Responsive Vocational Education

Preparing VET Students for Tomorrow's Labour Market

I.

Teaching Practices Revisited

Preparing VET Students for Tomorrow's Labour Market: Teaching Practices Revisited

IF YOU HAVE ANY QUESTIONS REGARDING THIS BOOK OR THE PROJECT FROM WHICH IT ORIGINATED

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Preface

This book is the first volume of two resulting from the Erasmus+ „Reacti-VET - Teachers for Reactive and Responsive Vocational Education" project, which ran from 2019 to 2021. The content was developed by the project team (from Hungary, Italy, Estonia and the UK), pulling on its long and collective experience of vocational education, 21st century teaching methods and eLearning.

The goal of the project was to develop a new, responsive methodology which will enable leaders and teachers in vocational education to respond quickly to address skill gaps identified by the labour market, which itself is changing at a pace never experienced before. The focus of the underlying methodology exploits the hidden pedagogical potential and creativity within vocational schools by establishing local partnerships with all relevant stakeholders in vocational training, i.e. teachers, students and companies alike.

This first volume is based on the learning materials developed for the online Reacti-VET training programme used to upskill vocational teachers - „Preparing VET Students for Tomorrow's Labour Market: Teaching Practices Revisited". This upskilling course provides guidelines for vocational teachers wishing to develop their own collaboration with local actors in industry and working with them to implement a tailored „responsive project" aimed at delivering an upskilling micro-course for their students. These micro-courses – integrated into the curriculum and using active and digital learning methods in a blended form – teach specific chunks of knowledge and skills not included within the standard curricula but which have become essential skills and competences required of students for today's job market.

The chapters of the book assist teachers to expand their own professional portfolio with 21st century, active teaching methods, including particular skills for planning learning outcome-oriented blended courses delivered within a virtual learning environment. The chapters also offer practice-oriented guidelines for finding and making use of interactive digital tools and online 'apps' for managing a responsive project within a collaboration of relevant stakeholders.

The second Reacti-VET volume provides a detailed description of the responsive project methodology as used in pilot projects carried out in Hungary and Estonia. The teachers who took part in the initial upskilling pilot used what they had learned and experienced to plan and develop their own micro-courses for their subjects and students. The project teams – involving these teachers, their students and local companies - share their project results and their experiences in this second book.

We offer these books to all teachers of vocational education who are motivated to refresh and reorient their teaching practices by adopting accepted 21st century teaching methods. This will hopefully help them to reactively address the professional needs of their students in the ever-changing labour market, but also help them to further enhance their own continuous professional developments as well.

I would like to express my thanks to all Reacti-VET project partners, to all the experts and teachers who worked with us on these developments, and to the Hungarian National Agency - the Tempus Foundation - for supporting us over the period of this Erasmus+ project.

Hartyányi Mária, iTStudy

1

Data collection and analysis

The networked 21st century school: the opportunities for, and responsibilities of, teachers; digital tools for external and internal communication; data collection and analysis.

1 Reactive teachers - adaptive vocational education

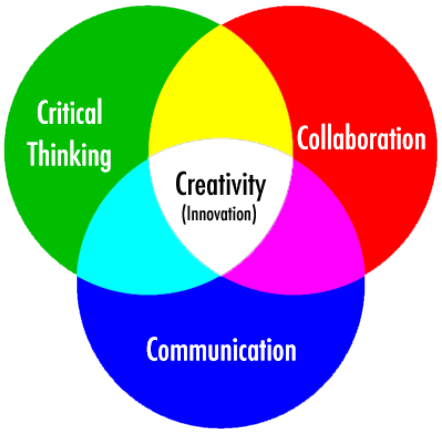
LABOUR MARKET - THE DEMAND SIDE

Education, and in particular vocational schools, have never faced such complex challenges as in the age of the Fourth Industrial Revolution1. Digital transformations are re-shaping the way we are working and doing business, the rapid changes of technology are drastically altering all industrial sectors, and digital skills are essential for all jobs - from the simplest to the most complex.

Meanwhile, Vocational Education is being asked to develop job-specific skills relevant to the latest technology, but also to focus on transversal skills - now-a-days referred to as the "4Cs":

1. **C**ritical thinking
2. **C**ollaboration
3. **C**ommunication
4. **C**reativity - crucial in all types of activities.

Jacob Morgan: The 5 Trends Shaping the Future of Work



4C's concept in educations
Source: Azizey Shurki

1 https://www.weforum.org/agenda/2016/01/what-is-the-fourth-industrial-revolution/

WANTED: CREATIVITY!

Internal initiatives have been emerging within large multinational companies aimed at motivating the work force to create new solutions to problems they face at work, or to suggest innovations that can make operations more effective.

Employees in various fields are encouraged to work together in groups to progress ideas and innovation. Even if their ideas are not implemented, their initiative is generally awarded in some way. Neglecting the development of such innovation can lead to a failure by companies to fully meet their performance targets in particular periods, resulting in lower rewards in following periods.

Innovation is built into the general responsibilities of staff at successful companies such as GE Aviation, GE Power and Siemens Ltd., among others.

VOCATIONAL EDUCATION - THE SUPPLY SIDE

While society and the labour market need an immediate response, the hundreds-of-years-old education system (little changed from the time of Socrates?) moves like a giant oil tanker, unable to change from one day to another. It is not uncommon to have students learning from textbooks published ten years ago.

> *"From the user experience point of view, text books are out of date when they are printed and very out of date by the time they reach the age at which a school would normally retire them from use. However examiners expect current material. Students therefore tend to get out of the habit of using the book for study and as a consequence they can have difficulty in relating theory to practice."*[2]

Vocational education is perceived as "*occupations-specific education and training geared towards securing supply of skilled labour*" (CEDEFOP[3]). Attempting to fulfil its mission has never been so difficult as it is today. Almost daily we hear about "skill gaps" - the mismatch between skills supply and demand in the labour market. VET qualifications are based on standard curricula that precisely define what should be taught, and most systems have complex and long accreditation procedures, so the approval of a new curriculum - or even the modification of an existing one - usually takes such a long time that it becomes obsolete before the procedures end.

WHO ELSE CAN CHANGE IF NOT TEACHERS?

Recent research concluded that the main players with the potential to initiate the changes needed to renew education are none other than the teachers themselves.

"In educational institutions, it is teachers and trainers who have most impact on learners' performance. They can inspire and help learners to acquire higher and more relevant skills. They also play a key role in introducing new teaching and learning methods, in stimulating creativity and innovation, in overcoming biases and in bringing out the best in increasingly diverse classrooms."

These conclusions were reflected in the Education and Training Monitor published by the EU Commission in 2019.

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[2] Philip Hall, Teacher, Edinburgh Academy, UK

[3] European Centre for the Development of Vocational Education

Teachers first: excellence and prestige for the European Education Area

Source: Shutterstock

"Among all factors in the school environment, teachers are considered to have the greatest impact on students' learning outcomes.

Any policy effort seeking to improve educational outcomes – or the efficiency of education and training – is bound to take a close look at the role of teachers and look for ways to help teachers excel in what is a demanding profession. New evidence from the OECD TALIS survey sheds additional light on the potential role of teachers. Recent survey data informed the 2019 Education and Training Monitor, which contains a dedicated analysis of schoolteachers in the EU. As a unique source of information on teachers' motivations, lifelong learning and careers, this new evidence from TALIS 2018 can help policymakers to harness the full potential of teachers by preventing and addressing challenges." (Education and Training Monitor 2019)

START WITH DATA COLLECTION

The schools are forced "to get out of the box" and open up towards wider collaboration and more intensive communication inside and outside of the school walls. The traditional way of entering the classroom, closing the door, and simultaneously excluding the outside world is the antithesis of reactive teaching.

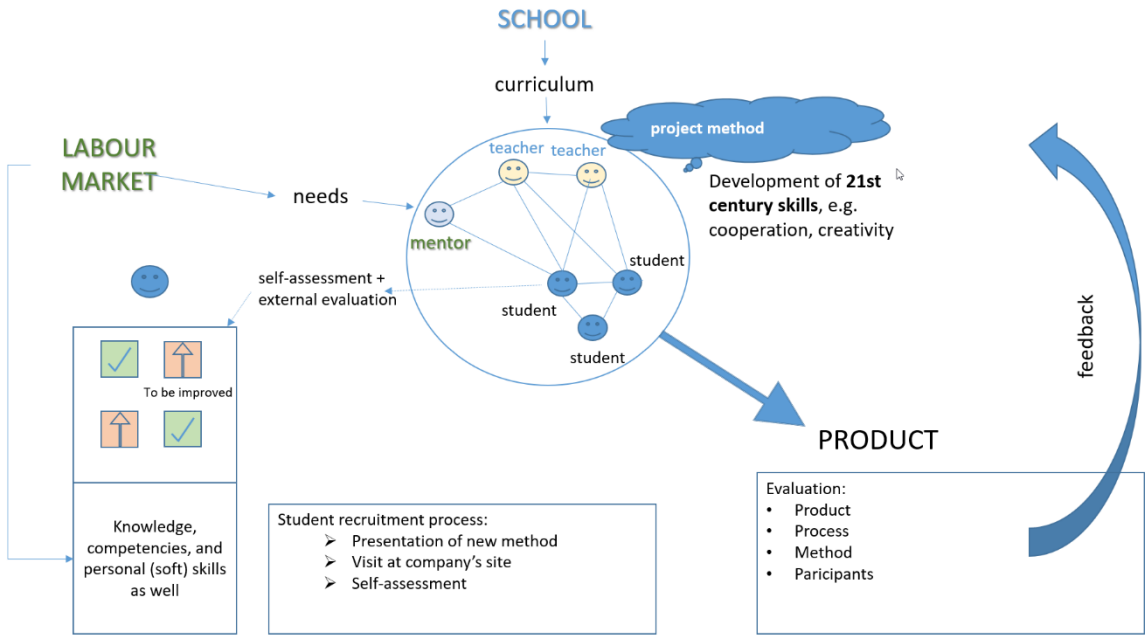
Collecting and processing feedback from all parties, gathering information by using digital platforms and tools, working in teams and involving professionals from business into teaching - and even into developing training programmes - should become a daily routine for teachers if they want to narrow the skill-gaps.

The following "reactive" model illustrates how teachers, together with labour market actors, can identify a project task that requires the very knowledge and skills needed by companies, but which are not necessarily included in the curriculum. The work starts with data collection and ends with a "reactive exam", where the teams of students present the result of their projects and the process by which they managed to accomplish the task.

In this module we deal with the first step: methods and digital tools for data collection and analysis. However, we would like to give insight into the adventure as a whole and invite teachers to not only try out the draft model but to collaborate in improving it as well!

Step 1 Initiating Upskilling
The Reacti-VET methodology is presented to students, teachers and employers alike.

As a first step, students should ideally be able to visit the sites of potential employers to understand the range of skills that industry requires. This early insight will give them an understanding of current skills needs, which will help with their understanding of why they are learning particular topics. Those students, teachers and company representatives who are interested in preparing these future learners will hopefully form a project team to work together over a semester or longer. The methodology of Reacti-VET is summarised in the figure below.



Reacti-VET model
Source: Own figure

Step 2 Identifying the skill gaps
Establish teams, data collection activities, gather information, start the all-important communication with companies. The labour market representative defines the required knowledge, competences and personal skills related to a specific job or profession. The team then selects a part of it that can be covered in one semester.

Students may perform a self-assessment of the specified requirements at the beginning of the process to gain an understanding of their particular skills gap. At the same time the teacher can also perform an assessment of these students, based on the same scale (it is interesting to then compare this external evaluation with the students' self-assessment.)

Step 3 Collaborative content and course development
Based on the assessments and the company's requirements, an upskilling course is created in close cooperation of teachers and company representatives - and possibly even students (for example, they might find useful and relevant online resources, or even create them for specific needs). The

company assigns a task to the students that will serve as their final product for the project. The upskilling training should then support the completion of this task.

Step 4 Running the upskilling course
The upskilling course is carefully planned and delivered (as a project) partly within the school, partly within an online environment, and it may also involve consultations with the company, if that is practical and possible.

Step 5 Assessment
After the completion of the course, the product is evaluated by the company, and the whole process and method is evaluated by all participants (teachers, students, company). Successful elements are highlighted, and improvements are suggested for the future.

The student self-assessment and external evaluation is performed again (the same as performed earlier) to see the improvement.

2 From data collection to data analysis

HOW TO ANSWER THE QUESTIONS POSED BY ANDREAS SCHLEIER?

"Employers and teachers need to work far more closely together to help broaden young people's horizons and raise their aspirations. For those with the right knowledge and skills, digitalisation and globalisation have been liberating and exciting; but for those who are insufficiently prepared, they can mean vulnerable and insecure work, and a life without prospects.
As an educator, how are you ensuring your students have the right knowledge and skills to navigate the world of work in the future?
What messages are you conveying to students about future education and occupation possibilities? Are students at your school introduced to a wide range of careers options and opportunities?" (Andreas Schleier, Director for Education and Skills at the OECD)

One of the key issues in education today is how to improve the quality and relevance of learning/teaching in vocational schools.

Vocational training organizations work on the basic principle that their students should be prepared to make a positive contribution to the economy and therefore these students must have a realistic expectation for their economic prospects. Consequently, the perception of quality and relevance of VET education focuses on the status of this economic relationship and it is therefore extremely important for VET institutions to maintain a respected reputation among entrepreneurs and the local community.

Being linked in this way to the world of work not only means responding positively, if mechanically, to the current needs of companies and industry, but also being able to develop an ability to anticipate upcoming professional trends in the labour market, tailoring training programs accordingly and introducing innovation into the curriculum.

In order to meet and match those expectations, vocational education organizations must keep up a close and constant relationship with the physical, economic and industrial environments that they prepare students for, to follow the demands of the labour market, to recognise trends and to adapt to them quickly.

WHY COLLECT DATA?

We all like to get feedback from our customers, our users of a process, on a product, or on a particular approach we might have taken to satisfy a need. We like to know what we did well, but also what might need to be improved to help us do it better in the future.

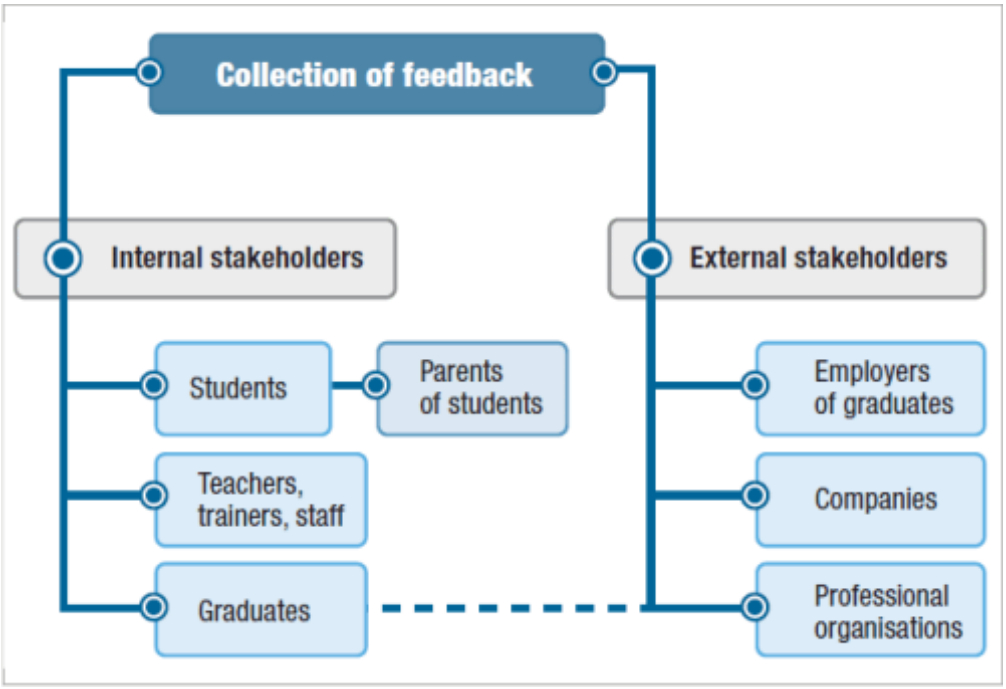
Among educational researchers, there is a debate about who the customers of a school are - the students, parents, society, employers or who?

As a consequence, one of the main tasks of the vocational schools is to involve all relevant stakeholders into their teaching processes. To do so requires schools to build effective relationships, to communicate and collaborate effectively with stakeholders, and to collect data from regular feedback. The goal is to be involved in a continuous improvement of the educational services provided.

Stakeholders have a 'stake' in the school and its students in the sense that they may have personal, professional, civic, or financial interests in the well-being of the school. In education, the term 'stakeholder' typically refers to anyone who invests in the welfare and success of a school and its students. These generally include administrators, teachers, staff members, students, parents, families, community members, local business leaders and companies who will be the future employers of graduate students.

