Classroom method. It is necessary to think about strategies, it is necessary to consider the learners, their abilities and learning preferences.

The success of the Flipped Classroom depends on the alignment of the contents. The teacher must make his / her students familiar of what he / she wants them to accomplish before, during and after the class.

An effective and successful flipped classroom needs a really careful preparation, a careful lesson planning. The universal requirements generally imposed on lesson plans have to be obviously applied to Flipped Classroom lessons as well. Teachers have to plan their own activites and their students´ activities carried out in three phases (mentioned already above):

"before the class", "during the class" and "after the class".

Generally speaking, a lesson plan can be considered to be the teacher´s road map of what students are supposed to learn and how that will be done effectively.

There are three key components to be integrated in every lesson plan:

- Learning **objectives**
- Teaching / learning **activities**
- **Strategies** to check / assess student understanding
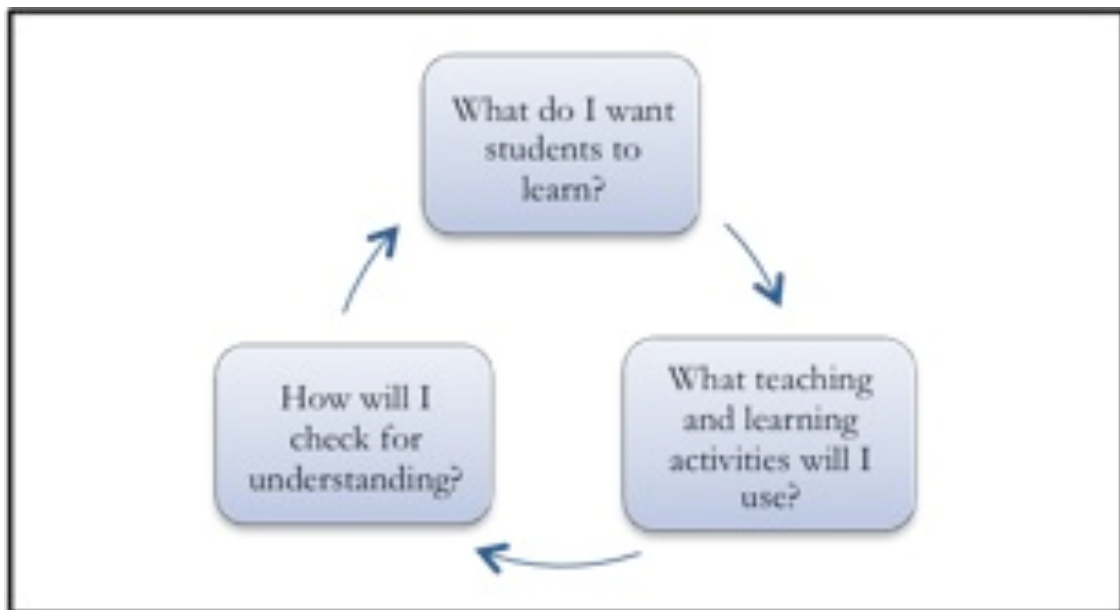
As indicated above, the following steps are essential on the way of creating a successful lesson plan:

Step 1: Identification of the learning objectives

It is highly important for students to understand WHY they are taught the lesson and WHAT they can expect to get out of it.

Teachers should be able to give answers to the following questions:

- What is the topic of the lesson?

- What do I want the students to learn?

- What do I want them to understand and to be able to do at the end of class?

- What do I want them to get out of this particular lesson?

- What are the most important concepts/ideas/skills I want students to be able to grasp and apply?

- Why are they important?

It is recommended to apply active verbs from Bloom´s taxonomy to describe which cognitive process the students are expected to go through. This process can be described with the following continuum going from lower order thinking skills to higher order ones: remember → understand → apply → analyse → evaluate → create.

Step 2: Planning the specific learning activities

Teachers should be able to give answers to the following questions:

- What will I do to explain the topic?

- What will I do to illustrate the topic in a different way?

- How can I engage students in the topic?

- Are there relevant real-life examples, analogies, or situations that can help students understand the topic?

- What will students need to do to understand the topic better?

Step 3: Planning how to check the students´ understanding

Teachers need to know whether their students have really learnt something, they have to plan what questions they will ask the students to check for understanding and what they will ask the students to demonstrate. It is necessary to go back to the list of the learning objectives and to think which activities can check whether each of those has been accomplished. Possible types and procedures of assessment have to be considered (formative and/or summative, self-assessment, peer-assessment) together with assessment criteria and standards (rubrics) and the provision of feedback.

As it has been already said, the above given steps are generally applicable for any kind of lessons. Concerning the Flipped Classroom, some specific strategies should be applied mainly within the three steps.

Step 1

Develop a creative introduction to the topic to stimulate interest and encourage thinking. Present the topics / issues which students struggle with. When starting with the FC, do not be too ambitious! The videos made by you do not need to be perfect!

Step 2

Applying the FC approach, it is essentail to consider the following three issues:

- Is the material effective and relevant for the presented topic?

- Do the students have access to the material?

- Do the students know how to use the material?

When learning activities are planned in the FC, teachers should choose the evidence based instructional approach which fits the main learning activity.

The pre-class work should set the scene for the in-class activity. Teachers have to carefully plan how they will communicate the new instructional ideas. Would students benefit more from watching a video demonstration outside of class at their own pace and as often as needed or would some other media type be more effective?

Specific learning *motivating* activities are to be prepared before class. The essential questions are:

- What kinds of activities will motivate students and prepare them for class?

- What should students be able to do to prepare for class?

- What questions will the students be asked?

Teachers need to identify the kinds of incentives or motivations that will engage students in the instructional material and prepare them for the in-class activity. It is crucial to determine how the teacher can provide feedback to students about what they know and do not know prior to class.

The most important issue about planning *in-class* activities is that these activities are to provide students with opportunities to deepen understanding. That is why they are to focus students to attain higher-level cognitive abilities. These activities need to be aligned & matched with the learning objectives, clear instructions are to be prepared for distribution to students in-class.

Teachers need to use a timeline work plan to help you keep manage the activity and keep students on task. When planning post-class activities which are to extend students´ learning, these questions are to be answered:

- How will students continue the learning experience from the inside class activity to outside of class? (We do not retain well what we may learn from just one exposure to the materials.)

- What kind of in-class activities will focus students to attain higher-level cognitive abilities? (see Bloom´s taxonomy above).

- Teachers need to prepare clear instructions for distribution to students in-class; they also have to consider how they will connect thes lesson to the next lesson so that they flow coherently.

<u>Step 3</u>

Teachers should know if their students really learned something. To do this, they have to plan what questions they will ask the students to verify their understanding and what they will ask them to demonstrate. It is necessary to return to the list of learning objectives and think about what activities can verify if each of them has been achieved. The possible types and procedures of evaluation (formative and / or summative, self-evaluation, peer evaluation) should be considered together with the evaluation criteria and standards (rubrics) and the provision of feedback.

With respect to the evaluation strategies, in the inverted class model it is recommended to apply the evaluation by pairs. This type of evaluation allows students to see other points of view with which other peers developed the same activity, while also learning to tolerate critical comments about their work from their peers, and learn how to evaluate the performance of peers. a constructive way In this way, they can make the most of collaborative activities.

However, it is also important the evaluation of the teacher who must carry out a continuous and personalized follow-up of the students according to the following criteria:

- If they accessed materials outside the classroom
- If they adequately understood the contents
- If they are able to apply them properly in different contexts
- If they are actively involved in face-to-face sessions
- If they collaborate with other classmates

As in any other educational model, having an educational program in the Flipped Classroom model is essential.

Peer-assessment is definitely also to be applied in the FC model. Students can learn how to cope with and potential critical comments given by their peers, they can learn how to evaluate their peers´ performances. Then they can profit from collaborative activities.

When planning any lessons, Flipped Classroom ones not excluded, teachers need to create a realistic timeline for all the phases. And, above all, the need to be flexible – they have to be ready to adjust their lesson plans to their students' needs and focus on what seems to be more productive rather than sticking to their original plans.

3.3. Lesson plan elements

Everybody surely made a lots of different lessons plans before, now we are only presenting a standard template for creating your own lesson plan, togethet with some ideas to ensure that the lessons plans will be useful.

Compulsory elements of a lesson plan:

Scheduling a face-to-face session

- Teacher's name:
- Subject:
- Course:
- Lesson theme:
- Objective of the lesson:
- Duration of the session:
- Connection with other subjects:
- Evaluation methods:

Timeframe	Parts of the lesson	Teaching strategy			Notes, comments
		Methods	Working forms	Tools	

Tips and Suggestions

Here we formulate the expected learning outcome, in a way that it is measurable.

Define the knowledge that should be mastered (e.g. new concepts), cempetencies to be developed, the achievement level you aim at.

It is worth phrasing it like that:

> *"By the end of the lesson students will be able to create ……."*

You may give more than one objectives, you can create smaller objectives to each activity of the lesson. For example, as for the material shared with students pre-class, we could aim at: Having watched the video, students will be able to list…

When formulating the objectives, we can select from the verbs based on Bloom's taxonomy, such as:

Individual, BEFORE CLASS (lower order thinking)

      Understand – summarize, explain, debate, demonstrate…

      Remember – define, list, memorize, repeat, recall…

IN CLASS (higher order thinking)

      Create – *construct, design, **create**, simulate, invent…*

      Evaluate – *criticize, judge, review, defend, validate, test, argue…*

      Analyze – *compare, examine, relate, categorize…*

      Apply – *use, demonstrate, implement, illustrate, operate…*

Teaching Strategies

In the template provided, we differentiate between methods and ways of working. When we talk about methods, we refer to the concretion of a pedagogical approach in a given context, taking into account the age of the students, the learning subject, the expected results. The application of a didactic method involves a series of specific techniques and principles. Some of the most commonly known methods that are perfectly integrated with FC are all those that encourage the student's active participation, such as: project learning, autonomous learning, cooperative learning, service-learning, case studies, dialogical learning or gamification.

To better understand this, when we speak of pedagogical approach, we refer to a set of principles and a description of the teaching practice, which we could link to a certain ideology, that is, to a way of conceiving the learning and teaching process, as well like the evaluation one. Some pedagogical approaches most commonly used are, for example, the constructivist, behaviorist, trial-error, inductive or deductive.

Finally, when we refer to forms of work, we refer to the way in which we manage and energize the group of students in the classroom. We can do activities in pairs, in groups, with the whole group or individually. The work can be simultaneous or sequential, and we can offer more or less the work to be done, everything depends on the methods that we want to apply. The most important thing when selecting and applying teaching strategies is consistency and clarity. When students do not understand the work dynamics or do not think it is fair or adapted to their needs, it is easy to lose interest and attention.

The following example may help to understand more clearly how to select teaching strategies in the programming of a FC lesson

- Subject: Training of trainers
- Course: Training of trainers
- Lesson theme: Programming training actions
- Objective of the lesson: the participants will be able to define and program training actions for active workers based on the analysis of the job
- Duration of the session: 2 hours

- Connection with other subjects / courses: Description and analysis of jobs
- Evaluation methods:
  - Self-evaluation: Through a survey
  - Co-evaluation: Between groups, by means of the work evaluation rubric carried out by each group and intra-group, evaluating the group process and the contribution of each member by means of a checklist.
  - Hetero-evaluation: Rubrics for evaluating the work of each group

Timeframe	Parts of the lesson	Teaching strategy			Notes, comments
		Methods	Working forms	Tools	
10 min	Checking what has been learned in the study of teaching materials	Gamification	Individual. The whole class	Kahoot	Those who get the best score will be the first to select a job to work with in class
15min	Selection of jobs to be worked with		Individual	Notice board with profiles	There is definition of profiles of different sectors
5 min	Group of students based on the selection of positions		Group (cooperative) Roles:	Countdown timer	The time in which they are quietly grouped in the classroom is timed
50 min	Definition of training actions and their didactic programming	Case Study	• Coordinator: organize work and boost work • Secretary: Write relevant information, save and share documents	One laptop per team	They must include all the elements of a schedule. No template is offered, they must work based on what was studied in the didactic material provided
25 min	Presentation of the work done		• Controller: time and task compliance • Spokesperson: speaks on behalf of the group to consult doubts to the teacher	Given	The exhibition is made by a member of the group selected at random, which forces everyone to work because the note is the same for all team members. 5 min per group
15 min	Evaluation of the activity and the work done		Individual and group	Evaluation tools: survey, rubric and checklist	1st individual, 2nd group (the rubric to evaluate the work of the rest of groups is used during the exposition of each group)

Tools

The **web 2.0 tools** presented in Module 2 can be applied during the classroom lesson as well.

When introducing a new topic, we can create infographics. We can recall knowledge with the help of mindmaps, but a common brainstorming in Linoit will also add colour to the lesson.

If we have to revise a topic, we can use LearningApps, Quizlet, timeline creator, wordcloud maker applications, or Kahoot.

We can create practice exercises in LearningApps-szel, while timelines, infograohics and mindmaps are useful tools when summarizing and closing a topic.

3.4.   The role of assessment and its types

Basically we can differentiate 3 types of assessment. Let us look at them before talking about assessment in a flipped classroom context:

Diagnostic assessment: It serves as a tool to identify a problem or a situation, its aim is to map needs or possible lack of knowledge. Its aim is to gather information so in this case grades are not given. Typically we do this type of assessment at the beginning of the school year or when introducing a new subject.

Formative assessment: It is based on regular monitoring. It gives feedback to students and to the teacher during the activities. Such techniques include making notes on essays or assignments, multiple choice exercises performed as part of student self-assessment.

Summative assessment: This happens at the end of an activity, to check to what extent the objectives were met. An example for this is the final written test at the end of a topic.

In the case of flipped classroom, a so called pre-formative assessment category can be integrated to the above mentioned ones. This refers to the activity students perform individually, before the classroom lesson.

We can classify the types of assessment from another point of view: who is taking part in the process. We can distinguish the following cases:

- Teacher evaluates individual student performance

- Teacher evaluates groupwork

- Student self-assessment

- Student assessment by peers

For the last two, instruction needs to be provided by the teacher at the beginning, so students gradually learn hoe to provide feedback about their own performance or about their peers' performance.

Self-assessment and assessment by peers both increase student autonomy, responsibility and helps to develop social skills.

Assessment Feedback Loop

In the first module we got familiar with the characteristics if the FC method – one of the key features of the model is that it is student centered.

To ensure that this approach is maintained througout the whole teaching-learning process, the evalutaion system should also be **student-centered**.

Nowadays we look at evaluation as a continuous process, not simply a way of „accounting" when closing a topic. Traditional evaluation methods usually compare students to each other, and so generate competition among them. As opposed to that, in the student-centered approach the aim is to monitor the development of a student **compared to herself/himself**, giving regular feedback on her/his progress in the learning process.