Stakeholders can be divided into two main groups:

1. internal stakeholders (like colleagues, your principal, students, technical and administrative workers, funder)
2. external stakeholders (e.g. education authorities, parents, employers of graduates, companies, professional organizations, etc.)



Source: Cedefop (2015)

The most important stakeholders from a teacher's perspective are the **students** so, obviously, their feedback is the most valuable.

To solicit feedback, a questionnaire survey can be conducted, ideally at least once a year. The simplest tool to be used for this type of activity today is the Internet. Questionnaires may include personal information (guaranteeing anonymity), information about the institution and the services it provides (such as the library or dining facilities), but questions should also focus primarily on the learning process. We might ask:

- how well students are aware of their expected learning outcomes
- how relevant is the theory and practice
- how new media is being used
- what self-organizing learning opportunities are there
- how transparent are the performance assessment methods.

Parents may be asked about how they think teaching has improved their child's knowledge and competences, or what positive and negative feedback they receive at home about the school, classes, and even their VET teachers.

It is advisable to ask **teachers**, trainers or other staff members about the institution's quality culture, leadership methods, opportunities for participation, satisfaction with communication and information, the workplace atmosphere, and conflict management methods.

The employment record of **former graduates** is also very important for the performance of the vocational education institution. Surveys provide data on whether graduates were able to meet the expectations of employers and the job, how the knowledge gained at the workplace was utilized, and how the skills acquired at school prepared them for life and/or work.

It is very important to ask employers too, not just graduates, to determine to what extent graduates were prepared for the skills and competences required, and to what extent these skills were able to contribute to students' career development.

Company feedback questionnaires, on work experience and on the quality of workplace training, are also a reflection of the quality of communication and collaboration between companies and schools. They provide feedback on the quality of teaching, the curriculum and assignments, and problems that might emerge during the school year.

Finally, **other stakeholders**, such as chambers of commerce and industry, trade unions, employers' organizations or disadvantaged groups, can also be surveyed for their comments on issues related to the quality of institutional work and the image of the institution.

Strategies for collecting feedback from stakeholders include:

- Active communication and publication activities, closely involving external stakeholders in the practices of the school
- Soliciting regular feedback through question-based surveys
- Invitations to events and workshops
- Building networks and establishing cooperative projects with local companies.

The most important characteristics of data collection are:

- regularity
- transparency
- timeliness.

Well-organized data collections should be retrievable, comparable and supporting of the educational organization's self-monitoring, monitoring processes. In addition, by regularly monitoring the learning outcomes and industrial needs of the workforce, schools can be much more effective in updating their teaching programmes.

When gathering data, we concentrate on information that is meaningful. People do not have time to waste and will only dedicate time to answer or to fill in questionnaires that make obvious sense. They also appreciate feedback as it shows that their contribution was valuable and potentially initiated some meaningful change.

HOW TO START?

When the time comes to collect data, it is essential to identify the objectives and set out a survey plan that covers:

- the target group
- the methods to be used
- the time schedule
- the data to be collected
- the responsibilities of each person taking part.

It is useful beforehand to gather reference data from other schools or organizations to compare with the new data to be collected. These are potentially obtainable from existing databases, for example of graduation rates.

An example of a survey plan:

Objective	*Before starting, the aim of the survey has to be described by the leader of the investigations (teacher/the leadership of school).*
Target group	*Who are the targeted stakeholders?*
How?	*What kind of methods should be used?*
When?	*You should decide the frequency and regularity of the data collection.*
Who?	*Who will collaborate in this work?* *Who will be responsible for data collection?* *Who will be responsible for data analysis?* *Who will be responsible for communication?*
Reactions	*How the results will be used? What kind of activities, changes will be carried out depending on the results, who are the decision makers?*

In defining the aim of the survey, it is worth considering some preliminary questions that we would like to see answered by the result of the survey. For example:

- what are the skills and knowledge areas that are not covered by an existing curriculum, but which the companies involved will need?

While planning a survey to collect information about the needs of the labour market, it is likely that we already have some assumptions about the gaps identified by following job offers and advertisements. In this case, the result of the survey will be used to confirm if our initial hypothesis is true or not for the companies surveyed.

- The initial hypothesis related to the aim of the survey is called **null hypothesis**. The result of the survey will confirm whether this is true or not.

As you have learned earlier, data can be collected in various ways, though many are really the domain of the serious researcher. There are widely used online tools that require minimal effort, for example Google Forms, and you should be able to find useful templates for different purposes and for various questionnaire formats.

WHAT KIND OF DATA TO COLLECT?

Personal data

When performing a survey, you may need to collect personal data from people being questioned. As personal data is considered to be very sensitive data, collecting and managing personal data is regulated by law applicable to the whole area of the European Union [4].

Qualitative data

We collect qualitative data when we want to understand the social reality of individuals and groups, and the feelings of participant. We usually gather such data when we want to find answers for questions that ask “why” and “how”. The main methods for collecting qualitative data are:

- individual interviews
- focus groups
- observations.

Because of the subjective nature of qualitative data, it is difficult to apply conventional standards of reliability and validity, while analysing them is also prone to difficulty owing to the subjective nature of responses.

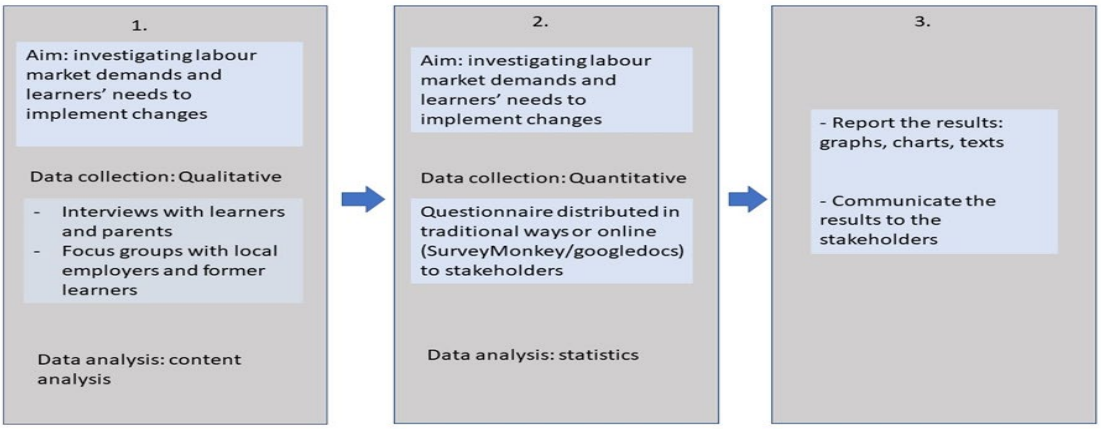
Quantitative data

This represents information on quantities and numbers. Data gathered in numerical form can be ranked, categorized, or measured objectively. Using quantitative data, you may construct graphs, charts or diagrams to visualize feedback and for reaching a clear conclusion. For example, a questionnaire containing rating scales or closed questions will generate quantitative data as it provides numerical data or data that can be categorized.

[4] The European Data Protection Regulation is applicable as of May 25th, 2018 in all member states to harmonize data privacy laws across Europe: https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu_en. On the website, you can choose your national language to read the content.

METHODS OF DATA COLLECTION

Interviews are a relatively simple process for collecting and analysing both qualitative and quantitative data in order to get a direct perspective on a topic:



INTERVIEWS

For a teacher, gathering a learner's needs and opinion is fairly easy as they are in constant contact on a daily basis.

However, such interpersonal discussion is very much a qualitative method of data collection and, as such, it is difficult to summarize and explain numerically. What it does do is help you to get a clear picture of their feelings and motivations beyond simple 'yes' or 'no' answers. Do bear in mind that it is still necessary to do a content analysis when conducting qualitative research.

Here are typical questions that might be asked of students.

1. *Are lessons interesting?*
2. *Is the necessary equipment readily available and do you get help to use it effectively?*
3. *Do you have the resources you need to learn from, e.g. hand-outs, books, computers, software, Internet access?*
4. *Do you have ample opportunity to talk to your teachers about your learning and progress?*
5. *Do you get the opportunity to get on with the work yourself, e.g. searching for information or practising skills?*
6. *Do teachers help you if you have difficulties or if you want to find out more?*
7. *Do you and fellow learners get a chance to talk about your job perspectives?*
8. *Is the atmosphere in lessons conducive to learning?*
9. *Is there plenty of opportunity to discuss relevant topics with other learners as well as teachers?*
10. *Do teachers let you know what work you will be doing throughout your programme?*

Schools should do more than just respond mechanically to the needs of companies. They should also be able to anticipate upcoming professional trends and needs in the labour market and react accordingly - adapting the content of training programmes and introducing innovation into curricula.

A teacher who is devoted to his/her special professional subject will usually follow changes in that field and collate information about the latest trends from relevant resources. Now-a-days the Internet provides an unlimited opportunity to stay up to date. However, the actual needs of

companies in particular regions may differ from the general trends, so it might be important to collect local or regional data in order to refine the picture. This is one reason why schools may need to meet representatives of the local (regional) industries in order to gain information on their perspectives and hear their needs.

Reflective Activity

How is the rate of change in your special subject? Do you have time to keep up with any changes? How well does the standard curricula of your subject area follow the needs of this area? Are you able, or allowed to, integrate new trends and practices into your lessons?

FOCUS GROUPS

Focus Groups are a tool that schools are increasingly using – and successfully – to assess the views of external stakeholders.

A focus group is a tool through which a group of people are brought together and asked to express their opinions – on the quality of a product or service, on concepts or ideas, or to discuss new trends and developments. By definition, a focus group is a gathering of people deliberately selected to participate in a planned discussion, either in person or possibly online.

While interviews always occur on an individual basis, members of a focus group might interact and influence each other during the discussion.

Focus groups are a **qualitative technique** for **data collection** and a type of investigation for soliciting open-ended thought and feelings from participants, unlike **quantitative research,** which involves numerical-based data collection. A focus group typically consists of around 6 to 12 target members engaged in a discussion led by a research moderator.

The focus group is used mainly to:

1. *generate research hypotheses that can then be checked via a quantitative phase of the research;*
2. *stimulate new ideas and creative concepts;*
3. *generate opinions and impressions relating to specific topics of interest;*
4. *know how to express a phenomenon of interest. This can be useful in the creation of questionnaires for a quantitative phase of research;*
5. *collecting opinions and impressions relating to specific topics;*
6. *understand and explain data collected by a questionnaire, etc.*

Focus groups in VET schools can be run by involving different, internal and external stakeholders, e.g. teachers, students, representatives of companies, etc. The group can be:

- homogeneous (invited students only), or
- heterogeneous with participants from different stakeholders.

Both types have their own advantages and disadvantages:

- *Homogeneous groups have the advantage of a greater openness and potentially more open communications, but they run the risk of conformity.*

- *Heterogeneous groups have the advantage of richer and more varied discussions, but they have a risk of generating conflict without gathering usable data.*

For the purpose of collecting data on demands of practice and knowledge, the ideal focus group should contain representatives of local employers, former students of the vocational training institute working on their behalf, and representatives of the education institutions developing their curricula based on needs.

Methods for conducting an effective focus group
The simplest methodology consists of generating discussions through relevant seed questions on a special topic, allowing participants to air and share their opinions to generate new ideas and opinions through debate.

A well-run focus group can reveal previously aired opinions that the participating may not have been aware of. The key factors for a successful focus group include:

- *an open, relaxed atmosphere - influenced by the composition of the group and the environment in which the focus group takes place;*
- *communicative/relational skills of the leader;*
- *management of time;*
- *type and sequence of questions.*

The setting has to encourage group interaction, e.g. a room with good acoustics for recording, with adequate lighting and large enough to have the chairs in a circle so all participants and the facilitator can see one another. Any observers should occupy a position in the background. The time for the event should be limited to a maximum of two hours, with effective time-management where every participant gets a 'voice', but where nobody speaks too much.

The success of the event mostly depends on the abilities of the leader:

1. *high level communicative skills;*
2. *pays attention to each participant;*
3. *skill to observe and understand non-verbal signals;*
4. *an active listener;*
5. *moderates debates using assertive communication techniques*
6. *controls and stops negative or authoritarian attitudes.*

STRATEGIES FOR DISCUSSION: THE FUNNELLING TECHNIQUE

The funnelling technique is about asking questions in order of importance, putting key topics to the centre to maximise the level of reflection and interaction.

This technique uses the following strategies:

1. *ask questions from the general to the specific*
2. *reflect on positive and negative aspects of the topic (asking first the negative and then the positive questions)*
3. *allow pauses (to give an opportunity for reflection and to stimulate further comments).*

Keep the focus on the topic and avoid digressions, e.g. interrupt people who wander from the topic, but do so diplomatically. For example, say "*we are more interested in your opinion about... rather than…*". Try to dig deep into some group comments, e.g. with questions that all participants agree on.

Data analysis and reporting
Data analysis is about understanding, classifying, restructuring and explaining information collected in order to answer preliminary questions and assumptions defined in the survey plan.

Analysis is not necessarily an easy job, not least because it may be based on many different sources, e.g. facilitator notes, minutes (records) of discussions and comments from participants and observers. The analysis must focus on the key questions, it should support the comparison of results from many focus groups on the same topic, and it should provide a clear explanation of the topics investigated.

The report usually includes an introduction to the aim of the survey, any specific problems and topics, and a summary of results and conclusions. It may also suggest further actions for to fully resolve problems and issues.

The advantages and disadvantages of the focus group technique are listed below:

Advantages	Disadvantages
You can interact directly with participants.	Relatively small sample size.
Results can be easier to understand than complicated statistical data.	Group discussions can be difficult to steer and control.
You can get information from non-verbal responses.	Respondents can feel peer pressure to give similar answers.
Information is provided quickly.	Moderator can affect responses

There is a short video about how and when to use this technique here:

How Focus Groups Can Help Your Research: Qualitative Research Methods

QUESTIONNAIRES

A questionnaire survey is a standard data collection method used as a quantitative research method.

ADVANTAGES	DISADVANTAGES
The application of the questionnaire is simple.	Establish a representative sample can be expensive.
Questions are pre-recorded, as are the range of answers if limited to closed questions.	It can be a complex task to create a precise questionnaire for accurate assessment.
High reliability.	Respondents may not be able or willing to answer.
Relatively simple coding, recording, information processing and analysis.	The answers might not always be honest.

Interviews can be conducted in-person, by telephone or via postal and electronic channels (email or internet). In the case of in-person interviews, the interviewers follow the questions of the questionnaires with the target group; in the case of postal or electronic interviews, they use a self-questionnaire method. Over the telephone, CATI - a computer-assisted method - has become common.

Online questionnaires are:

- faster and much more efficient than paper-based questionnaires, including for collecting, processing and evaluating data;
- from a financial perspective they are cost efficient (no expenses for printing);
- people are more easily available online than in person;
- they have a much higher turnout and response rate than other methods;
- answers to questions tend to be closer to reality and more honest, as users feel more anonymous;
- forms can be more animated and interesting.

Rules for creating a questionnaire

Before determining the questions, it is important to gather preliminary information or doing desk research to ensure that you know your subject in depth. It can be worthwhile mapping out questions that emerge during such research, including using data from previous research or using data collected on similar topics by others for bench-marking.

With an understanding of the factors above, problems can be pinpointed early, and questions formulated and structured precisely for the objectives of the survey.
At this stage the hypotheses that the research is supposed to justify should be formulated.

- The hypothesis is always a statement, never a question!

The next step is to identify the main questions in the questionnaire and be convinced that they refer directly to the hypotheses. The size of the sample (estimated number of respondents) should then be determined. It has to be of sufficient size as, if the number of respondents has not been set correctly, this may lead to misleading conclusions when evaluating the results.
Before editing an online questionnaire, it is important to consider the basic criteria needed to make the questionnaire relevant for the objectives for gaining information and for success.

Respondents must be able to fill in the answers with ease, so the questions must be set confident that the respondents have sufficient knowledge and understanding to be able to answer them accurately.

It is also important that the respondents be motivated by the questions. If their interest and understanding of the goals are not aroused, then they will tend to offer shallow answers. In this respect questions must be asked in an appropriate form and the potential for response errors minimized as much as possible.
Before you formulate the questions, clearly define the topic and the purpose of the questionnaire. This will help with setting out the structure of the questionnaire, and with putting the questions in logical order. Once the topic, the purpose and the structure have been defined, questions can then be grouped into different sections by their sub-topics.
Questionnaires generally follow a logical structure, starting from the general, easy-to-answer questions to the topic-specific questions. Here is a section of questions that refer to the same topic.

Task 1: What do you think this topic might be about?