In case of a flipped lesson there are more opportunities for interaction during the classroom lesson. By asking questions, the teacher will have immediate feedback about students' understanding of the topic. Voting applications (e.g.Kahoot!) are very useful tools to support this activity as we can have feedback from all students at the same time with the help of such online tools.

There is no need to always think about tests and grading, when talking about evaluation. We can have a lot of information from an informal discussion with our students, talking through a process.

The aim of the so called **developing assessment** is to develop higher level thinking skills by involving students. This way assessment is not only about performance evaluation, but also a way to imporve competencies necessary for **„learning how to learn.** We have to enable students to be able to identify their own weaknesses, plan the necessary next steps and take responsibility for perfoming them. Ideally students will set up their own systems for learning, and will make decisions regarding their own learning process. At the same time the teacher can make necessary corrections, amendments in the teaching process as well.

Methods supporting student-centered assessment:

- self-assessment, assessment by peers,
- evaluation of project work, cooperative work,
- portfolio,
- articles, studies,
- study logs.

Remember: **The objective of assessment is to improve the quality of learning.**

3.5.   Checklists

From time to time it is worth to formally look at and make notes on how students can apply the new concepts, skills and attitudes.

Using **checklists** is one way to do that, evaluating different areas, such as:

- presentation to class

- thinking skills

- communication skills

- cooperation

- problem solving skills etc.

By type it can be:

- self-assessment

- peer assessment

- assessment by teacher

These checklist are used for a quick check of understanding or lack of understanding.

How to use them?

Based on the examples shown below we can create checklists for our own purposes, preferably online. It is advisable to share these with the student before they start working, so that they can see what aspects will be evaluated, by whom. We can apply different types at the same time, as it can be useful to compare the self-assessment with the peer assessment, and have a discussion about that.

3.6.   Questionnaires, quizzes

We can check the understanding of the learning material by quizzes, questionnaires prepared with web 2.0 applications, this way we can make sure that even those students will answer who would not be active otherwise. We receive feedback from the whole class at the same time, so we have a picture about how they understodd the material – whether we need to review some parts individually with some students, or whether we have to work on something in more detail as most students did not understand it. For example Kahoot! is an excellent tool for making quizzes.

Alternatively we can prepare online questionnaires as well, for example using Google Forms. In this case evaluation is easy to do, and we receive a lot of useful information this way. In the next section you will find a tutorial to this application.

CHAPTER 4. A COMPARISON OF 2 APPROACHES AND A PROPOSED MODEL

A comparison of 2 Flipped Classroom approaches

Over the course of the Flipit Project, two flipped classroom approaches were piloted with two distinct groups of learners for two distinct teaching and learning purposes. The pedagogical approaches utilised were undertaken using may of the tools and methodologies identified in this book.

1) The first group involved a number of teachers who wanted to use video-based teaching and learning approaches in their classrooms.
2) The second group involved secondary school students and was based around providing these students with training on how to pan, design and develop digital games.

The approaches utilised in each of these pilots and the results of same are outlined below. A number of conclusions are offered in relation to key findings and recommendations arising from each pilot experience, as well as identified elements of overlap, difference, etc. which further informs proposed uses and approaches for the flipped classroom approach.

We hope that this information will be useful for you in helping you to be aware of important elements which you should bear in mind when considering your own implementation of the Flipped Classroom.

1.1. Using the Flipped Classroom to teach instructors about how to use Video

Introduction

Video occupies an ever-increasing position of importance as a learning technology due to its affordances such as immutability, editability, adaptability, and the potential for revision and re-purposing. Video is very "information-dense" and can be used to convey certain information far more effectively than, e.g.:, text, "chalk and talk", etc. and can facilitate the application of alternate pedagogical strategies (Sherin, 2004) and through viewing and reflection, can support a formative function for teacher and learner alike (Mitra et al., 2010).
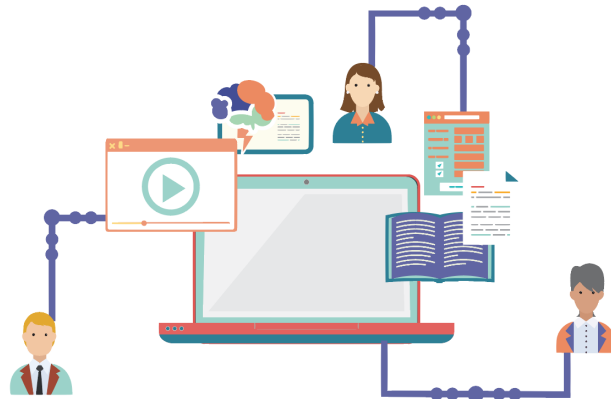
Given the effectiveness of video, why then is it used so rarely?

The potential for video as a tool for teaching and learning, is generally offset by the supposed difficulty of the software, hardware and production requirements which are often associated with the creation of video. As identified by Norton & Hathaway (2010), a lack of teacher education on the creation of bespoke video for teaching is a major barrier to its effective use and a lack of video production knowledge can result in a failure to manage associated necessary elements such as time required, the importance of appropriate spaces for filming, etc.

Ultimately the difficulty facing teachers who want to use video for teaching and learning is not one single, simple reason, but incorporates elements such as the cost of purchasing and using video equipment, a lack of knowledge about how to capture video footage to a reasonable standard, a lack of knowledge on how video can be used to support or enhance teaching and learning, a lack of knowledge about how to use video editing, etc. Adding in the time and energy demand by video, and it is little wonder that many teachers find the use of video a challenge to introduce.

Instructional Goals

Based on many of the approaches outlined in this book and framed against the standard Technology Acceptance Model (TAM) and drawing upon research undertaken in the area (e.g.: Davis et al, 1989), the use of the flipped classroom approach was selected as a means of teaching 10 instructors, teaching a variety of subjects ranging from marketing to physical education to physics, how to use video in order to support some aspect of their teaching and learning process(es).
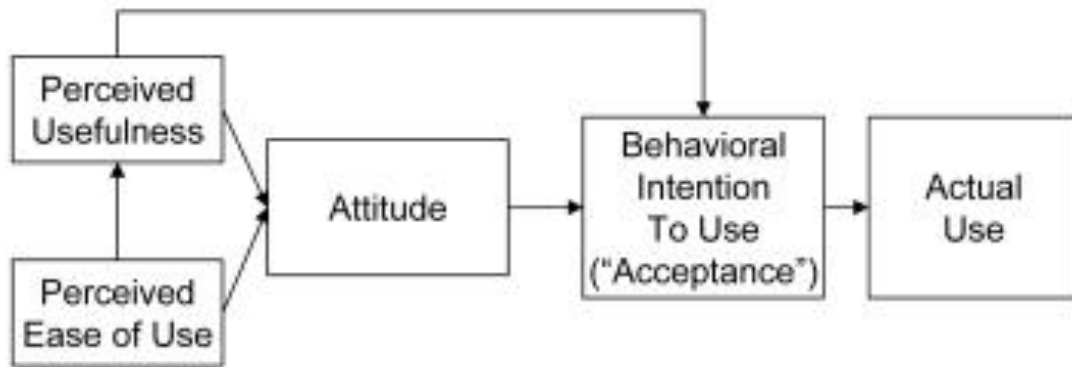
The use of the flipped classroom approach for this project was also intended to help facilitate teachers in adopting the same approach for use with their students - i.e. by teaching instructors how to use video, that they would be able to develop online resources to share with students outside of class and use in-class time for peer discussion, debate, etc. In essence, to use the flipped classroom approach to teach lecturers how to use video so that those same lecturers could use video for the flipped classroom themselves.