	A Strongly Disagree	B Somewhat Disagree	C Somewhat Agree	D Strongly Agree
1. Teachers treat one other with respect.				
2. Teachers know about their students' lives outside of school.				
3. Teachers help each other and work together.				
4. Students and teachers treat each other with respect.				
5. Students discipline practices and policies are fair.				
6. The principal models respectful behaviour.				
7.Faculty and staff value what students have to say.				
8. The faculty and staff respect all races and culture.				
9. Most students care about learning and getting a good education.				
10. The school environment is safe both students and teachers.				
11. Students are involves in decisions about things that affect them in school.				
12. Most teachers are enthusiastic about teaching and communicate this to students.				
13. Teachers are respectful of parents.				
14. Teachers welcome contact from parents.				

Source: Template net (last visited in Sept. 2019)

Types of questions
There are two basic types of questions most commonly used in questionnaires to collect data.

- **Open-ended questions**

In the case of an open question type, the person answering the question formulates his or her own answer to the question asked, rather than selecting one or more options from a predefined list.

Open questions are useful in cases where we are interested in the respondent's emotions and judgement (qualitative data). This type of questions should be avoided for self-completed questionnaires as, from a statistical point of view, evaluating data from open questions is difficult.

- **Closed-ended questions**

A closed question is the polar opposite of an open-ended question, where the respondent chooses the most suitable answer from a predefined set of fixed answers. In general, it is not possible to offer an 'other' answer category though this is sometimes used (quantitative data). Closed questions make it very easy to evaluate the data gained from the answers using statistical methods or online tools.

True/False questions, Selection questions and Scale questions belong to this category of questions.

- **Scale questions**

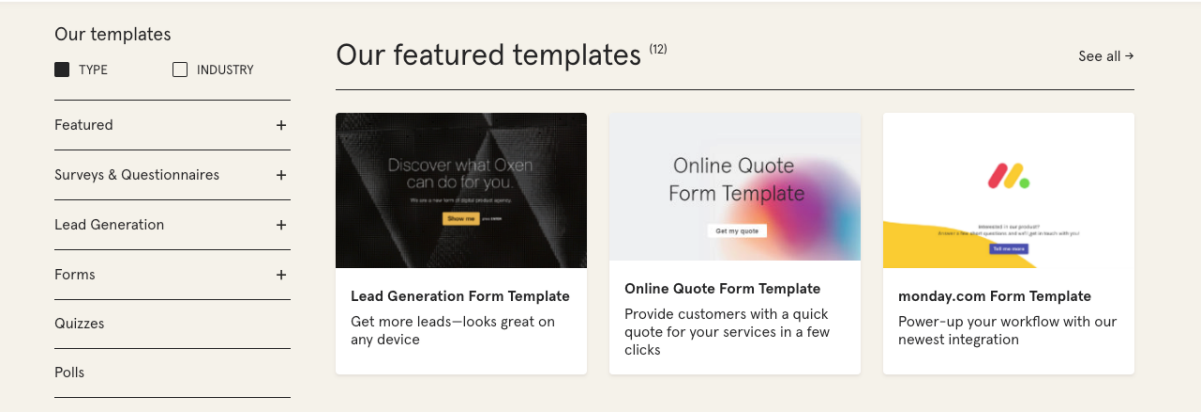
These question types are often to measure feelings, attitudes and positive and negative values. Several types of scales are common (ordinal scale, interval scale, rating scale, nominal scale). Often, a scale rating of 1-5 is used in questionnaires. Note that there tends to be a symmetry of each level of the scale so that the neutral attitude (3 in this case) is the same distance from both the positive and negative endpoints. It is also important that if you use a different scale range that it should always be an odd numbered scale.

The widely used **Likert scale** (developed by the social psychologist Rensis Likert in 1932)[5] is a five-point or seven-point scale. The choices may range from 'Strongly Agree' to 'Strongly Disagree' - and there is always a mid-point such as 'Neither Agree or Disagree' - with two moderate standpoints such as 'Agree' or 'Disagree'.

For example:

Your relationship with classmates is:	Very good	Good	Average	Not good	Very bed

You can readily edit a Likert scale questionnaire of your own online, using different templates from various providers, such as the following:



Source: Typeform

[5] Rensis Likert LIK-ərt; August 5, 1903, Cheyenne, WY, US – September 3, 1981, Ann Arbor, MI) was an American social psychologist who is primarily known for developing the 5-point Likert scale, a psychometric scale that allows people to respond to questions of interest, in order to measure people's attitudes (such as personality and attitude tests)(wikipedia

Sections of questions
As illustrated above, questions can be grouped into key sections, including:

1. **Information about the respondent**
Although questionnaires are largely anonymous, it is useful to gather some basic information about the respondents, such as age, gender, educational background, etc.

2. **General information**
In this group of questions, we might investigate the general experiences and perceptions of respondents, focusing on their knowledge of the topic.

For example:

- What do you think about the local labour market?
- How satisfied are you with your job prospects?
- Have you ever visited a local company site?

3. **Topic specified questions**
The questions in this section probe that specific and crucial knowledge and opinions which will form the core of the evaluation. This is obviously the most important question section and therefore it requires particular attention. It usually makes up the largest question group.

For example:
- How do you rate your level of professional ability?
- Were you lacking practical knowledge at your first workplace?
- Did you attend training organized by your work?

4. **Problem solving questions and suggestions**
In this section, respondents can express their views and opinions on the topic and make suggestions that might be used later. At the end of the set of questions, it can be useful to give the respondents an opportunity for 'feedback', through which they can comment on the questions in an open-ended way. The suggestions may help to develop new focal points later and possibly highlight previously undetected errors.

Basic rules for creating questions
1. The questions asked should be simple, short, concise. Try to be clear so that the person filling in is always aware of what the question is about. Avoid multi-compound, long questions with logic that is unnecessarily complicated.
2. Avoid placing too many questions on one page. Although in using a "Grid" questionnaire item [6]you have the ability to estimate the frequency of several factors at once (via a matrix question), you can also manage with a number of simpler questions that break down the complex matrix questions.

[6] A question grid contains multiple questions with the same response domain answer, along with any instructions and headings. When entering groups of related questions, lists of questions, or tables in Archivist, it can be useful to use a question grid to express the information rather than separate question items. - https://wiki.ucl.ac.uk/display/CLOS/Question+Grids

Additional questions for managers and supervisors	I fully disagree	I dis-agree	Neither agree nor disagree	I agree	I fully agree
44. The quality of vocational education/adult training is good in our region.					
45. Vocational education/adult training shows renewal and development potential.					
46. The schools providing vocational education/adult training have competent staff.					
47. The vocational education/adult training meets the competence needs of the labour market in this region.					

Source: (Cedefop, 2015)

3. Respondents attention and interest must be maintained from start to finish, otherwise you will be returned inaccurate data, or in some cases spontaneous answers or semi-completed questionnaires that cannot be evaluated, and your database will be filled with missing variables.
4. It is important that you use filtering on answers to structure following questions that ask about habits and opinions.
5. Before publishing the questionnaire, you need to make sure that you have given all the possible answers to the respondents. If you are not sure, it is worth adding an "Other" heading to the answer options.
6. Always formulate your questions precisely so that they will not be misunderstood!
7. Avoid making suggestive questions, which may influence answers or even the objective judgement of the respondent.
8. It is important that when asking about frequency or quantity to always present clear and complete answer options.
9. Try to avoid "Don't Know" and 'hard to answer' options if possible, as these answer options are not relevant for evaluation.
10. Do not use words with contradictory meaning within the question, as this may affect the correct interpretation of the respondents.
11. Pay special attention to sensitive issues (e.g. income levels) and response options, even in the case of anonymous questionnaires.
12. Ensure there is opportunity to refuse an answer. For example, sensitive questions may be uncomfortable for the respondent to answer. Refusing to answer a single question is much better than dismissing the whole questionnaire.
13. Think about the necessity of each question. Raise interesting and motivating questions right at the beginning of the questionnaire. Do not ask open-ended questions at the beginning of the questionnaire, rather place them in the middle or in the end of the questionnaire.
14. Before using the questionnaire always have it tested it for possible errors and do pilot testing.

Reflective Activity

In most of the vocational schools there are regulations regarding the communication with, and collecting feedback from, internal and external stakeholders. Briefly describe the practice followed at your school?

BENCHMARKING

If you don't have the luxury of data from past surveys, then make this the time you regularly start collecting feedback on a topic to see progress or change. This is what is called benchmarking.

You establish a benchmark or baseline number and, moving forward, you can see whether and how this has changed. You can benchmark not just stakeholders' satisfaction, but other topics as well. Subsequently you will be able to track, year after year, how internal or external stakeholders feel about the topic, e.g. what competencies are most needed in different professions.

COMMUNICATION OF RESULTS

The results of any survey are not automatically visible to both internal and external stakeholders and direct "consumers" (students, parents).

- Evaluations should therefore be accompanied by an active publication and communication strategy.

This strategy should specify who can access what information, through which media. The confidential nature of some data makes it impossible to make all measurement data available to all stakeholders, or to disclose everything to the general public, e.g. via the Internet.

The results of a survey about training needs, for example, are important for subject teachers and for the school's leadership, so they should simply be discussed among the internal staff.

A well-designed and implemented communication strategy should define the communication goals - in this case the conclusion of the survey - in order to develop a clear view of the changes and modifications that might be needed to implement more practice related training. It should also identify the target group – stakeholders, e.g. teachers, school directorate, learners, experts - that will be involved in decision making. Based on the goals and the audience you can then determine which communication channel or medium would be the most suitable to reach out to them.

As the objective of your surveys is to understand the demands of the labour market, to measure the satisfaction levels of former learners and their employers, and to understand the expectations of recent graduates, then suitable forms of personal communication and local communication channels should probably be chosen for this purpose. For example:

Communication goal	**Target group**	**Communication channels**
Reporting the results of the survey to internal stakeholders	Teachers, school leadership, learners	Presentations, internal networks, sharing on the institute's homepage
Inform external stakeholders	Recruiters, managers of local companies	Presentations, newsletters, institute's homepage
	Parents, local communities	Bulletin boards in the school, local media, homepage, social media, other Web.2 tools - blogs, etc.

When creating a communication plan, remember to establish: a timetable for the various items; the responsibilities of the staff during the process; the budget required; and how to follow up the summary of the target audience opinion.

As for questionnaires, you should also be able to find example communication plan templates on the Internet to make the job easier, for example:
TemplateLAB: http://templatelab.com/communication-plans/ (Last visited 10. Sept.2019.)

3 Online tools for data collection and analysis

GOOGLE FORMS

Technology can help us not only to easily create questionnaires but also to share the results in various ways (email, social media, website etc.). We can collect answers online and even automatically present the results in bar charts and graphs automatically.

One option to create a questionnaire is by using an online tool such as typeform.com mentioned above, but you can also use Google Forms to manage the whole process - from designing the questions to evaluating responses on a topic you wish to survey.

There are many good web sites offering an introduction to Google Forms, including tutorials. Here are a few (but use Google to look for others?):

- The Beginners Guide to Google Forms
- Google Forms Full Tutorial From Start To Finish (YouTube video)
- Google's own How to use Google Forms

2

21st Century Teaching Methods

Active learning with digital devices; practical application of collaborative, active teaching-learning methods; digital tool support.

1 Technology transforming education

INTRODUCTION

It is an appropriate time to re-think education for the 21st century, and evolve approved, tried and tested teaching methods of the past.

Why? The **rapid development of technology** has significantly changed many practices in our lives. The changes are irreversible, transforming communication, *education*, business life, work, entertainment, etc.

From an educational point of view, important changes have also been brought about by technology. Some of these are going to be detailed in the next sections.

ACCESS TO INFORMATION

Nowadays information is widely available. You do not necessarily need to sit in a classroom any more to gain knowledge – though this is not the same as learning! We all have almost immediate access to various sources of information, through all sorts of devices, at any place, any time of the day. The teacher is no longer our sole source of information.

Students can search for information on the web, enrol on online courses, watch YouTube videos … Do we now need teachers at all?

Certainly, a student can watch a video in a certain topic, but is the quality of the video acceptable and is the information correct?

Students can certainly use devices, often more effectively than their teachers, but what do they use them for? Do they know how to find reliable sources? Do they evaluate the information?

The teacher must still be there **to guide the student** through the learning process - to offer reliable sources, to promptly answer questions (yes, sometimes in the evening, via Facebook?), to pose problems that students can work on in the classroom, and to develop their related skills to a higher level.
Teachers are - and will be - just as important as ever. According to the Brian Greenberg, CEO of Silicon Schools, progressing technology does not endanger the teacher's role in the classroom — but enhances it. There is no good teaching without a good educator.
It is not only students, but teachers too, who have access to more information and digital tools than ever before. Therefore, educators need to be able to **utilize the advantages** technology can bring to education.

Teachers need to use this opportunity and

- look for materials (e.g. open educational resources) to support the learning process
- develop materials using various applications (mind mapping, infographic creator, video maker, etc.) to make learning more fun for students.

All in all, technology in itself does not result in more efficient or effective teaching. ICT tools are only relevant if they fulfil a particular need within the subject, or if they support a pedagogy or methodology. If an educator applies technology well, it can support the learning process, making it more interesting and motivating, enhancing student activity.

LABOUR MARKET NEEDS

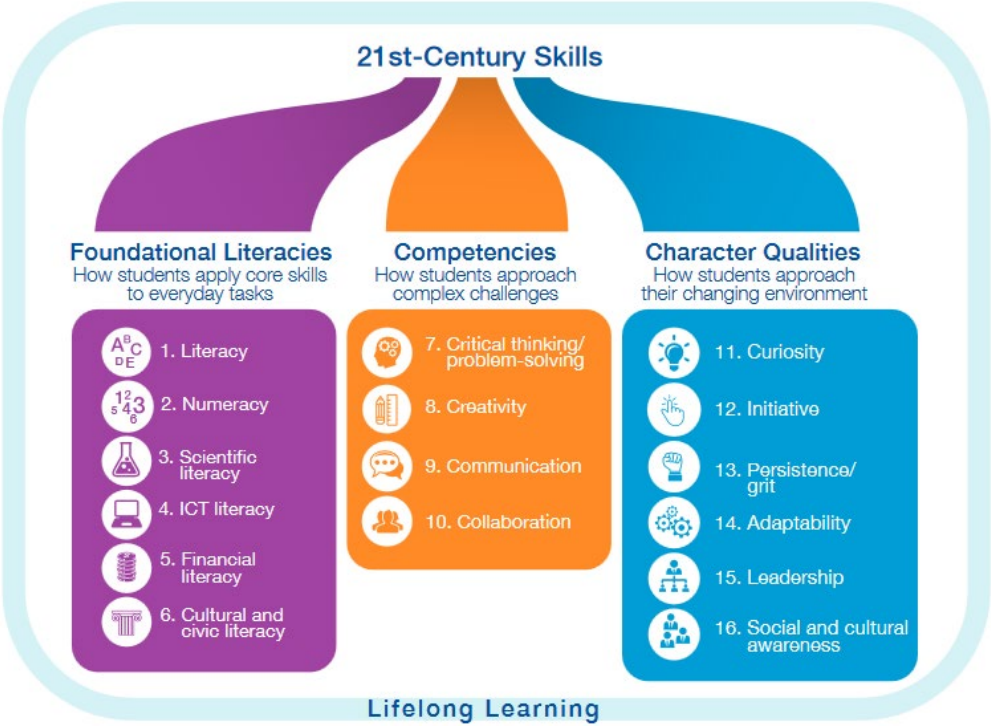
The same technological changes are changing existing professions as well. These professions demand new skills of today's workforce, and hence of today's students. Education needs to be able to judge which professions will be in demand in the near future, and what skills will be required of current students. It is essential that they develop to match these needs, so that they will be suitably prepared for tomorrow's life and with increased chances of employment.

The rapidly changing economic and social environment requires constant adaptation from the actors of the economy. This includes vocational education who prepare the workforce for the changing labour market. For this very reason vocational education has been pushed into the limelight in European countries over the past few years, and a reformation and transformation of the development of vocational education is subsequently in progress. The aims are focused on reducing the distance between what education provides and what work requires, for example by enhancing practical education and placing less emphasis on theory-based teaching methods.

Today, employers require workers-to-be to have a wide range of practical skills and experience, besides theoretical knowledge.

Within such a rapidly changing environment, students need to be able to quickly acquire and apply new information. Furthermore, they must exhibit those 21st-century skills that will enable them to perform effectively in the labour market and to be able to **adjust to rapid economic and technological changes**.

The World Economic Forum has undertaken a multi-year initiative - the New Vision for Education - to examine the pressing issues of the widening skills gaps, and to explore ways of addressing and closing these gaps through judicious use of technology. The following skills have been defined as the top 21st century skills for students entering into the job market in the future:



Source: [World Economic Forum: New Vision for Education]

These skills include problem solving, critical thinking, communication, teamwork, the use of technology, and innovation. To develop these skills, traditional, frontal teaching methods are no longer appropriate. It is time to shift towards more student-centred, active learning methods.

LEARNING ATTITUDES

Teens' Cell Phone Use
Source: Freepik

The phenomenon in the picture is familiar to all of us.

Today's secondary school students are members of the so-called Generation Z - children born between 1995-2009, also known as the digital generation - who were born into a digital world. They use info-communication technologies and digital devices with confidence and proficiency having encountered computers and mobile phones as part of their everyday lives from childhood. They take digital devices for granted.

They use their phones for a wide range of activities (book a ticket, chat with friends, share a photo, order food, look at the news or the weather forecast, play a game, look up an English word, etc. The list is endless, and learning should definitely be integrated within this world.

Teachers also have to be able to take advantage of the devices that the students live with. By doing so they will add motivation to learning for many.

Students are online much of their time: they are part of virtual communities and many cannot imagine a world without mobile internet or social media.

With this background it is not surprising that social interaction in the classroom, as well as in their free time, is also important for them. These relationships can be the generators of learning for them, particularly through teamwork which must be given particular emphasis in their education.

Learning happens all the time and students, in particular, are learning all the time, even outside classroom walls.

How can all this be turned to their own good, i.e. to their self-development?

The needs of this new generation of students challenge most teachers. To continue to prepare learners for a successful life, many teachers must now alter their normal, or routine, teaching

methods. For today's teachers, it is not a question of if they should or shouldn't utilize technology: the question is which online tools they should use in teaching and how.

Teachers have to make use of online educational tools, resources and materials in their classes to meet the expectations of today's students and to make use of the skills they have developed.

It is definitely a challenge to teach English to a student who watches a lot of videos in his free time in English, and already has higher level skills than the classmates.

How can the teacher motivate him if he has read through all the lessons in the students' book during the first couple of lessons as he was bored?

Well, it would be useful find out what his areas of interest are, share with him any freely available open educational resources, quizzes, ask him to prepare some learning materials for a specific topic, etc. In fact, there are endless possibilities - it is only a question of creativity and, of course, time. Eventually a teacher's success will be measured by the progress of his/her students so it is worth investing time and effort.

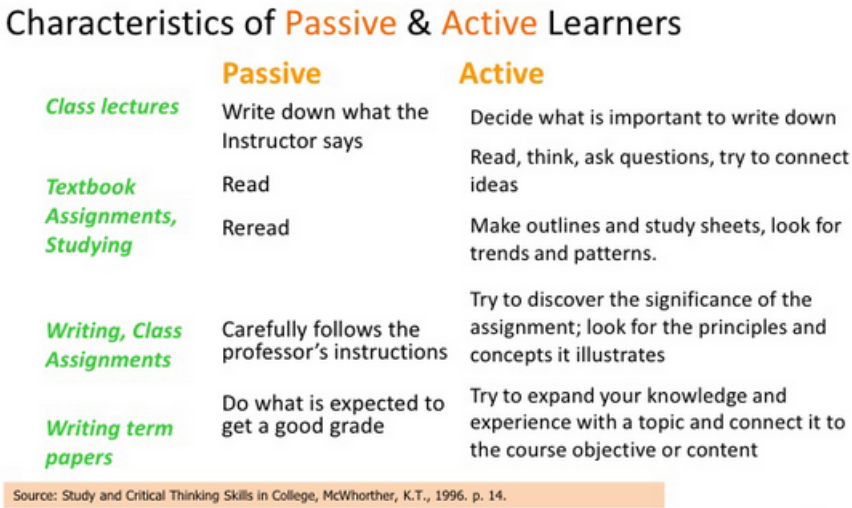
To be able to effectively handle the above challenges, teachers have to review and change their teaching methods, and even play a different role in the process. This is a learning process for the teachers themselves.

CHANGING METHODS IN EDUCATION - ACTIVE LEARNING

Traditional teaching methods tend, not unnaturally, to be centred around the teacher, who transmits knowledge and information to the students in what is generally a one-way communication process.

Learners listen, take notes, and often participate all too passively in the classes. Modern active learning methods are being designed to change this so that students participate much more actively in the overall learning process.

The table in the figure below highlights the key differences between students as passive learners (the traditional norm) and having students involved in a more active learning environment:



Characteristics of Passive & Active Learners

	Passive	Active
Class lectures	Write down what the Instructor says	Decide what is important to write down
		Read, think, ask questions, try to connect ideas
Textbook Assignments, Studying	Read	
	Reread	Make outlines and study sheets, look for trends and patterns.
Writing, Class Assignments	Carefully follows the professor's instructions	Try to discover the significance of the assignment; look for the principles and concepts it illustrates
Writing term papers	Do what is expected to get a good grade	Try to expand your knowledge and experience with a topic and connect it to the course objective or content

Source: Study and Critical Thinking Skills in College, McWhorther, K.T., 1996. p. 14.

Our society today needs young people who are flexible, creative, and proactive – young people who can solve problems, make decisions, think critically, communicate ideas effectively and work efficiently within teams and groups. 21st century skills (such as creativity, communication, critical

thinking, persistence, initiative, leadership skills, etc.) can undoubtedly be better developed through practical, group-based tasks.

Simply 'knowing knowledge' is no longer enough to succeed in the increasingly complex, fluid, and rapidly evolving world in which we live. In order to optimise life-long learning and potential success it is now widely accepted that young people need to be given opportunities to develop personal capabilities and effective thinking skills as part of their well-rounded education. (Source: Active learning and teaching methods, Page1). This implies the need for a more student-centred teaching and learning approach.

One of the real challenges are to **keep students motivated** and engaged in their learning. We must find innovative ways to integrate technology effectively in order to challenge students with **problem-solving tasks**. The student should learn from building, creating, and collaborating with peers - in other words the student needs to be 'doing' rather than sitting and listening.

Active learning applies to activities done by students, who also should always reflect on what they are doing. Of course, the transfer of knowledge remains important, but the development of abilities and skills gains a greater significance. Active learning is learner-centred, shifting the emphasis from the teacher and the transfer of the learning materials to the active work of the students with the learning material.

21st century skills (such as creativity, communication, critical thinking, persistence, initiative, leadership skills, etc.) can better be developed by practical, group-based tasks.

If you would like to see how a learner-centred class might work, you can start by raising an issue or setting a problem. Then you might divide students into groups, and assign a task which the learners must actively participate in.

Go from group to group, supporting them in their understanding of the problem, and guiding them to finding a solution. However, let them arrive at the answer for themselves!

If students actively participate in the learning process, they will gain the desired knowledge and skills through their own efforts. Moving away from frontal instruction gives students the autonomy and responsibility for their own learning.

In the next unit we are going to present a selection of methods that support active learning.

THE CHANGING ROLE OF TEACHERS

Now that information has become readily available to everyone, any time, the role of teachers should necessarily be redefined. How can educators be prepared for this changing role?
In the frontal, traditional style of teaching, the teacher transmits knowledge to the students, who receive and (hopefully) learn all that knowledge.

At the end of the learning process, the teachers measure - by means of a test - to what extent learners have succeeded in acquiring the learning material, i.e. whether they succeeded in achieving the objectives. The teacher's role is active, while that of the students is much more passive - absorbing information.

"The introduction of active learning methods into the school classrooms has brought about an unambiguous change in the teacher role too. The teacher's earlier distinguished position—in front of the class, or standing in the middle of the class—has also ceased, the educator has rather become a kind of "mobile counsellor," who is learning along with their students and meanwhile labouring to allow greater and greater space to them. For the sake of facilitating active learning, the teacher must become a tutor." (Niemi, Hannele: Active learning, 2005, p. 90)

Role of Teachers
Source: College Ready

This new teacher role places teachers in the midst of the learners. Their role is complex: they stimulate interest, prompt with thought-provoking questions, observe and foster the work of the groups, give help and information, control, offer feedback, guide practice, and evaluate, etc.

Experience shows that it is not easy for teachers to change from one day to another. You may like explaining things and having students look at you attentively, but it is necessary to try to introduce change and consciously draw back a little. Make any changes in small steps, but make a conscious and deliberate start. Become a "guide on the side" rather than a "sage on the stage."

2 21st century teaching methods - active learning

INTRODUCTION

Student-centred teaching and learning is based on **constructivist** learning theory, where learners are active in how they interpret information and in building meaning and knowledge through prior experiences by using observation, problem-solving and processing (Cooper, 1993; Wilson, 1997; Ertmer & Newby, 1993).

In the following sections, we will present the Flipped Classroom and the Project-Based Learning approaches that are both very much suitable for the needs of the new generation of students.

The former is basically a modern classroom management tool, into which other approaches (like project-based learning) can readily be integrated.

THE FLIPPED CLASSROOM METHOD

The Flipped Classroom (FC) is a **student-centred** model aimed at increasing student engagement, understanding and retention by reversing the traditional classroom teaching approach. It is not strictly new, but it has been given greater attention with the increased number of options opened up by advances in the use of technology.

There are a number of existing definitions for the FC, most of which vary only slightly, but the Flipped Classroom is basically a more student-centred approach to learning whereby **students receive lecture materials before class, generally in some digital format,** which they should then study before taking part in discussions about their learning in class**.**

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

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

KEY FEATURES

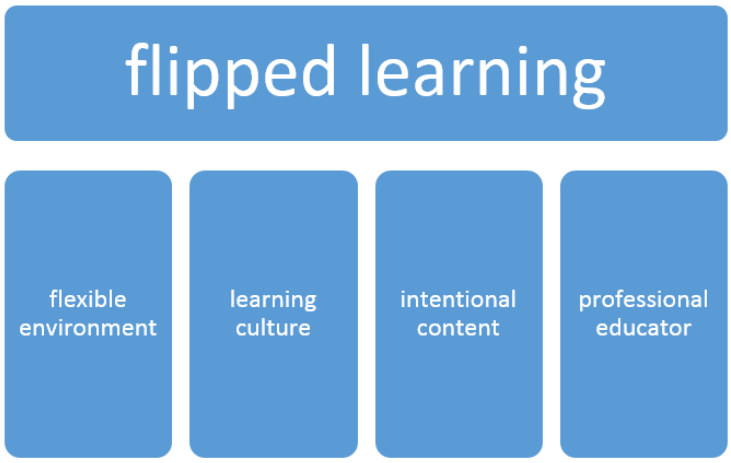
These are the key features of the method:

- 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.



There is no single prescribed way to apply a Flipped Classroom method.
The more teachers, the more possible applications of the method.
Find what suits you!

BENEFITS

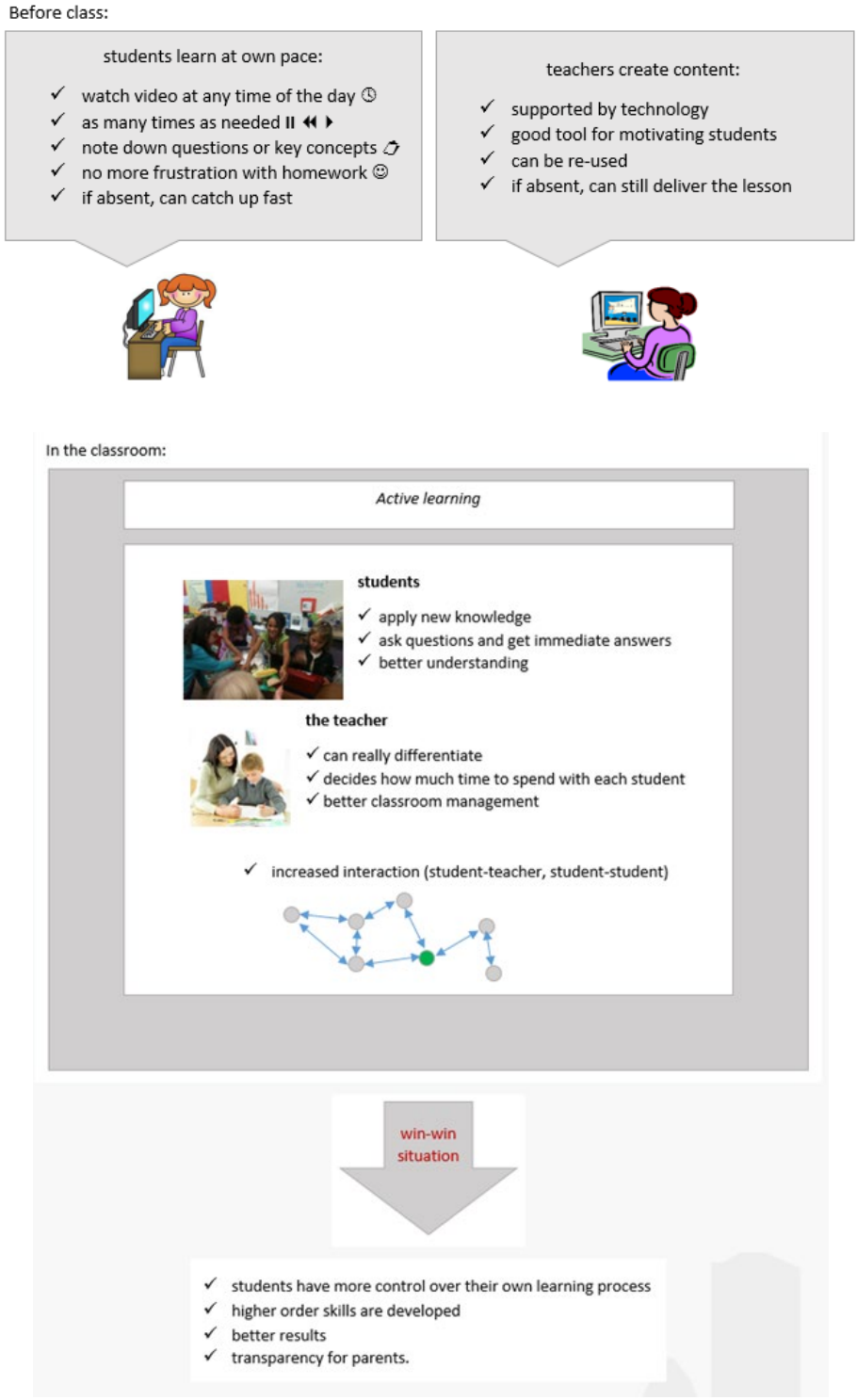
With this model we can **use class time more efficiently,** by focusing on the **practical application of knowledge** during class. Students **come to class more prepared**, hence their efficiency as well as learning autonomy increases.

By producing useful **resources for re-use** by educators and students, **student engagement and motivation** can be significantly increased. This is perhaps the most significant driving force behind 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 opens up **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 & creation (Bloom et al., 1956), critical thinking and problem solving. This interaction is often peer-to-peer, providing educators with more opportunities to reinforce 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 grades as well as in the attitudes of their students. Almost every teacher who tried this model wanted to flip classes again.
Here is a summary of the key benefits that are behind this success:



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

CHALLENGES

Despite the increasing popularity of the flipped classroom model, a number of challenges have been identified.

Organisational challenges have 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. Also, students themselves may be slow to support a more active role in their learning, fearing that it might be 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.

FLIPPED CLASSROOM IN PRACTICE

Having been introduced to the main features of the Flipped Classroom method, it is time to consider its **implementation**. How can we create our own digital material? Where can we find re-usable digital content?

Fortunately, technology offers a diverse variety of tools to support the teaching / learning process, particularly if we flip the classroom. Module 3 of the Reacti-VET course presented and detailed a wide selection of applications that might help a teacher motivate their students, create digital learning objects for them that match their learning styles, and involve them actively in the learning process.

However, it is useful to clarify that (at least) two ways of proceeding when planning a flipped class. Once you decide about the age group and topic for your flipped lesson, you can:

- look for materials online and **RE-USE** what has been prepared by other teachers.

  There are substantial amounts of Open Educational Resources available on the net. We are going to guide you through some platforms where you can find valuable learning materials, within the next module.

- **CREATE** materials on your own.

  There is a near infinite number of applications you can use when creating digital material for your classes. Reacti-VET selected the ones that deemed most easy to learn and use, but which are of great help from a pedagogical point of view.

Once you have collected or created the content for your lesson, you need to make it accessible for your students. To assist you in this process, it is then important to know ways of SHARING learning materials within virtual learning management platforms. Reacti-VET's Module 4 covered some common options.

LESSON PLANNING CONSIDERATION

An effective and successful flipped classroom needs **careful preparation and lesson planning**. The normal requirements for lesson plans apply equally, if not more so, when applied to Flipped Classroom lessons.

Teachers have to plan their own activities, as well as their students´ activities, for three distinct phases:

1. **before the class**
2. **during the class**
3. **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

Let us look at each of these steps in a bit more detail:

*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 might I do to explain the topic?
- What might 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 a FC, do not be too ambitious! The videos made by you do not need to be perfect!

Step 2
When applying a FC approach, it is essential 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 within a FC, teachers should choose an '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 *motivating* learning activities are to be prepared before class. The essential questions they should answer 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 there to provide students with opportunities to deepen understanding. That is why they must help to focus students to attain higher-level cognitive abilities. These activities need to be aligned and matched with the learning objectives, with clear instructions 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 should be answered:

- How will students continue the learning experience from the in-class activity to outside of the class? (students do not retain knowledge well from just one exposure to learning materials.)
- What kind of in-class activities will focus the 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 one lesson to the next so that they flow coherently.