Initially, the entire pilot was intended to be based around the use of the flipped classroom to promote the use of the flipped classroom to the participants, but as the pilot progressed, it was identified that central to the success of the pilot was the development of video by each participant in the context of their own discipline and teaching practice. By avoiding a prescriptive "one-size fits all approach", staff were able to place their own needs at the center of the project's training experience and were empowered and supported in using the technology with confidence and creativity and for optimal pedagogical effectiveness with their students. To this end, it should be noted that the flipped classroom approach may not be appropriate for all students and every subject and it should always remain the decision of the teacher themselves if, when and how to use the flipped classroom to facilitate learning.

The Flipped Classroom Approach

Training in the initiative was facilitated via a five week online course which used the flipped classroom approach. The course covered the fundamentals of video production with a focus on enriching the teaching and learning experience. Each week, participants attended one of two face-to-face workshops which were used as collaborative spaces where participants could cover some of the more practical elements of their individual projects.

The learning outcomes for the development of skills related to the use of video for teaching was largely drawn from Koumi's (2014) "Potent Pedagogic Roles for Video". These can be categorised into 4 areas:

1. Facilitating cognition

2. Providing realistic experiences

3. Nurturing affective characteristics (motivations, feelings)

4. Demonstrating skills
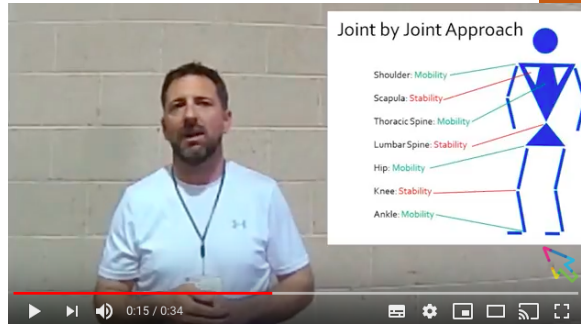
The process of developing and facilitating these was based around teaching video techniques and teaching functions that exploit video's distinctive presentational attributes - that other media cannot achieve as effectively. It was agreed, following discussion and learner need analysis that the programme should run over 5 weeks and should cover a range of elements related to the use of video for teaching and learning purposes.

Week 1	Week 2	Week 3	Week 4	Week 5
Pre-production	Shooting Scenarios Introduction to the camera	Learner Engagement Multimedia Principles Use of the Camera	Production Skills Editing	Publishing

It was agreed that the flipped classroom approach would provide online video-based lessons which were 40 minutes each and which would also include a 10 minute activity. These would be made available at the beginning of each week and would be developed using some of the software identified under section 2.10 ("Videos, images and animations"). It was also agreed to use a range of Technology Enhanced Learning tools to support all of these activities, including many of the tools identified in this book such as software identified under 2.11 ("Mental and Conceptual Maps"), 2.12 ("Word Clouds") and 2.17 ("Online brainstorming").

The in-class element of the approach would include two one-hour face to face workshops per week and would be reserved for practical activities & discussion. As part of this, it was agreed that there would be a range of elements involved, including one to one discussions on project progression, peer learning through discussion in a collaborative environment and submission of evidence of progress. As identified earlier, it was noted early on in the process that it would be key to to avoid a prescriptive "one-size fits all" approach and to give the learners space to consider and follow a range of ideas, instead of dictating what they specifically should or should not do. To this end, it was very important to facilitate both group collaboration and individual feedback.

Timeframe	Parts of the lesson	Teaching strategy	
		Working forms	Tools
5 min	An overview of project progress	The whole class	Presentation/ Kahoot
10min	A quick recap of the latest video lesson(s)	The whole class	Video
15 min	Open discussion and debate	Group Led by instructor	Mindmap

		Minutes taken by another organiser Participants to discuss, debate, tec.	
10 min	Collaborative opportunities	The whole class	Brainstorming tools
15 min	One on one discussion & problem solving	Individual	N/A
5 min	Any additional project updates	The whole class	Evaluation tools/ Data-gathering tools

Evaluation of the student progression was based around the submission of evidence of progress each week, based on the subject area being taught - e.g.: in week 1, where there was a focus on pre-production, participants were required to submit a storyboard and/ or script, in week 2, where there was a focus on using the camera, participants were required to submit a short piece of footage they had filmed. Each week therefore required the students to submit a piece of media as well as a reflection on progress and processes. To incentivise participants in completing the course, it was agreed that a specially designed "digital badge" or "microcredential" would be awarded to them on successful completion of the project.
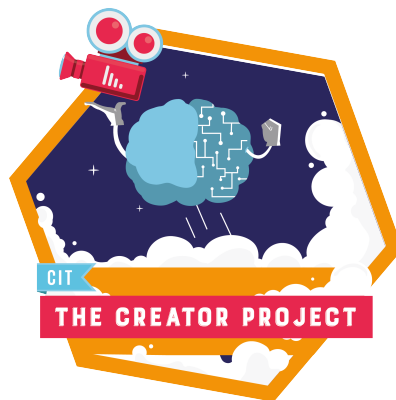
Data Gathering and Feedback

Qualitative feedback was gathered through a focus group with the entire group of participants and threat 3 face-to-face interviews with individual participants.

Theme 1 - Your Experience

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1. What aspects of the creator project were particularly useful to you? What elements stood out?
2. What aspects of the project do you think could be improved?

The overall impression was that the entire project was very useful to both staff and to the students whom had benefited from the development of the video-based learning material/ activities. The flipped classroom approach was identified as being extremely beneficial to the project and that it had been presented and run in a favourable manner. Participants stated that the digital resources were "excellent for the nuts and bolts" - referring to the basic knowledege required for activities related to planning, filming and editing. Participants also noted that there were able to greatly benefit from discussion in the face-to-face sessions, as opposed to simply sitting through presentations and/ or demonstrations. One participant noted that "being able to re-watch, pause and fast-forward through the video resources outside of the classroom and using the online videos for on-the-job references was great". It was also noted that for some projects, their ideas for the project facilitated the adoption of a flipped classroom for their own students (e.g.: providing students with pre-class/ pre-lab resources).

1.2.   Using the Flipped Classroom to teach instructors about how to use Video

Introduction

The global video games market generated $91bn in 2016, ranging from mobile and console games to associated areas such as e-sports, gaming videos and the development of Virtual Reality (VR). It is further estimated that, with an annual growth of 6.6%, the global games market will reach $118.6bn by 2019 (PEGI, 2016). And while the development of programming skills is necessary for effective game development, the overall process of designing a game requires a more holistic approach in student education development.

The "Press Start" initiative was developed through a collaboration between the Dept of Technology Enhanced Learning in the Cork Institute of Technology and Cork Educate Together Secondary school. The aim of the "Press Start" initiative was to attempt to facilitate training for students focused on how to effectively plan, develop and publish an educational digital game. While the focus of the initiative in terms of training technical skills and knowledge was based around the process of creating a "traditional" or "commercial" game using industry-standard tools and techniques, elements such as processes related to idea generation, the planning of gameplay mechanics, etc. were orientated towards educational game development.

Instructional Goals

A key element in the development of the approach for the pilot was the decision that the students should not just develop a game, but develop and educational game. It was intended

that the students would create educational games designed to teach their peers about a specific social or ethical topic of their own choosing. To this end, the "Press Start" initiative focused on a process of teaching game development skills and knowledge through encouraging students to develop their own educational games - games which would be designed to teach their peers about the ethical or social issue of their own choosing. Students developing the games were themselves thus compelled to learn about their selected ethical area of interest themselves in order to scaffold relevant information related to this ethical/ social area within the game itself. The ethical/ social subjects were identified as appropriate given an ongoing element of the student's curriculum related to ongoing social issues and the growth of games for social good. A group of 45 students in Cork Educate Together (approximately aged between 14-17) were selected as participants.