Step 3

With respect to checking strategies, **peer-assessment** is should definitely be used, or considered, in the FC model. Students can learn how to cope with potential critical comments given by their peers, and they are able to learn how to evaluate their peers´ performances. Through this, they can benefit greatly from collaborative activities.

When planning any lessons, including Flipped Classroom ones, teachers need to create a realistic timeline for all phases.

Above all, there is a need to be flexible. Teachers should be ready and willing to **adjust their lesson plans** to suit their students' needs and focus on what might be more productive, rather than rigidly sticking to original plans.

FLIPPING IN REACTI-VET

The Flipped Classroom method can be a good choice for the upskilling training of your students. One reason for this is that you will certainly not be able to transfer all the intended learning material in classroom lessons, simply because you will not have time.

Instead, you can think about sharing parts of the learning material with the students in a virtual learning environment, so they can learn at their own pace, any time. Of course, you will also have to be present online, and promptly answer their questions. But do reserve the classroom lessons for active learning, where students solve problems in groups.

It will almost certainly be the case that the students do not always need you. They can watch a video, do some research on a topic on their own, etc. But when it comes to solving problems and applying their knowledge, many will almost certainly encounter some difficulties and that is when they need you - in the classroom.

You have to carefully consider, though, what to share with students before class. Make sure that the shared content is relevant and motivating - and not too long. Try to check if they watched it by posing related questions online.

Make sure that the classroom lesson builds on the pre-class material. Prepare for different learners, be flexible, help those who need help, and provide more resources to those who are ahead. The key to success is detailed planning. You need to know in advance what you want to achieve and how. Students will appreciate your dedication and the effort you put in the process, and they will surely be partners in it.

To achieve a high level of student engagement you will need to talk about the Flipped Classroom method itself with the students before implementation. You need to set up and agree on new rules together. They need to know what changes are happening and what is the reason for that. Communicate effectively, positively, highlighting the benefits for them: no more “lectures”, they can watch the tutorial any time, and with difficult tasks they can come to the lesson where you will help etc.

For more detailed information, practical application and real case studies of the flipped classroom method, download this book that has recently been issued in four languages, specifically for **vocational education:** Flipped Classroom in Practice

PROJECT-BASED LEARNING

Project-based learning is a student-centred, **cooperative** teaching-learning strategy that can be readily integrated into a Flipped Classroom model. Project team members work on a complex topic according to a plan, and the result is a presentable **product** (physical or intellectual, or a performance).

This approach is very much applicable in our Reacti-VET methodology, for various reasons. First of all, student will receive a *real* project task from a partner company, one that they will have to accomplish within a given timeframe (about four months). Your task will be to support your students, to guide them along this process in a structured way. In fact, you will be managing a project yourself (i.e. involving stakeholders, planning activities, designing and delivering the upskilling mini-course for your students).

The project-based approach is of major importance in the Reacti-VET methodology, so there is a dedicated section (Module 5) for this topic, which will provide you with useful tools to help you manage your own project, as well as practical tips on how to integrate elements of the PBL approach into the upskilling process (managing group-work, assessment types, teacher’s role etc.).

PROBLEM-BASED LEARNING

Problem-based learning is a student-centred approach, often considered as a type of Project-based learning.

Students are given real life problems before working in groups, trying to understand the problem, gathering ideas and looking for solutions. In traditional teaching, students would be first taught from pre-determined curricula, then use their knowledge to solve problems. In this method the problem is the start and focus of the learning process, which encourages motivation and learning.

Problem-based learning
Source: Advancement Courses

Why use problem-based learning?

Nilson (2010, p. 190) lists the benefits of problem-based learning. A well-designed problem-based project develops the following skills of the students:

- Working in teams.
- Managing projects and holding leadership roles.
- Oral and written communication.
- Self-awareness and evaluation of group processes.
- Working independently.
- Critical thinking and analysis.
- Explaining concepts.
- Self-directed learning.
- Applying course content to real world examples.
- Researching and information literacy.
- Problem solving across disciplines.

A useful link to learn about Problem-based learning:
Maastricht University: Problem-Based Learning

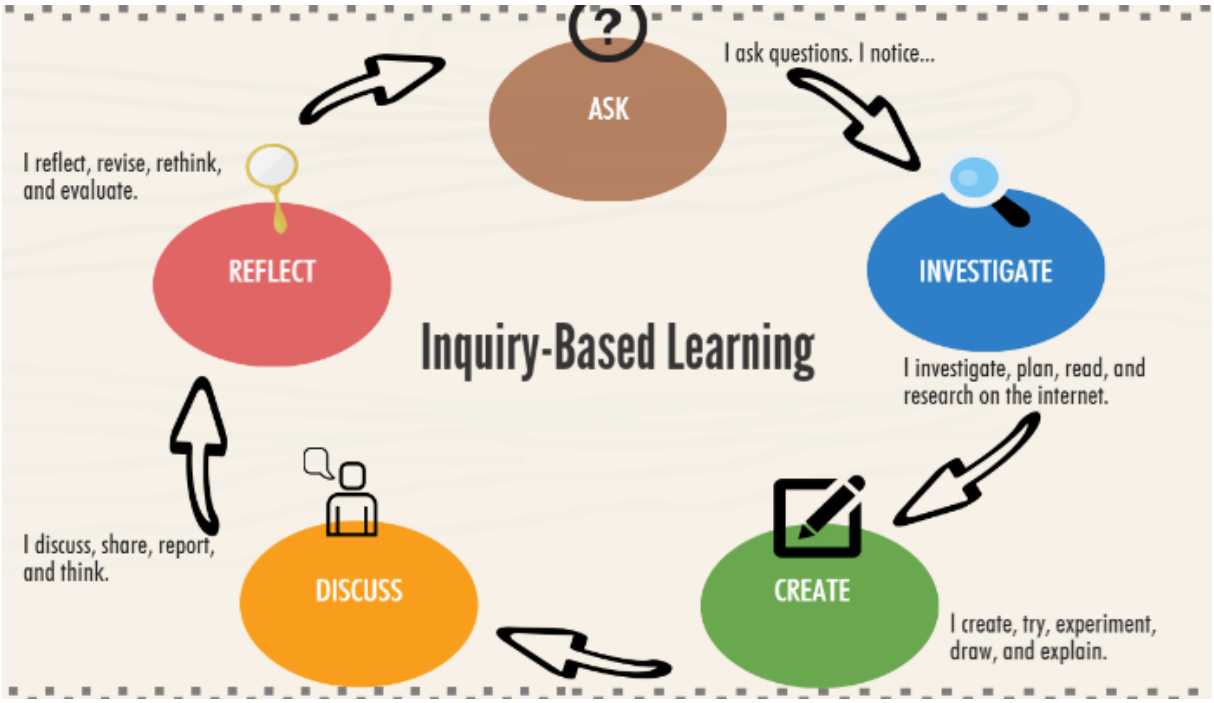
RESEARCH-BASED LEARNING

Teachers using PBL often also use this method, especially in science education.

Research-based learning builds on a student's curiosity and their motivation for study. It is an educational method that models scientific research and is also often referred to as inquiry-based learning, or discovery-based learning.

Students need to solve a real-life problem, form groups, ask questions, and find answers to questions. Students build on their own knowledge based on information available from various sources.

This approach helps students learn about hypothesis generation and testing. The emphasis is on discovering facts or developing a higher order understanding of the topic. Curiosity is developed within the students, and their learning is enhanced through questioning and systematic investigation - which is actively encouraged. This type of hands-on instruction is more effective than traditional methods as it improves the problem-solving ability.



Inquiry Based Research Process

Source: Atlas

The basic steps of research-based learning are:

1. To formulate a question or a series of questions related to the research topic. This question is also called hypothesis or problem statement.
2. After asking the question, students are encouraged to explore the topic by gathering information from different sources before starting their research.
3. If students have gathered enough information, they should sort them into categories or sketch the data that highlights key information related to the topic.
4. In order to develop a better understanding of the topic, discuss and analyse the information. The teacher can also direct the discussion and highlight the conclusions of the research work and show how they relate to solving the initial problem
5. Conclusions should be drawn up and re-assessed with respect to the original questions. Student reflections are very important, as through these students can compare research results and conclusions with the original questions and list the steps that led to the conclusion.

Advantages of research-based learning include:

- students can control their own learning, in the same way that scientific research works in reality.
- students are able to identify their own research areas and participate in a practice-oriented learning, where they seek information through scientific research methods.
- this method increases the student's commitment to learning and enhanced critical thinking skills, while creating a culture where students evaluate their own ideas and possibly those of others.

3

Open Educational Resources

Integration of freely available learning resources into the teaching of professional and general subjects; joint curriculum development with stakeholders.

1 Production, sharing and re-use of OERs

OERS: WHAT & WHY

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

(George Bernard Shaw)

ACTIVE DIDACTICS, CONTINUOUS UPDATE AND SUSTAINABILITY

IS DIDACTIC INNOVATION SUSTAINABLE?

The teaching methods proposed in the first module are focused on making students active within their learning path. This is not a new idea as Plutarch had already written 2,000 years ago that:

> *"the mind is not a vessel to be filled, but a fire to be kindled"*.

The teacher as a 'transmitter' of predefined content is replaced by a teacher who is a guide, an animator, a consultant and a coach in the classroom. However, before interacting with the students she/he plans educational activities and prepares educational support resources appropriate to the different learning styles and plurality of levels of knowledge, experience and motivation of the students.

The focus of this whole course is on keeping the educational offering up to date with respect to the needs of society and the world of work. This implies that any supporting educational resources must be frequently renewed.

A teacher cannot do it alone.

Traditionally, support for teachers is provided by the publishers who produce textbooks that the teacher uses as a reference for their own 'transmissive' lessons and which students use to support their study and exercises.

Publishers have impressive editorial structures, making use of subject matter experts - some used to 'produce' the work, others charged with the functions of checking and evaluating the product. They are able to invest a huge amount of money for the design, drafting, revision and production of texts or multimedia materials that cover the syllabus of whole subjects.

This is what traditionally guarantees the scientific validity of the product. However, even if publishers today strive to enrich their books - possibly digital books - with diversified multimedia materials, the book is no longer enough. It is not enough in the sense that it does not meet the needs of personalization and customization of educational paths.

It is also not enough in those fields which evolve most rapidly and where the processes of adaptation must be fast and continuous, in contrast to the lengthy processes of traditional text book production.

- **Publishers are not enough, but teachers cannot do it alone.**

The problem is, therefore, how to sustainably produce **didactic materials** in line with technological, social and working evolution while, at the same time, being suited to the multiform needs and characteristics of the students?
It is here that the idea of Open Educational Resources takes on a meaning: resources that teachers can use without having to produce them on their own, and which they can eventually modify them to adapt them to the needs of the context in which they are to be used.

SUSTAINABILITY: THE FOUR Rs OF ECOLOGY APPLIED TO TEACHING
To make the teaching materials proposed in the two previous modules sustainable, we need to adopt models of sustainability already applied to other fields.
Following the logic of environmental sustainability, used in order to reduce waste and pollution due to production, we refer to the rule of the 4 Rs:

- **Reduction** (e.g. packaging).
- **Re-use** (e.g. of clothes and shopping bags).
- **Recycling** (as in the case of separate waste collection).
- **Recovery** (e.g., waste used as fuel in waste-to-energy plants).

What does it mean to apply the 4 Rs to educational resources? (Ravotto et al. 2009)

- **Reduction**. In the production of Educational Resources, the concept of reduction relates, above all, to the time and intellectual energy spent in the design and production of a resource. How many English teachers have produced a resource on 'simple past' and how many Physics teachers on Ohm's law? Why invest time and energy to do something that has already been done?
- **Re-use**. Reusing a book, buying it at a second-hand stall for example, means adapting to something that is at least partially 'consumed'. However, a digital resource is not consumed with use - another good reason to reuse not only our own resources (and is normal) but also those produced by others.
- **Recycling**. Recycling a didactic resource, our own or of others, means modifying it in order to make use of it in a different way from the original, e.g. reusing video tutorials on how to produce videos and video lessons on the flipped classroom methodology and using them to create a Moodle course on "Producing videos for the flipped classroom".
- **Recovery**. The Internet offers access to an almost infinite amount of resources. We can readily search and retrieve them for various educational purposes, e.g. use the video of Obama's inauguration address in the White House, but interrupting him with a quiz to create a listening/ comprehension exercise, or retrieving scenes from one or more films about Napoleon to explain specific stages of history. To apply the 4 Rs to educational resources, these must be 'open'.

OPEN EDUCATIONAL RESOURCES

An Open Educational Resource (OER), must have three features:

1. **It can legally be used, distributed and modified.**
   The vast majority of textual and multimedia materials, for educational and non-educational purposes, are protected by a copyright which prohibits their use, distribution and modification without a specific authorization (generally paying a fee) by those who hold the author's right. An open resource must instead be issued under a license that allows its use, distribution and modification.

   We will talk about this in the next paragraph devoted to 'copyright' and 'copyleft'.

2. **It is technically modifiable.**
   The permission to modify a resource does not imply that the modification is actually possible. Modifying a digital resource means opening it with software, introducing changes and saving it. A resource is considered technically open if it can be opened and modified with non-proprietary (or at least freely available) software.

3. **It is available**.
   A resource residing on my computer's hard drive is not accessible to others. As it is not if it resides on a school server, accessible by password. To be considered open, a resource must be in a freely accessible environment and it must actually be easily traceable. Repositories of open resources, that is to web environments in which they are made available and catalogued to be easily traceable, are expanded on below.

COPYRIGHT VS COPYLEFT

COPYRIGHT, PUBLIC DOMAIN, COPYLEFT

Author's Rights (in *civil law* countries) and **Copyright** (in *common law* countries) are two legal institutions that vary from country to country but which, in all cases, are intended to protect the products of intellectual activity through the recognition of a series of both moral and patrimonial rights to the original author of a work - text, music, image, video, software, ... Often the term copyright is used to designate both.

Public Domain refers to works that can be freely used, either by the will of the original author or the passing of a certain number of years, in many countries 70 years after the death of the author.

Thanks to the pun, the word **Copyleft** was coined to allow free distribution and reuse of Free/Open software. “Left” opposite to “right” as in the political terminology, but also “left” coming from the verb “to leave” in sense of “not constricted”, “let free”.

Yet any type of freedom to be granted needs the observance of some rules. I may produce free software and allow somebody to make use of it but I might want to applying a copyright on its use. This is the reason why “licenses” have been provided in order to protect and grant the rights of free use. Practically, to be legally protected, the creators of free software state: “©This software is released under licence X”.

CREATIVE COMMONS LICENCES

Creative Commons is a not-for-profit organization, founded in 2001 aimed at defining *“the spectrum of possibilities between full copyright - all rights reserved - and the public domain - no rights reserved. Our licenses help you keep your copyright while inviting certain uses of your work – ’some rights reserved’ copyright.”*

The key elements of Creative Commons licenses are as follows. They are presented by means of very clear icons.

Attribution

You let others copy, distribute, display, and perform your copyrighted work - and derivative works based upon it - but only if they give credit the way you request.

No derivatives

You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.

Non-commercial

You let others copy, distribute, display, and perform your work - and derivative works based upon it - but for non-commercial purposes only.

Share Alike

You allow others to distribute derivative works only under a license identical to the license that governs your work.

Here the different licences:

ATTRIBUTION

You are free:

- to copy, distribute, display, and perform the work, • to make derivatives work,
- to make commercial use of the work,

under the following conditions:

- you must attribute the work in the manner specified by the author or licensor,
- for any reuse or distribution, you must make clear to others the licence terms of this work,
- any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.

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- to make commercial use of the work,

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- any reuse or distribution, you must make clear to others the licence terms of this
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ATTRIBUTION – NON COMMERCIAL – SHARE ALIKE

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- to make derivatives work,

under the following conditions:

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- you may not use this work for commercial purposes,
- if you alter, transform, or build upon this work, you may distribute the resulting work
- only under a licence identical to this one,
- for any reuse or distribution, you must make clear to others the licence terms of this work,
- any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.

OERS: THE KEY FOR INNOVATION IN VOCATIONAL EDUCATION

The production, sharing and reuse of Open Educational Resource is a solution that makes didactics, based on resources that continuously updated and adapted to the multiform needs and characteristics of students, sustainable - even in the absence of massive government investment.