This concept of having students learn through developing educational games could also be compared with the notion of teachable agents. Teachable agents may be contrasted to a pedagogical approach referred to as "pedagogical agents" in which there is a graphical representation of a character who inhabits the role of a coach or peer to help optimize learning (Baylor, 2007). Some key elements in the effectiveness of teaching agents relate to existing research identifying the benefits of learning-by-teaching (e.g.: Roscoe & Chi, 2008, etc.). Martin & Schwartz (2009), for instance, note that learners frequently better organize their understanding for the task of teaching another person better than they do for themselves.

The Flipped Classroom Approach

Training in the "Press Start" initiative was facilitated via a flipped classroom approach due to a number of reasons.

Students were to be provided with instructional videos each week, over a 8-week period and then use in-class face-to-face time to experiment with the relevant software, ask questions, share observations, and get engaged in group discussions and collaborations. etc. The flipped classroom was identified as key for this process due to a number of elements which it facilitated, not least of which was the ability of the flipped classroom to maximise the impact of the available in-class time. One of the most immediate concerns in the project related to what was feasible for students to fully inculcate over a period of 5 months in addition to their ongoing classes. It was felt that by utilising a flipped-classroom approach and encouraging students to study and experiment using the developed resources outside of the classroom, that this would free up class time and ensure that students would be able to have time to effectively engage with each other.

It was agreed, following discussion and learner need analysis that the programme should run over 8 weeks and was based on the creation of a "bare-bones' programme of instruction for teaching game development, incorporating:

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
An overview of the project concept, brief and timelines. An introduction to serious games.	An introduction to the game development process.	An introduction to game idea development, game design documents and mood board development	An introduction to concept art development and storyboard development.	An introduction to animatic development (based on storyboards).	An overview of Unreal Engine	Further techniques with the Unreal Engine	Final Presentations and Discussions

It was agreed that the flipped classroom approach would provide online video-based lessons which were 30-40 minutes each and which would also include a series of activities which each group should select and perform in-class. These were made available to students at the beginning of each week and in-class time (45 minutes twice a week) would be given to development of assets, asking questions, sharing observations, group discussions and collaborations and completion of the requested activities. Some of the software identified under section 2.10 ("Videos, images and animations") was used for development of the video-based lessons. A range of Technology Enhanced Learning tools were to support many in-class activities, such as software identified under 2.11 ("Mental and Conceptual Maps"), 2.12 ("Word Clouds") and 2.17 ("Online brainstorming").

Also built into this timeline were a number of periodic review sessions in which students were required to present their work to date for review in-class. An initial review of the game idea and moodboard occurred after week 3, a review of game concept assets after week 5, etc. With all of these instructional decisions agreed, students were then divided into 11 groups (with approximately 4-5 students per group), asked to collectively agree an ethical and/ or social issue to base their game upon, and the project proceeded.

Timeframe	Parts of the lesson	Teaching strategy	
		Working forms	Tools

5 min	An overview of project progress	The whole class	Presentation, Kahoot
5 min	A quick recap of the latest video lesson(s)	The whole class	Video, Presentation
10 min	Open discussion and debate	Group-based Led by instructor Students to discuss, debate, tec.	Mindmaps, Word Clouds, Online Brainstorming
10 min	One on one discussion & problem solving	Individual/ Group	N/A
15 min	Time for working on In-class activities	Group	N/A

It was agreed that evaluation would be based on the developed games as well as a final presentation in-class in week 8, in which student groups would present on everything which they had achieved during the project, from their initial game idea, to the game assets which they had developed (i.e.: concept art, storyboards, animatics, etc.) to any prototypes which they had developed in Unreal Engine.

The social/ ethical areas on which the student groups based their games were primarily related to 4 main areas:

- Environmental/ Sustainability issues (4 of the 11 groups developed games based on this)
- War and Refugees - (4 of the 11 groups developed games based on this)
- Poverty/ Homelessness - (2 of the 11 groups developed games based on this)
- LGBT issues - (1 of the 11 groups developed games based on this)

Data Gathering and Feedback

Kirkpatrick & Kirkpatrick's (2007) model of evaluation was chosen to structure the evaluation process for the initiative. The effectiveness of the "Press Start" initiative was considered against four levels:

1. Student reactions to the initiative.
2. What students learnt by engaging in the initiative.

3. If students identified any changes to future behaviours as a result of participation.
4. How the initiative could be improved and re-run.

A questionnaire and two focus groups with participating students were adopted to gather data across all four levels. Both were structured with questions designed, where possible, to address each of the levels identified. Each focus group featured 6 questions/ discussion points. The questionnaire featured 12 questions, 9 of which presented a five-level Likert item, 3 of which were open-ended text questions. The questionnaire was distributed as a hard copy and was anonymous to encourage honest feedback. The total number of questionnaire respondents was 35. Two focus groups were held with 6 students in each focus group and were audio-recorded to facilitate analysis. Both the questionnaire and the focus groups took place before the final student presentations on everything which they had achieved during the initiative.

The flipped classroom approach undertaken generally received quite positive feedback and students identified that it had been effective in what it had attempted (In relation to a positive disposition to the flipped classroom approach, 24% of the respondents identified their opinion as "Definitely yes". A further 40% identified their response as "Yes"). The approach undertaken was considered to be very effective, but a common suggestion made by participants to improve the process related to more frequent interaction with software earlier in the process, suggesting that a key element in the process was giving students time to begin engaging with software, etc. early on in the process ("Even if we aren't being taught about it, we can use it ourselves and get used to it before the video lessons cover it"). Feedback from the focus group suggested that the primary areas in which participants felt most confident in what they had learned related to the process of working an idea from initial conception to actualization within the game development software ("The best part was learning about being able to use ideas - use your imagination and then make it", "The process of making something like that - finding a good way to do stuff"). Participants noted that they had learned a lot around the use of game development software but that this software, for many, had been the most challenging in terms of learning how to use it ("it was kind of like a puzzle, but there was a lot of satisfaction when you got used to it"). Sentiment analysis from the focus group collated with much of this feedback, identifying that much of the general reaction to the project and towards the flipped classroom approach was positive, with many of the focus group participants identifying that they enjoyed the project but that the game development software and game character design software was quite complex to use and that the game development software could be introduced earlier into the process to allow more time to work with said software. Students also suggested to spread the initiative over a longer period of time, allowing students more in-class time and space to complete the activities and reflect and discuss their experiences.

1.3.   Conclusions and Recommendations

Based on the experiences outlined above, and drawing from the evidences outlined in this book, a number of conclusions on the use of the flipped classroom can be reached.

- A key element mentioned earlier is to avoid a prescriptive "one-size fits all" approach. While a class can be provided with the same material outside of class and pursue the same activities in-class, it is important to remember that each learner is an individual and will interpret and pursue information in a different way. You should give the learners space to consider and follow a range of ideas, instead of dictating what they specifically should or should not do and anticipate that not all learners in the flipped classroom will end up with the exact same results.
- The flipped classroom requires that students work in groups. Even if the students' work is individual, they are generally required to engage in group activities in-class and certainly one of the benefits of the flipped classroom relates to the ability of students to hear from their peers and engage in activities with their peers, such as discussion, debate, collaboration, etc. To this end, it is important to be aware of group dynamics and to ensure that group activities are structured. It is also important, if at all possible, to encourage students to take part in group activities as much as possible.
- Certain skills and knowledge related to learning activities will allow one to get more from the flipped classroom approach. While the flipped classroom is a highly effective and dynamic approach, it does require a certain amount of pre-existing skills in order to best facilitate it. In-class activities such as discussion, debate, collaboration, etc all bring their own challenges and require certain activities of their participants. The more familiar and comfortable a class is engaging in these activities, the more they can get from the experience.
- You may find different experiences between different target audiences. Similar to the previous point, different target audiences may find the approach more or less effective than traditional classroom learning based on their own abilities, familiarity with the subject being taught, their ability to learn independently, etc. In the two examples given, the instructors who were taught video were more comfortable engaging in independent learning and needed little guidance apart and were ready and willing to engage in the face-to-face sessions. The students being taught game development were slower to engage in the face-to-face sessions and some feedback gathered identified that some students would have preferred more structure and more guidance on how to work within the flipped classroom approach.
- There may be a temptation with the flipped classroom to give students too much space and to assume that they are working contentedly on material. While the flipped classroom may require students to engage in independent study and for them to "own" their learning, it is essential to engage with students as an instructor in the face-to-face sessions to allow them the opportunity to ask questions, seek clarifications, etc. It is recommended that in-class sessions therefore be facilitated as often as possible and to structure these in order to best facilitate students.

- It should be noted that the flipped classroom approach may not be appropriate for all students and every subject and it should always remain the decision of the teacher themselves if, when and how to use the flipped classroom to facilitate learning. What is key to determining this is to examine what is to be taught and to identify the appropriate online resources and the in-class activities that can be undertaken which are of genuine relevance to the learning required. If there are not in-class activities in a particular subject which would realistically facilitate learning, then the flipped classroom approach may not be applicable.

1.4.   A potential Flip IT! Flipped Classroom Adoption Model

Based on the results contained in the Flip IT! Project and based on the above experiences, as well as on foot of the experiences of the consortium, some general guidelines and a model for introducing the flipped classroom - both to teachers and students - are presented below, which is orientated towards specifically addressing the multiple critical elements of European VET.
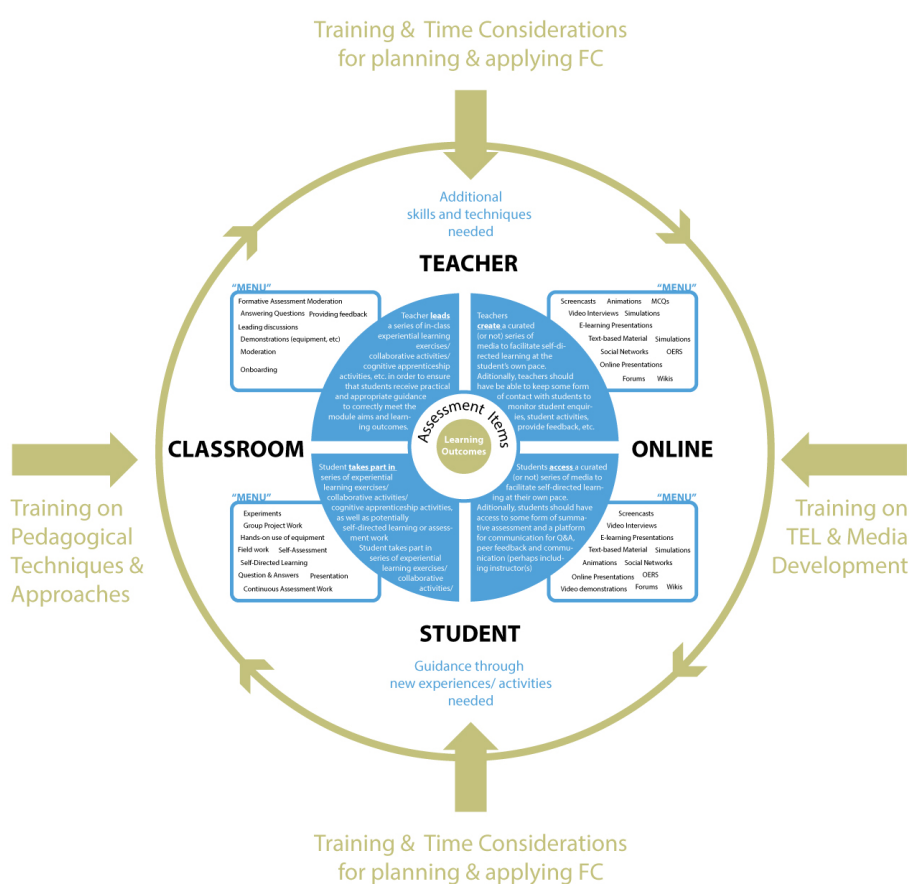
There are a number of key elements to consider as part of this model:

Overall Instructional Goals

At the core of this model is the Overall Instructional Goals. These are to be determined by the teacher/ institution and should ultimately refer to the learning outcomes of the given course of study. Ideally, the instructional goals could be summarized in a single sentence and the learning outcomes guided by this.

Assessment Items

The assessment items involved in the course of practice lie outside of the instructional goals but it is extremely important in the selection of the assessment items that these correlate directly with the learning outcomes (in an effort to ensure constructive alignment). On this basis, it is important that the appropriate method of assessment be selected and that non-traditional methods of assessment be considered as part of this. The flexibility of the flipped classroom in potentially providing in-class time to students to, for example, engage in project work or in application of the skills and knowledge they have learned outside of class, could facilitate numerous methods of continuous assessment, as opposed to a single summative assessment (e.g.: written or MCQ exam) at the end of a module.

Online

It is recommended that time and activity outside of in-class time take place in a primarily online format. Both teachers and students may need to be provided with training related to developing and accessing digital support learning material. Considerations therefore need to be made for logistical considerations like training for new skills development, available time and resources for developing and engaging with online content, etc.

Teacher's Online Role

The role of the teacher from an online perspective in this approach lies in the creation or sourcing of a series of media to facilitate self-directed learning at the student's own pace. This media could include screencasts, video and audio recordings, development of rapid e-learning, narrated lectures, etc. Students should be able to use this content to engage in self-directed learning in order to adequately prepare for in-class activities related to applying, discussing or analysing this information. Additionally, teachers should engage in communication with students while online in order to monitor student enquiries, student activities, provide feedback, etc. The teacher's online role may require the development of skills in developing and/ or sourcing supporting learning material, curating this material and making it available to students (and others) as well as skills in online communication and collaboration.

Student's Online Role

The role of the student from an online perspective in this approach lies in accessing and absorbing the information contained in the curated series of learning support media, developed by the lecturer, to facilitate self-directed learning at their own pace. This learning content should then be applied in some way in actual in-class time (this is something which should be made explicitly clear to the student). To this point, it could be recommended that students be required here to engage in some form of formative assessment related to this material pre-class to ensure understanding/ evaluation, etc and/ or some form of communicative or collaborative activity. These elements have the added benefit of increasing

student digital literacy skills, as well as potentially building skills in communication, collaboration, independent learning, self-evaluation, etc.

In-Class

It is recommended that time and activity during scheduled in-class be given to the application of learned content. This can involve multiple combinations of various activities, including but not limited to discussion, hands-on demonstrations, application of learned content, etc. Both teachers and students may need to be provided with training related to utilising new (or not) in-class methods and activities. Additionally, it is important that all stakeholders (potentially including support staff, IT support, etc.) be clear on what the requirements and goals for the in-class time should be. Considerations therefore need to be made for logistical considerations like training for new in-class activities, available scheduled time and equipment, the overall module/ curriculum organisation, etc.