The evidence of this can be readily found. There are many very good OER resources to support education and training, as well as other fields. There are many lessons being learned from the way software is now being developed (see appendix 1). The software industry has taken many new ideas to heart that few people would have predicted 30 years ago:

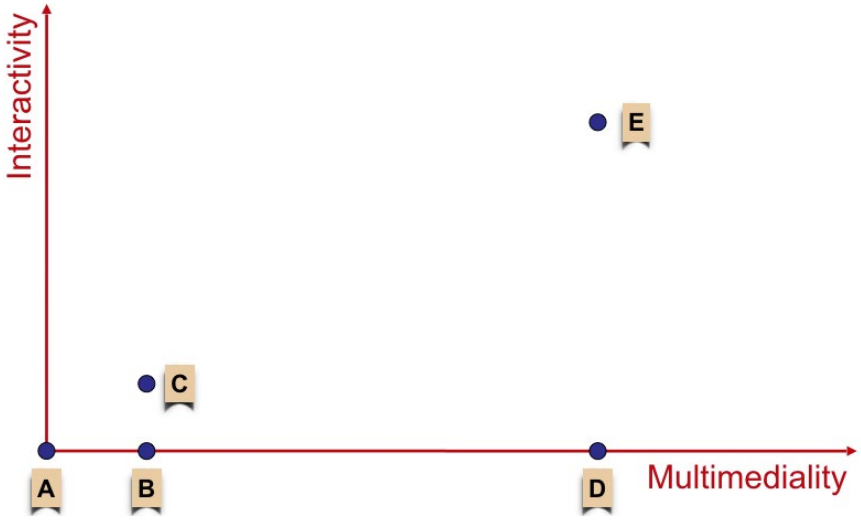
- a software development model based on a world-wide community of developers, capable of producing very stable and reliable software
- business models based on open licenses and reuse
- continuous interaction with users allowing greater efficiency in development
- a "release often and quickly" model that has proved to be a winner.

2 Learning resources

MULTIMEDIALITY & INTERACTIVITY

It is instructive to position educational resources within the diagram below, where the axes indicates the level of multimedia of the resource and its interactivity.

- At the intersection of the axes (point A) there are resources for which the degree of multimedia and interactivity is zero. An example at this point is a text book (although you could argue that the printed text is also a medium and the reading operation is also an interaction between the reader and the printed page)
- Traditional educational resources - with a focus on books - tend to consist of texts with some images, so they are placed on the axis of the abscissas (multimedia), but rather close to the origin of the axes. They exhibit low multimedia and no interactivity (point B).
- A book that contains questions and answers, possibly with feedback, starts to have a bit of interactivity (point C).
- A resource containing text, images, a video and, say, a simulation will be found farther along the multimedia axis but may not have any level of interactivity (point D). However, if the user is able to manipulate the simulation parameters to see the effect of change, and if the resource offers different (adaptive) paths depending on the right or wrong answer being given to questions, then it will be high up the axis of interactivity (point E).



Having an understanding of where a particular resource we have, or one which we want to create, is positioned on this diagram can be useful. In particular, it is appropriate to understand the educational value in both the level of multimedia and that of interactivity.

This plurality of media can be used effectively to support learning (the image above, for example, helps us better understand the reasoning behind the creation of a resource) as well as playing a role in drawing students' attention to particular concepts. Multimedia objects require the student to give them more than mere "passive" attention - it is important to promote the student's engagement too as this is what stimulates reflection. This is the rationale for making use of such rich resources. As a simple example, there is a big difference between simply reading the text above that describes the diagram from actually having to think about where to place points C, D and E in their correct position

in the diagram. There is even more benefit to be gained if feedback is given when a resource is put in the wrong place.

The use of such resources is not simply a matter of catching a student's attention with special, sexy effects. It is about meeting a pedagogical objective, adding proven educational value and the context in which resources are used.

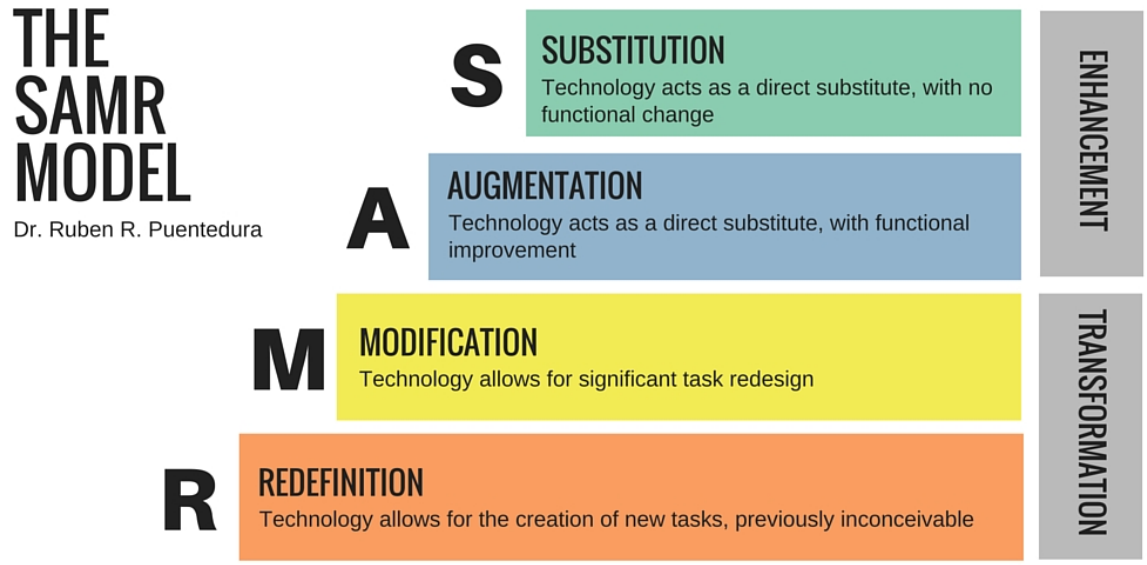
Finally, it is important to realize that the transition to digital opens up possibilities that just did not exist in traditional, analogical didactics. Therefore, one should resist the temptation to simply recreate digital resources that add nothing over their analogue equivalents, but instead strive to imagine how the technology can improve on and create value unthinkable in the analogical context.

THE SAMR MODEL

The SAMR Model is a framework through which teachers can assess and evaluate the technology used in the classroom.

It was developed in 2010 by Ruben Puentedura and identifies four different levels of the introduction of digital technologies in teaching, grouped in the two phases of Improvement and Transformation [6]:

1. ***Enhancement***
    - ***Substitution****. Technology acts as a direct substitute, with no functional change.*
    - ***Augmentation****. Technology acts as a direct substitute, with functional improvement.*
2. ***Transformation***
    - ***Modification****. Technology allows for significant task redesign.*
    - ***Redefinition****. Technology allows for the creation of new tasks, previously inconceivable.*



Wikimedia Commons, Lefflerd, By-SA

Let us take a simple example. Students often take notes during lessons. Sometimes the teacher specifically asks students to take notes and rearrange them after the lesson.

Traditionally, the student does this with a pen and paper, she/he eventually holds a notebook and then rewrites the notes taken in an orderly way in this notebook. Students can pass their notebooks to one another just to check if they have correctly marked all the things the teacher explained, in case they were distracted, took poor notes, or maybe because they were absent.

How does this activity change by employing digital tools?

- *There may be a simple **substitution**: equipped with a tablet, or a laptop, the student takes notes and saves them in a file. Eventually she/he prints it and/or passes it on to his classmates.*
- *A**ugmentation** is made much simpler. If she/he wants to re-order the notes taken, the student does not have to rewrite everything up in another file: she/he can make corrections in the original file, improving some sentences, tidying up or putting words into italics, using colours, etc. Moreover, if she/he wants to pass the notes to the classmates she/he does not have to go through the medium of paper: she/he can just pass the file by email or pen-drive, or even share it in the 'cloud'.*

- *Sharing opens up the potential for **modification**. The notes can be turned from an individual's notes to polished class notes. Students can collaboratively work on a single file while they are in class or while they are at home, and the teacher could - outside of lesson time - check the file, correcting it or reporting mistakes or points to be developed.*

- *The whole process can be one of **redefinition**.*
    - *Why limit ourselves to written notes or simple drawings? During the lesson, the notes can be enriched with:*
        - *photos of what the teacher wrote on the black/white board, of a map or images she/he showed, of an electrical circuit made in the laboratory, ...*
        - *audio recordings of significant sentences, for example definitions,*
        - *videos of the teacher reciting a poem, or explaining the technique of high jumping or first aid, of a physics experiment, ...*
    - *Why limit ourselves to what was said/done in the classroom? We can insert a link to a Wikipedia page, to a museum (to a specific page/work), to the video of a scientific experiment or to that of an actor reciting a poem or to a theatre performance.*

The age-old process of taking notes in a class can be transformed into the collaborative construction of a multimedia book for the benefit of the whole class.

TYPES OF EDUCATIONAL RESOURCES

The main types of education resources to be briefly discussed here are:

- Documents
- Presentations
- Videos & Interactive Videos
- Interactive Images
- Maps
    - Geographical maps
    - Concept maps
    - Mind maps
- Learning Games
- Simulations
- Quizzes

DOCUMENTS

The **document**, composed of text and images, is the most traditional form of educational resource, although it is not necessarily the easiest to find as open content.

The document serves to:

- convey facts, events, principles, rules, axioms, scientific laws,
- describe terms, classifications, methods, procedures,
- construct narratives that connect and give meaning to facts, events, principles, ...

The digital document can represent a step up, or an improvement or transformation, of the analogue equivalent in exactly the same way that simple note taking was enhanced in the previous section. While this is happening, many online documents and texts, however, are still the digital equivalent of their analogue descendants. Many publishers, for example, simply use online resources to offer a PDF, or similar, equivalent of their texts. Much more can be done.

PRESENTATIONS

Presentations are probably the most widespread form of teaching resource, created to accompany the presentations of speakers (teachers, lecturers, etc.) and highlighting the essential concepts of the talk by means of images, keywords, short sentences.

Initially they were very much based on transparencies projected onto a screen using an overhead projector, but these were transformed by digital equivalents, such as PowerPoint. Many of the younger generation will think is hard to imagine that non-digital presentations were possible!

The SAMR model can also be applied to presentations, identifying:

- **substitution**, the simple transition from analogue to digital slides,
- **augmentation**, reproducing and modifying a digital presentation is much, much easier than doing it on transparencies. It is also very easy to distribute a presentation to all participants in a conference or to students in a class,
- **modification**, for example the possibility of sharing it to work on collaboratively,
- **redefinition**, presentations can be greatly enriched with images, audio, videos and links, turning it essentially into a multimedia book.

Presentations are often used to accompany a lesson in the classroom. They are a key teaching resource when handed out to the students who participated in the lesson, but they may not be easily understood if distributed to others outside that context. This is a major failing in education as presentations (PowerPoints) are often simply posted up on some shared file store (a learning environment, for example) as a teaching resource.

Unless they are accompanied by some recording of the event, they often lack any value. Recordings may be audio or (the subject of the next page) video.

VIDEOS & INTERACTIVE VIDEOS

A lesson can be like the theatre. The teachers (the actors) act in the presence of the students. Their play takes place within a restricted environment, where the scenery can be changed - but generally not too much. The overall performance generally has a linear trend to it and it is generally always watched in real time.

The educational **video**, on the other hand, is like the cinema.

The actors act only once (possibly repeating a scene until it is optimal), the different pieces can be recorded separately and in different places and then assembled together as a coherent whole. Once done, an unlimited number of people can look at the result as many times as they wish, interrupting it, replaying it and restarting it at will. Such edited 'cinematic' productions can be very valuable educationally and be of high quality.

Unfortunately, there is also a hybrid - the potential for filming the theatrical performance.

There are many videos of this type online, particularly in higher education where university lectures are captured for online download or watching. Many conferences also do the same. These can be useful resources, but they often are completely devoid of quality. This is no fault of the 'actors' as, for many teachers, this can be an unnatural activity and one that carries a pressure not seen in normal lectures.

Educational videos can be placed into three categories:

- **Video Lessons supported by slides or images.** It is the one that is closest to the traditional lesson. The teacher explains/illustrates a topic, generally accompanying it with images and slides. If there is a video, the teacher might not even appear on it unless for a moment at the start to give the video lessons a more personal feel.
- **Video Tutorials.** The video shows how something is done. This is now very common and you can learn how to do anything - from repairing a washing machine, to changing a car headlamp or learning about a concept in economics - from videos on the Internet. There are very many, very good education resources to, typified by Khan Academy who produce very high quality, very consistently presented tutorials on a wide range of subjects.
- **Documentaries.** These videos illustrate natural phenomena, current or historical events, geographical features, biographies, ... using videos and a narrating voice.

Videos have the power of moving images and the combination of images, sounds and speech, but traditionally they only have a 'transmissive' nature, i.e. the student merely watches and listens. Today it is very easy to make the videos interactive by inserting questions or other activities for the students to engage in. It is even possible to alter the learning path that the student will take, depending on how they react to the interactions (e.g. their answers to embedded questions).

Again, we can see the SAMR model levels of **augmentation** up to **redefinition** in action.

On the issue of **redefinition**, digital capabilities and tools have introduced a disruptive innovation into the field of videos. In the recent past, to produce a movie - even a simple one - tended to require sophisticated instrumentation not generally accessible to everybody. Today anyone - and therefore any teacher but also their students (or perhaps we should say any student but also their teachers?) - can, with a mobile phone and a computer, capture actions on a screen, animate a presentation, insert an audio, edit and distribute a video. Actually, the computer is not even an essential as, if you have good manual skills, you can now do everything directly on a smartphone. It is not inconceivable that teachers and students should now be expected to be able to assemble pieces of existing videos together and make them interactive by inserting comments, quizzes and choices.

It is a change that even allows us to **redefine** our **teaching methods**. The methodological model of the flipped classroom was born from the idea that the teacher can provide students with rich, educationally sound lessons to study at home.

INTERACTIVE IMAGES

It is said "*an image [picture] is worth a thousand words*".

Images have always been used in teaching for their educational value. Think back to the walls of your elementary school - it was almost certainly festooned with maps, textbook illustrations, topical pictures, etc.

Digital technologies change how images can be use, making then more easily searchable, acquirable, distributable and editable. Having interactive workbooks in a class allows teachers to readily find, insert and re-use images in their lessons much easier than was possible in the past.

A picture may be worth a thousand words, but it is often appropriate, from an educational point of view, to add descriptions to them - to explain the details or to offer a comment on it. It is also a **requirement** for 'accessible' content. The added value lies in the combination of image and words (whether written or spoken).

This is probably no different from the way that teachers have long added annotations to text books and work books, but it has become much easier to add this value.

Today it is possible to create **interactive** images through the many free and freely available software pages available for download. Images can have 'clickable' links, for example on key features in the image, which can open up new text windows or tabs, for example to open up an appropriate Wikipedia page or YouTube video. An image can therefore be, by itself, a complex didactic resource that the teacher creates for his own students or, even better, that he creates together with them.

MAPS

Maps are an important cognitive tool, not just when a teacher provides students with fully-completed static maps, but when built along with the students, or indeed by the students themselves.

A map is a simplified representation of space that highlights the possible relationships between the components of that space. A map is used to orientate oneself in a space, to know how to move in it thanks to the simplification and highlighting of relationships. Maps take many forms.

GEOGRAPHICAL MAPS

This is the traditional concept of a map and a tool present in many classrooms, in particular to support the study of geography.

There are different types: physical, political, historical and thematic.

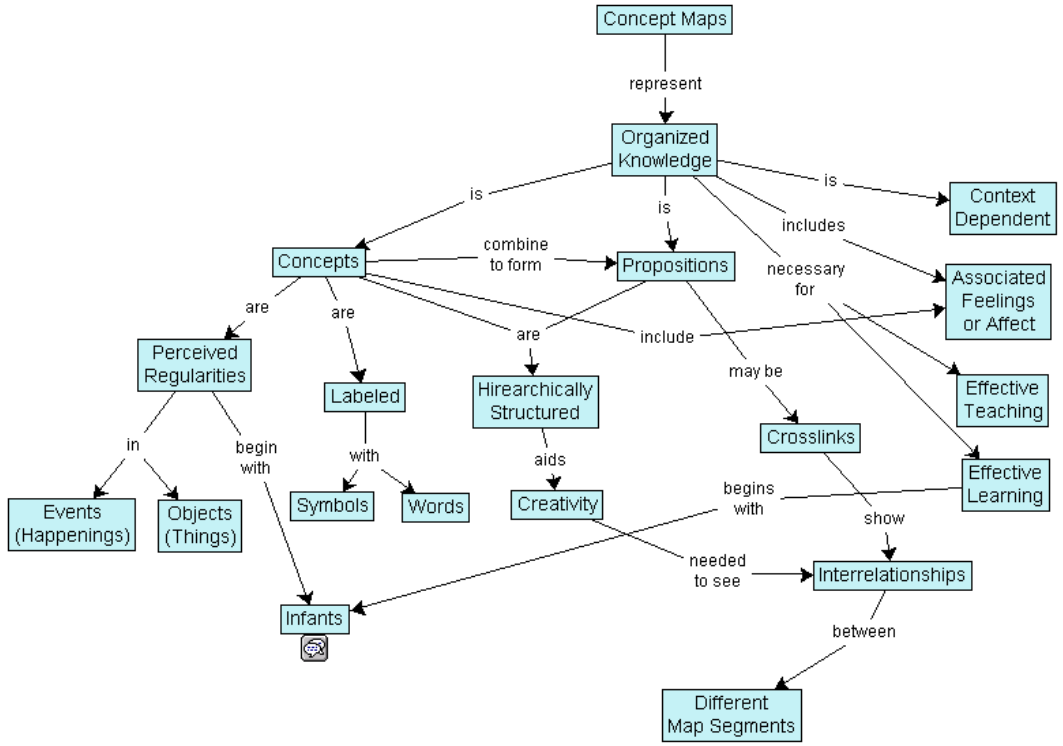
Digital technologies have introduced significant enhancements: with an interactive workbook and Internet access the teacher is no longer limited to a static set of maps but can move among different kinds of maps. Above all, tools such as Google Maps, Google Earth and Street View have completely redefined this field, incorporating not just the traditional map but using it as an interface to unparalleled levels and innovative views of the detail that lies below. Google's 'Street View', for example, let's you explore streets and buildings with near global coverage.

CONCEPT MAPS

Concept maps, designed by Joseph Novack, have a reticular, or netlike, structure. They need not have a precise or obvious starting point (even if this is present in most cases, as in the image below),

but each node represents an elementary concept - generally described by a label on a particular geometric shape (the shapes differentiate the type).

Nodes are connected by relationships, generally represented as oriented arrows in a directed (acyclic) graph and provided with a descriptive label (generally a verb).



Source: Wikimediacommons, Author Vicwood40
Creative Commons Attribution-Share Alike 3.0 Unported

MIND MAPS

Mind maps are used to depict and store concepts and information.

They have a hierarchical-associative structure, starting from a central concept from which the rays depart to associated concepts at a first level. These, in turn, can link to concepts at second level and so on, as in the images below.

The creator of this kind of maps, Tony Buzan, focused on 'evocativity' - bringing strong images, memories, or feelings to mind. All the elements of a mental map must be rich in imaginative and colourful images, because they stimulate the right cerebral hemisphere, the functions of which support faculties such as creativity, memory, mental association. The elements should be described with single keywords and not with sentences, in order to leave room for new associations.

Mind maps do not require digital technologies - you have probably seen someone scribble a mind-map at a conference or in a meeting - but digital technologies allow for enhancements and transformations similar to those described for the concept maps.

Source: Wikimediacommons, Author Fernandosca
Licence: Creative Commons Attribution-Share Alike 4.0 International

LEARNING GAMES

Much attention has been focused recently on the educational values of **games**, largely coming out of the type of activities generally found in the kindergarten or primary school where it is used fairly extensively.

Learning games, or serious games, are games specifically made to reinforce particular concepts through game-playing. The concept can be anything, from a historical or cultural event to a natural phenomenon or for acquiring a specific skill. Traditionally we have all played table games, card games and role-playing games, but digital technologies have allowed widespread distribution and participation in video-games and interactive, distributed games.

Wikipedia describes "Educational games" as:

"Games are interactive play that teach us goals, rules, adaptation, problem solving, interaction, all represented as a story. They satisfy our fundamental need to learn by providing enjoyment, passionate involvement, structure, motivation, ego gratification, adrenaline, creativity, social interaction and emotion in the game itself while the learning takes place." (Wikipedia-EN 11-4-2019).

SIMULATIONS

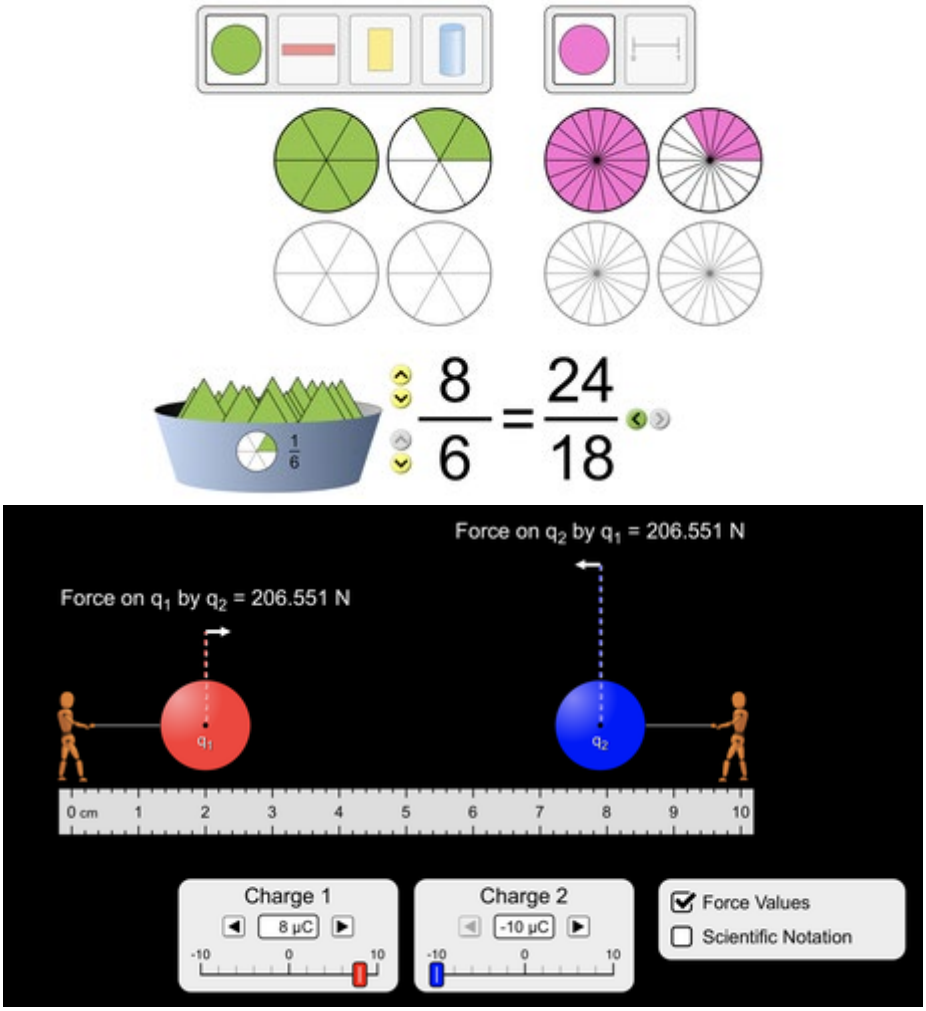
Simulations have been used for quite some time. They are typically simplified models that allow the user to make changes to various independent variables (parameters) of the model to see what the consequences are. They can be very varied in their use, from simplified economic or business models to experiments in a virtual laboratory.

Examples are shown in the image below from PhET at the University of Colorado. They make use of a very extensive, and highly functional, set of freely accessible simulations in mathematics, physics,

chemistry, etc. This is one of a very wide range of freely available simulation software libraries that can be readily found on the Internet.

The first is a simulation related to the equivalences of fractions. You can choose the type of object (pie, bar, cylinder), the numerator and the denominator of the first fraction and the different equivalent fractions.

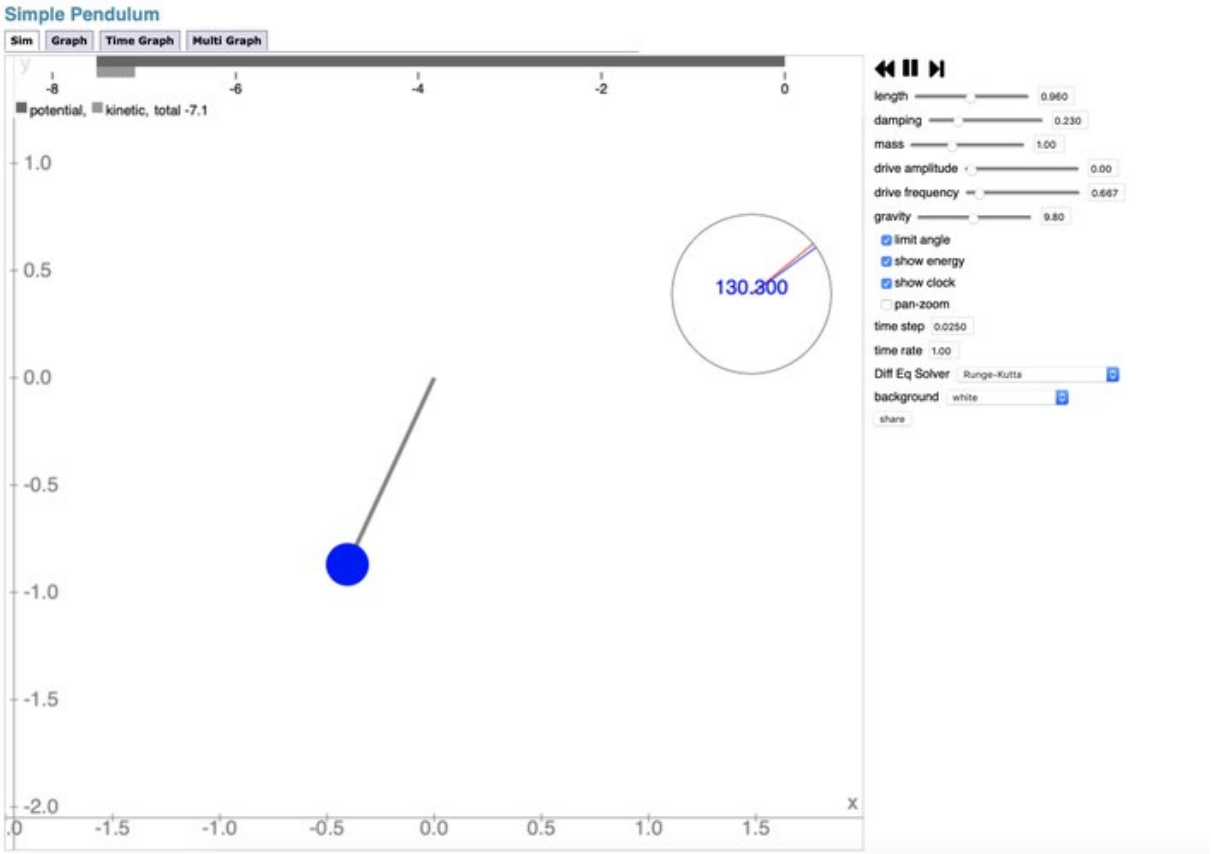
The second is a simulation in Physics on Coulomb's law. The distance between the two spheres and the charge, positive or negative, of each of them can be modified; the arrows indicate the intensity of the attractive or repulsive force between them.



Fractions: Equality
Coulomb's Law

In most cases, simulations are dynamic, as in the image below. The independent variables are the mass, the pendulum length, its initial position and the damping level due to friction. Once set, we can see the movement of the pendulum and how it slows down to a stop. It also shows the continuous transformation between potential energy and kinetic energy, as well as several other parameters. This particular simulation also outputs various graphs and tables that can be studied in detail.

It shows how valuable an educational tool even a simple simulation can be and how it can readily mimic the real world.



Source: Simple pendulum

Simulations can be complex and highly visual, as in this quite realistic virtual laboratory in the images below.

Source: *PraxisLabs*

QUIZZES

Quizzes and tests can perform different functions:

- **Self-assessment by the student.** If teachers are not monitoring the results of a self-assessment, the student feels relatively free to use the test when and how he wants without worrying that this might result in a negative assessment.
- **Formative evaluation.** This is a learning assessment generally used by teachers to define the next learning path, or the particular focus of attention, for a student.
- **Summative evaluation**. These are used to determine the final results, or grades, for the students.

Digital technologies provide many tools for the development of tests, with automatic correction, the possibility of corrective feedback, automated marking and to provide evidence of understanding. Technology can significantly enhance traditional test methods.

By providing students with a wide range of questions and question types, teachers can expose student to very rich testing at a level not possible traditionally. Tests can be customised on the basis of right or wrong answers provided (i.e. made adaptive - but be wary of the many claims here!) and they may include rich corrective feedback, which can act as a pointer for further study or follow-up learning paths.

Such tests existed on paper long before digital technologies became a reality. Tests produced in a digital form can be a simple **substitution** of the traditional ones, but there is huge potential for **augmentation** through exploitation of the new functionalities and capabilities now on offer. At the simplest level, tests can be modified and reproduced more easily, but they can take much richer, interactive forms. They can also be readily delivered to the students over the Internet, removing any necessity for the students to carry out the tests in the classroom.

The tests, and here we enter the field of **modification**, do not require the intervention of the teacher for the correction, as the identification of the error and subsequent explanation to the student. The test can be corrected automatically and corrective feedback can be given. And this opens up to **redefinition**: the test can be integrated with explanations, videos, simulations giving rise to complex resources, not imaginable in the past. Furthermore, tests used on large numbers of students give rise to big data that can be analysed to identify the questions with more errors and therefore to intervene on the test - to correct poorly formulated questions - or on the training path because they help to identify critical points.

3 Search and evaluation of resources in the web

DESIGNING EDUCATIONAL RESOURCES USING 4R LOGIC

Suppose we want to prepare training material for our students as guided by 4R, how do we approach this?

For example, we might want to provide our students with a video as a brief presentation to the topic, a conceptual map that highlights the different aspects/content of the course, an in-depth text, a simulation of some other content, a guided exercise, etc., followed by a self-assessment test, with corrective feedback, and a final summative assessment.

As a first step it would be worthwhile finding out if there are resources with the desired characteristics.

If we are lucky, we will find some. We may even find something we had not thought of but which may actually be more useful to our students, so we should be prepared to change our initial plans about what to provide them with.
Most certainly we won't find everything we need, perfectly suited to our needs. We may find some good resources that require some modification (e.g. to change some of the questions in the final test, or to simplify the in-depth text). We might even be unable to find any suitable resources so will have to produce them for ourselves (or maybe we can ask our students to create them?). Even in this case, though, before starting out with the development of our activity, we could still look for some "building bricks" to help to enrich it, for example useful photographs, drawings, video clips, etc.
Teachers who therefore want to organise learning paths for their students should learn:

- how to search for open educational resources,
- how to evaluate them,
- how to modify them,
- how to search for digital content to be used for new resources,
- how to create new resources.

In this Unit we will deal with the theme of the researching and searching of both educational resources and digital components that might be used to implement the required resources. Later in the unit we will provide an overview of digital tools that we think are useful in creating and modifying learning resources.

HOW TO EVALUATE RESOURCES
With online research it is prudent to ask "*how do we evaluate the results*?"

There are a few useful, but common sense, considerations:

- Does the resource add educational value? Any resource used should do more than simply look good within a wider publication. There should be something in it that enhances learning and understanding.
- The resource must be 'content correct'. The authority of the source of the object is certainly a factor in its reliability though, in general, a teacher should also be able to verify such correctness.
- The relationship between the resource and its didactic objectives must be assessed both in terms of prerequisites and an in-depth analysis of its contents.
- A resource should be evaluated in terms of how its characteristics match that of the learning patterns of students, for example in terms of the language used and any content references.
- It is also necessary to evaluate the technical usability and accessibility of the resource, particularly in the case of students with special needs.

RESPECTING THE COPYRIGHT
Some clarification is useful here. Providing a **link** to a resource accessible on the web does not violate any right and a teacher can legitimately provide her/his students with links to an entire learning path or a video, a presentation, a test, a simulation or a single image.

Problems arise if teachers want to **download** a resource and insert it into one of their own learning paths as they may then be modifying it.

For example, teachers might want to insert an image into a document or presentation of their own, they might want to insert some scenes from a video into a web page or a presentation, or to make their own movies by inserting a piece of someone else's video in it. They may even want to copy some questions from a test found on the net in a test of their own. In these cases, they will need **to pay attention to the licences** under which the resources they want to use have been released. What's more, they will have to **respect them**.

As an example, a teacher may want to insert a few sentences taken from Wikipedia into her/his own text. She/he can do this, **but** the license must be respected, for example with a clear statement along these lines:

"Text made available under the Creative Commons Attribution-ShareAlike License".

In this way a teacher can make use of those sentences, including for commercial use, and they can modify them but it must be indicated that those sentences came from Wikipedia. Any derived resource must also be released under the same license - or under a similar but **not more restrictive** license.

HOW AND WHERE TO SEARCH

The web is rich in resources specifically designed for educational purposes, as well as many created for other purposes but available for educational purposes.

Some of these resources are open - according to the definition we gave earlier in the unit - though there are also others that cannot be classified as an OER but which are still freely available to students. These are particularly interesting.

Those teachers and students who want to create their own educational resource can very readily find texts, images, video clips to use as components. There are so many resources available nowadays.

The difficulty lies in being able to quickly find those we are interested in.