Teacher's In-Class Role

The role of the teacher during the in-class period will be to lead a series of in-class experiential learning exercises/ collaborative activities/ cognitive apprenticeship activities, etc. in order to ensure that students receive practical and appropriate guidance to correctly meet the module aims and learning outcomes, as well as ensuring that they become work-ready graduates.

Student's In-Class Role

The role of the student during the in-class period will be to arrive to class having absorbed the online learning content and having performed any associated online activities and to then, in-class, take part in series of experiential learning exercises/ collaborative activities/ cognitive apprenticeship activities, as well as potentially self-directed learning or assessment work.

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Annex 1 - The Net generation

The **theory of 'generations'** was developed in the early 1990s by the American sociologists Neil Howe and William Strauss. Each generation has its own 'character' – a character shaped by their most relevant economic, social and cultural activities and attitudes, however, there are no precise dates for when the cohorts start or end. Generation X was named to represent an unknown factor, and Y and Z were selected as the letters following X.

"THEY are variously known as the Net Generation, Millennials, Generation Y or Digital Natives. But whatever you call this group of young people—roughly, those born after 1980 —there is a widespread consensus among educators, marketers and policymakers that digital technologies have given rise to a new generation of students, consumers, and citizens who see the world in a different way. Growing up with the internet, it is argued, has transformed their approach to education, work and politics." (Economist online, England, issue on March of 2010)

Generation Y is the Yahoo, mobile phones, Google, Facebook, iPhone generation. According to the studies researching these changing attitudes, digital natives are:

- fascinated by new technology: they **use IT devices intuitively** and navigate the Internet proficiently, due to the fact that they spend many hours every day playing video games and being connected to the Internet;

- not too bothered about how technological gadgets work, and generally not even interested in the detail;

- reluctant to read large amounts of texts; they are more **visually literate** than earlier generations;

- commonly using more than one medium at a time: they watch TV, talk over mobile phones, listen to music or the radio simultaneously - they are familiar with '**multitasking**';

- **quick** at information consumption: they are used to receiving information very quickly, and expect immediate responses.

- using technology intensively in their socialization: they are willing to join physical, virtual and hybrid communities equally well.

The children of **Generation Z** (born after 1995) have never known a world without computers and cell phones. The members of Generation Z integrate technology seamlessly into their lives, use it from the youngest age. They are more visually engaged than their parents, educationally transformed, they are entirely **dependent on ICT devices**.

Annex 2 – Bloom's Taxonomy

Bloom's taxonomy **follows the thinking process**: we are not able to understand a concept without remembering it, similarly we cannot apply knowledge and concepts without understanding them. It is a continuum from Lower Order Thinking Skills (LOTS) to Higher Order Thinking Skills (HOTS).

In 2001 Lorin Anderson and David Krathwohl (students of Bloom) revised it using **verbs rather than nouns** for each of the categories, and rearranging the sequence within the taxonomy.

Source: https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

In 2007, Andrew Churches further developed and refined Bloom's Taxonomy to create Bloom's **Digital Taxonomy,** a taxonomy more aligned with 21st century learning. Here is a diagram that Andrew used to summarise Bloom's digital taxonomy:

Bloom's Digital Taxonomy

HOTS
Higher Order Thinking Skills

Key Terms

Creating — Verbs →

Designing, constructing, planning, producing, inventing, devising, making, programming, filming, animating, blogging video blogging, mixing, re-mixing, wiki-ing, publishing, videocasting, podcasting, directing, broadcasting

Evaluating — Verbs →

Checking, hypothesising, critiquing, Experimenting, judging, testing, Detecting, Monitoring, blog commenting, reviewing, posting, moderating, collaborating, networking, refactoring, testing.

Analysing — Verbs →

Comparing, organising, deconstructing Attributing, outlining, finding, structuring, integrating, mashing, linking, validating, reverse engineering, cracking, media clipping

Applying — Verbs →

Implementing, carrying out, using, executing, running, loading, playing operating, hacking, uploading, sharing, editing

Understanding — Verbs →

Interpreting, Summarising, inferring, paraphrasing, classifying, comparing, explaining, exemplifying, advanced searches, Boolean searches, blog journaling, twittering, catergorising, tagging, commenting, annotating subscribing.

Remembering — Verbs →

Recognising, Listing, Describing, Identifying, Retrieving, Naming, Locating, Finding, bullet pointing, highlighting bookmarking, social networking, social bookmarking, favouriting/local bookmarking, searching, googling.

LOTS
Lower Order Thinking Skills

COMMUNICATION SPECTRUM

Collaborating

Moderating

Negotiating

Debating

Commenting

Net meeting Skyping video conferencing

Reviewing

Questioning

Replying

Posting & Blogging

Networking

Contributing

Chatting

e-mailing

Twittering/Microblogging

Instant messaging

Texting

Source: http://eduteka.icesi.edu.co/articulos/TaxonomiaBloomDigital

Annex 3 - Pedagogical approaches related to the Flipped Classroom

Active Learning

Active learning is broadly defined as "*any instructional method that engages students in the learning process*" (Prince, 2004; Michael, 2006) and is associated with student engagement and critical thinking (O'Dowd & Aguilar-Roca, 2009). The flipped classroom offers the potential for **on demand feedback** and **interaction with the educator** through this active learning process. While active learning is not a new approach, or unique to the flipped classroom, more time and focus is given to it as a key element of the process. Using the flipped classroom approach, time is given to allow students to actively construct knowledge in a meaningful manner under the supervision and guidance of the educator. This allows both students and educators to assess and evaluate the learning (Huba & Freed, 2000) and, if necessary, "*fix faulty models*" (Michael, 2006).

Research shows that active learning is a powerful tool. The benefits for students is the development of abilities that are crucial for learners, such as, **critical thinking, team-work** and **informational literacy**. It encourages learners to be **self-directed** which is a significant skill that students will need to acquire in order to be successful in the 21st century.

Project-based learning, problem-based learning, and inquiry-based learning all closely relate to the information processing approach. They all fit well with technology-rich learning environments where the focus is not on the hardware and software, but on the **learning experience**. In each case, technology is used to facilitate learning. It may be a tool to organize ideas, search for current information, or present ideas. However, the focus of learning environment is the student's excitement about solving a problem or addressing an issue they find meaningful.

Project based learning

Project-based learning is a teaching method in which students gain knowledge and skills by investigating and responding to an engaging question, problem or challenge.

As John Dewey, a 20th Century American educational theorist pointed out, "*Education is not preparation for life; education is life itself*".

PBL applies across disciplines and consistently emphasises active, student-directed learning. PBL gives students an authentic, **real-world context** for learning, creating a reason for learning to occur. PBL also offers students choice and voice, personalising the learning experience either through their products or in the design process. Students face complex challenges when they complete their formal education; knowing how to solve problems, work collaboratively, and think innovatively are becoming essential skills - not only for their future careers but also for tackling difficult issues in local communities and around the world.

Inquiry-based learning
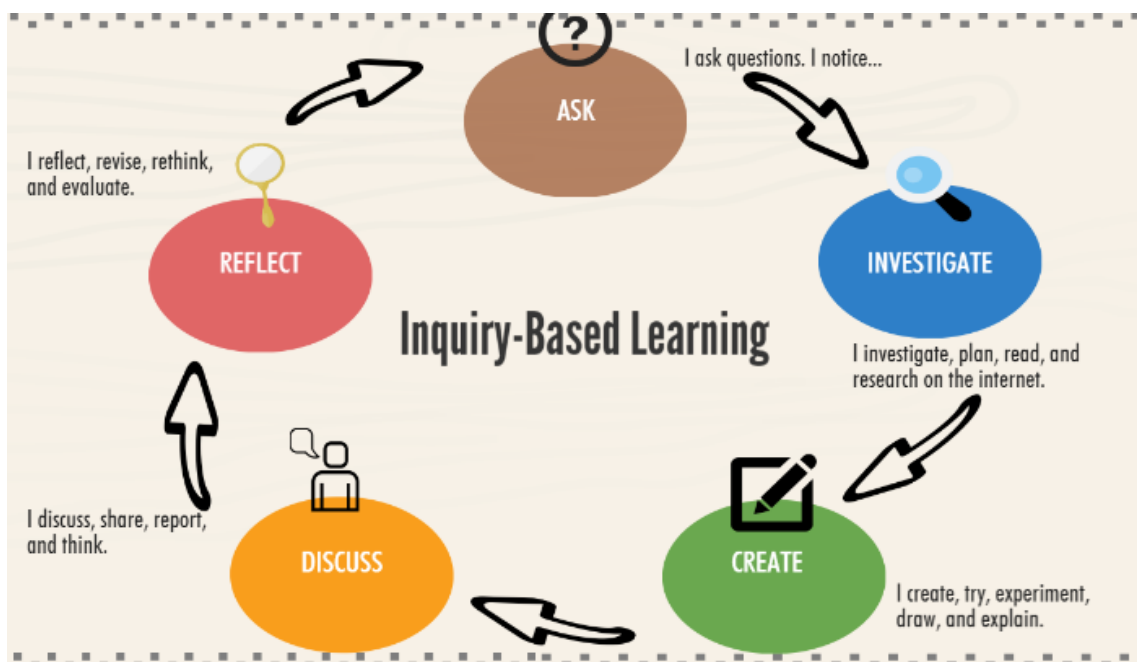
In our experience, children who are curious seem destined for success.

A curious child is motivated to ask questions, seek answers, and apply those answers to his or her personal experience. The good news is that, given the right conditions, every child in our classrooms can demonstrate curiosity, an attitude of wonder, and a desire to discover. **Curiosity and motivation** lie at the heart of inquiry-based education. This approach to learning has turned traditional classrooms into high-energy learning centres, where children are excited to learn and participate.

Inquiry-based learning starts by posing questions, problems or scenarios—rather than simply presenting established facts or portraying a smooth path to knowledge.

1. The first step in any inquiry is the formulation of a **question** or set of questions related to the topic of inquiry. Sometimes the question is referred to as a hypothesis or a problem statement.

2. Once a question is posed, pupils are encouraged to **investigate** the topic **by gathering information** from sources.

3. When enough information is gathered, it is **organized** in categories or outlined by highlighting the important information relative to the topic.

4. The information is **discussed and analyzed** for further understanding. The teacher can direct the discussion and highlight the implications that arise from the investigation and show how it relates to the solution of the problem.

5. **Conclusions** are made and related back to the original question. Student reflections are encouraged and serve as a way to relate back to the inquiry and retrace the steps that led to the conclusion.

Problem-based learning

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Problem-based learning involves students **working collaboratively** to solve complex open-ended problems in order to develop knowledge of content as well as improving "*problem-solving, reasoning, communication, and self-assessment skills*". Hmelo-Silver (2004) also notes the development of "flexible knowledge, [...] self-directed learning skills, [...] collaboration skills, and intrinsic motivation".

The problem is what drives the motivation and the learning. Rather than teaching relevant material and subsequently having students apply the knowledge to solve problems, the **problem is presented first** El problema es qué impulsa la motivación y el aprendizaje. En lugar de enseñar material relevante y, posteriormente, hacer que los estudiantes apliquen el conocimiento para resolver problemas, el problema se presenta primero.

Students generally have to:

- Examine and **define** the problem.
- **Explore** what they already know about underlying issues related to it.
- Determine what they **need to learn** and where they can acquire the information and tools necessary to solve the problem.
- **Evaluate** possible ways to solve the problem.
- Solve the problem, **test** the best solution.
- Evaluate results.
- **Report** on their findings, **share** results.

Nilson (2010, p. 190) lists learning outcomes associated with problem-based learning. A well-designed problem-based learning project provides students with the opportunity to develop skills related to:

working in teams	managing projects and holding leadership roles	oral and written communication
self-awareness and evaluation of group	working independently	critical thinking and analysis
explaining concepts	self-directed learning	applying course content to real world examples
researching and information literacy		problem solving accross disciplines

Fuente: (Nilson, 2010)

Peer assisted learning

Peer assisted learning is defined as "the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions" (Topping and Ehly, 1998). Peer-assisted learning complements independent study and direct instruction, and helps to provide timely intervention to reduce misconceptions early through rapid feedback from peers.

Cooperative learning

Johnson & Johnson (1998) define cooperative learning as that which involves students working together in teams to accomplish a common goal under specific conditions. According to the authors, these elements include positive interdependence, individual accountability, face-to-face promotive interaction amongst group members, appropriate use of collaborative skills and group processing. Smith and MacGregor (1992, pp 15) acknowledge that cooperative learning "represents the most carefully structured end of the collaborative learning continuum".

Peer instruction

Peer instruction (or peer tutoring) pioneered by Eric Mazur, is a "cooperative learning technique that promotes critical thinking, problem solving, and decision-making skills" (Cortright, et al., 2005) and is often facilitated by linking older or higher achieving students with younger or lower achieving students. Hamdan and McKnight (2013) note, however, that this approach is nothing new and has long been championed by teachers with Bloom observing, some thirty plus years ago, that "continuous feedback and correction students receive during one-on-one interactions significantly improves learning and achievement".
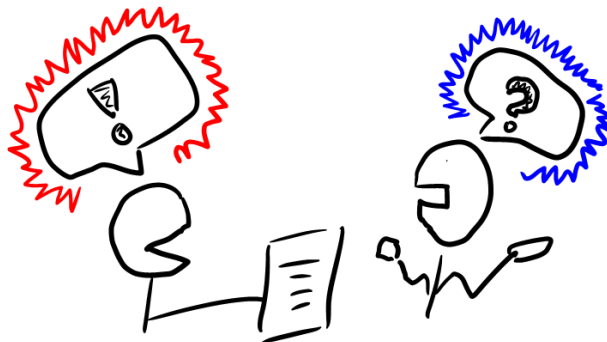
Priming

The flipped classroom model supports research on priming of memory, which shows that by exposing learners to something, their recall of that, or an associated, stimulus is later improved due to this prior experience (Bodie et al., 2006;).

As Kadry and El Hami (2014) observe with regard to the flipped classroom, "by providing students with direct instruction outside of the classroom, they are in essence 'primed' for the active learning tasks carried out in the flipped classroom".

Pre-training

Similarly, pre-training aims to reduce the cognitive load on learners by providing some instruction or information, e.g. giving "the name and characteristics of key concepts" (Clark & Mayer, 2003) to learners before they learn something in depth. This allows for some of the processing of this information to be carried out in advance thus preventing the learner's working memory from being overwhelmed. Various studies across multiple disciplines (Mayer et al., 2002; Pollock et al., 2002; Ayers, 2006; Mayer, 2009; Musallam, 2010) have supported the application of pre-training suggesting the effectiveness of pre-training, as used in the flipped classroom model, when managing and processing complex concepts.