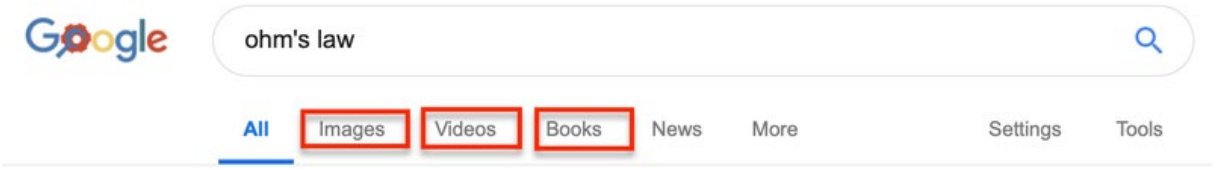
SEARCH ENGINES

One way to search for ready-made learning resources or for components to build them up from is to use a general search engine such as Google or a dedicated engine such as CreativeCommons Search or MOM.

GOOGLE
https://www.google.com

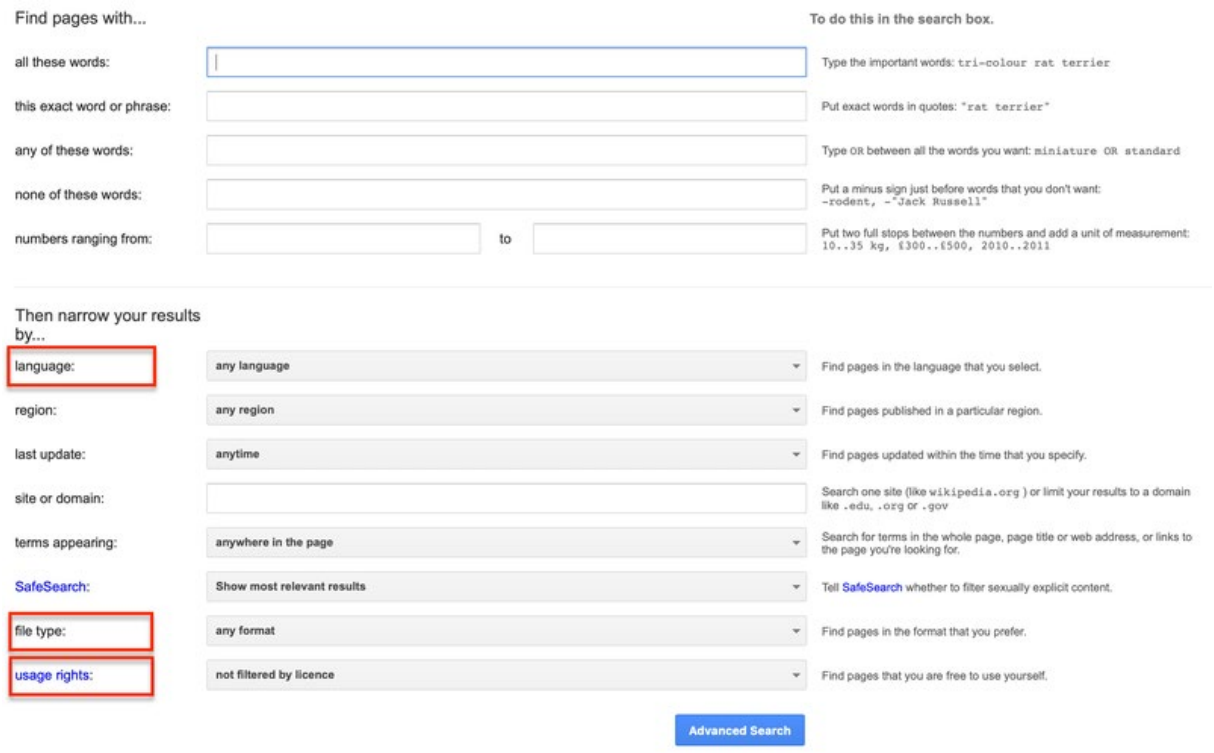
Google LCC is an American multinational technology company. Its headquarters are in 1600 Amphitheatre Parkway, Mountain View, California, U.S.

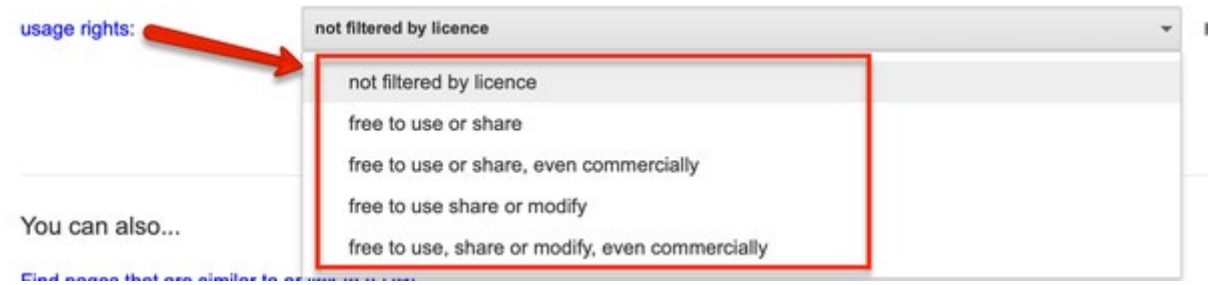
Google offers us the possibility to search for images, videos and even books, as in the following example:



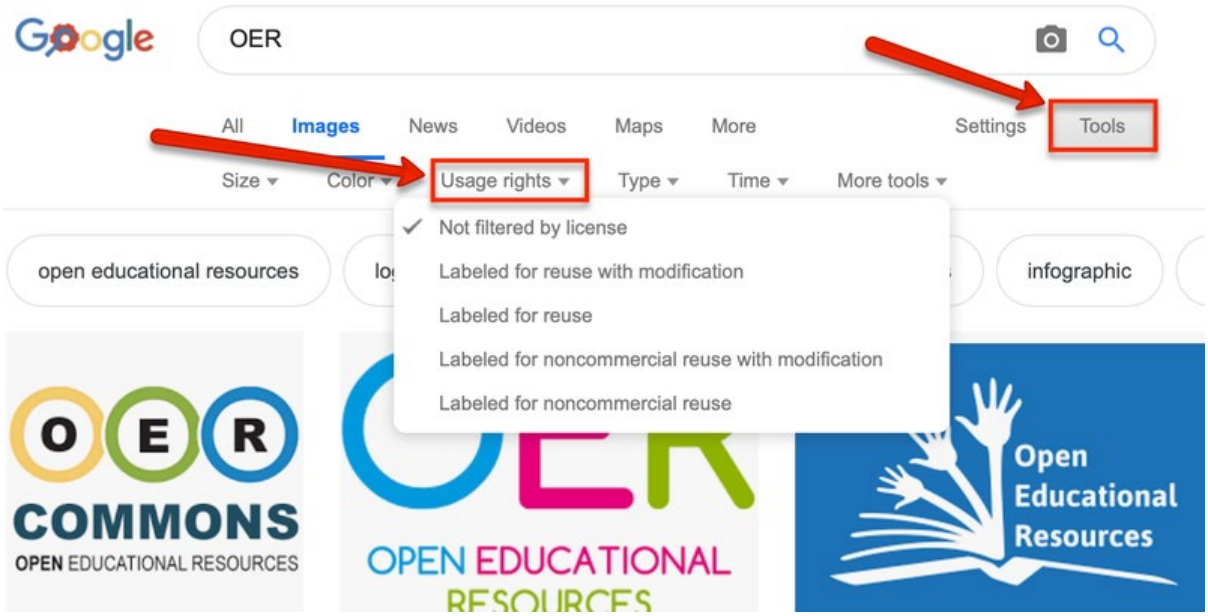
It offers advanced search, not only in terms of words or phrases but also of language, formats and rights of use.

You can also search for resources with specific user licenses, as shown in the image below:





If we are looking for an image - for example on the OER theme - using Google advanced search we need only to click on **Tools** and then on **Usage rights.**



Again, if we are looking for a video, it is possible to choose the duration that we are interested, or the site of origin (and each site corresponds to a specific use license).

CREATIVECOMMONS SEARCH
https://search.creativecommons.org/

Creative Commons is an internationally active non-profit organisation that provides free licences for creators to use when making their work available to the public. CC Search is a tool that help with finding openly licensed and public domain works.

Currently CC Search only searches images, but in future it may include additional media types such as open texts and audio.

CC Search searches across more than 300 million images. It aggregates results across multiple public repositories into a single catalogue, and facilitates reuse through features like machine-generated tags and one-click attribution.

Please note that CC does not verify whether the images are properly CC licensed, so it is advisable to verify the licensing status and attribution information before reusing the content.

DIRECTORIES & REPOSITORIES

The search for resources on the web is facilitated by the existence of web sites/environments in which the resources are organized and catalogued.

These can be distinguished as directories and repositories.

- **Directories**. These are databases that contain the **descriptions** of resources that reside elsewhere and provides links to reach them. They have generally been created to address the problem of recording and tracing existing resources, produced and stored elsewhere. It

would be convenient if there was only a single worldwide catalogue with all the resources in it, or a single means of cataloguing but, unfortunately, this is not quite the case.

- **Repositories**. These are real resource warehouses. They are developed by those who want to make their resources available, or by those who offer tools and space to create and store resources.

There are many directories and repositories, some national and others of a local nature, some thematic and others generic. In the following paragraph we offer an overview of the most widely known and used at an international level.

LEARNING RESOURCE EXCHANGE - DIRECTORY
http://lreforschools.eun.org/

This is a Directory created within the framework of the European Schoolnet - the network of 34 Ministries of Education at a European level. As of April 2019, it numbers over 330,000 open resources in a plurality of languages.

This is how it describes itself:

"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. It was developed in order to provide Ministries of Education with access to a network of learning content repositories and associated tools that allow them to more easily exchange high quality learning resources that 'travel well' and can be used by teachers in different countries.

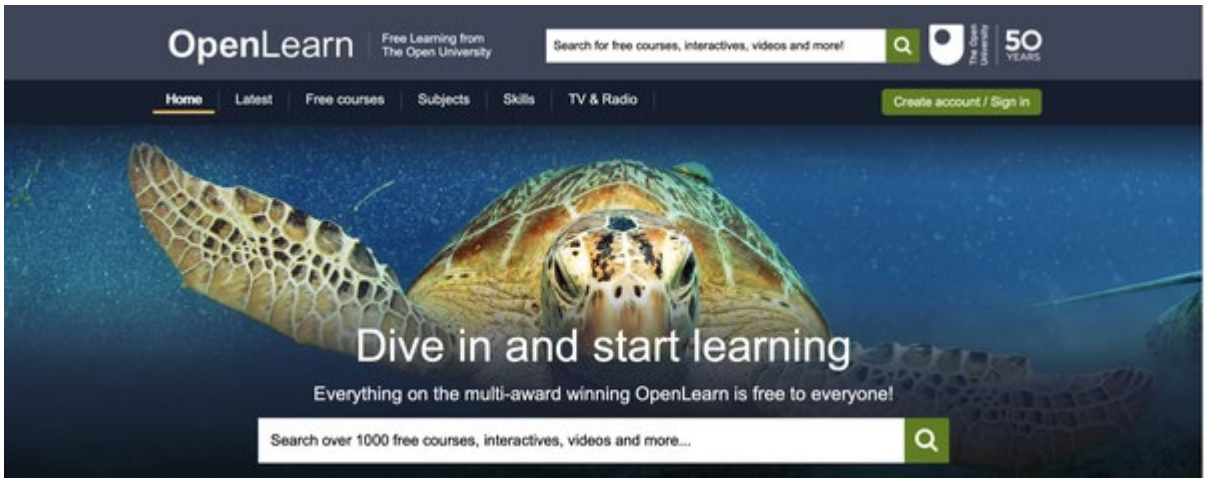
OER COMMONS - DIRECTORY
https://www.oercommons.org

This repository has been created by the *Institute for the Study of Knowledge Management in Education* and supported by the *William and Flora Hewlett Foundation* and the *Ford Foundation.*

OER Commons is a freely accessible online library that supports the search and discovery of open educational resources (OER) and other freely available instructional materials

Resources on the site can be searched and filtered using an expanded set of descriptive data, including conditions of use. The "metadata" is enriched by users when they tag, rate, and review materials, and share what works for them.

OPENLEARN - REPOSITORY
www.open.edu/openlearn/



www.open.edu/openlearncreate/

Most of the resources available in OpenLearn are released under the Creative Commons Attribution-Non-Commercial-Share Alike license.

Often, however, this only applies to written texts (owned by the UK's Open University) but not to images or videos supplied. Therefore, before using a resource, carefully read the guidelines about copyright.

As stated on their site:

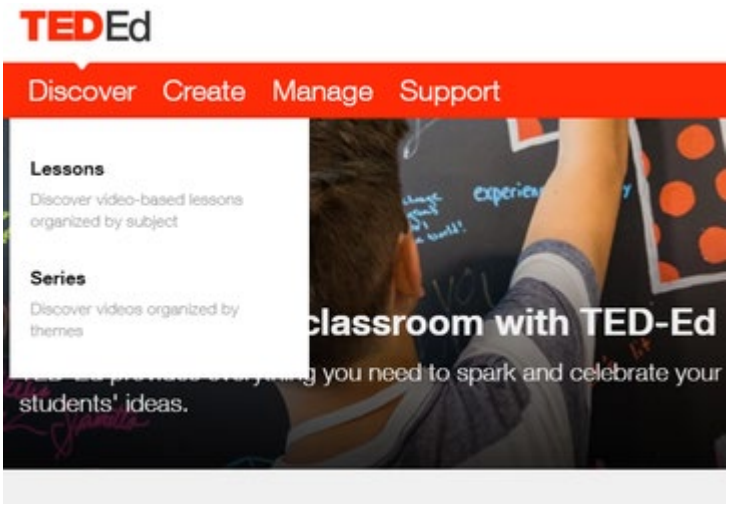
“OpenLearn Create is an innovative leading open educational platform where individuals and organisations can publish their open content, open courses and resources. It is Moodle based and has tools for collaboration, reuse and remixing”.

TED ED - REPOSITORY
https://ed.ted.com

TED is owned by a non-profit, nonpartisan foundation. TED is a brand of US conferences whose mission is summarized in the *"ideas worth spreading"* formula. TED events are held throughout North America, in Europe and Asia, with lectures being broadcast in live streaming and then made available for free at https://www.ted.com/talks under Creative Commons license. TED supports the automatic translation of subtitles.

Currently there are over 3,000 lessons available.

TED ED is a "derivative" of TED and is a tool made available to enable others to create lessons from a video and make the lessons available to everyone.



More details can be found in all cases in their respective web sites.

TOOLS FOR PRODUCING AND MODIFYING

DIGITAL RESOURCES

There is a very wide range of software tools that can be used to produce educational resources.

They obviously differ in respect of the type of resources they produce, but also with respect to the following characteristics:

- ***Rights of use**. There are proprietary products that require the user to buy a license, some that are open source, and some that are proprietary but where all their functions (or part of them) can be used freely.*
  For example, there are a number of document production/word processing options. Microsoft's Word is a proprietary product which requires the purchase of a user license, but Google Doc is proprietary but can be used freely. Writer - as in OpenOffice and FreeOffice - is open source software that can be freely used, distributed and modified.

- ***Working locally or in the cloud**. Some software requires installation on the user's computer, while some can be used over a network. In this latter case they are often referred to as web environments or web applications, rather than application software. Users of tablets and smartphones are familiar with Apps installed on these devices. Keeping with the example of documents, both Word and Writer require to be installed on the user computer, while Google Documents can be accessed via a web browser.*

- ***Resources local or in the cloud**. If a software programme resides on the user computer, the output from it will generally also be saved locally on the same device (though may eventually be uploaded on the net somewhere at a later time). If we are working 'in the cloud' (i.e. on a network resource such as Google Documents) the resource will naturally be available in the cloud itself, carrying the possibility of allowing students to link to it or even to include the resource created (embed) in a web page of their own. In many cases, it will be possible to download the resource though there may be a restriction allowing it only to be used where it was produced.*

For each type of educational resources, there are specific software/web environment and Apps that are popular and commonly used. The list to follow restricts itself to **open** products or those that allow free use of at least a usable subset of the features. With the latter, we will take into consideration the rights and rules of use. Often 'free use' can correspond to a limited period of use during which the 'free' plan restricts use to a few functions only, or for a limited number of resources, but with the intended aim of enticing users to subscribe to an upgrade plan.

It is up to the teacher to decide whether to create resources 'in the cloud' or locally - something entirely dependent on their context. The 'cloud' unquestionably offers considerable simplification - teachers and students can access resources from any device and from anywhere. However, this requires both students and students to have a good network connection, both at school and at home, and access to a cloud service – which generally carries a cost.

Access to the general Internet carries its own problems, particularly when working with minors.

APOWERSOFT: Free online screen recorder
APowerSoft can record anything displayed on screen and with different audio input (System sound, Microphone or Both System sound and microphone).

It allows unlimited screen recordings. However, be aware that on clicking on “Start recording” you will be asked to download and install a launcher. This takes a few seconds.

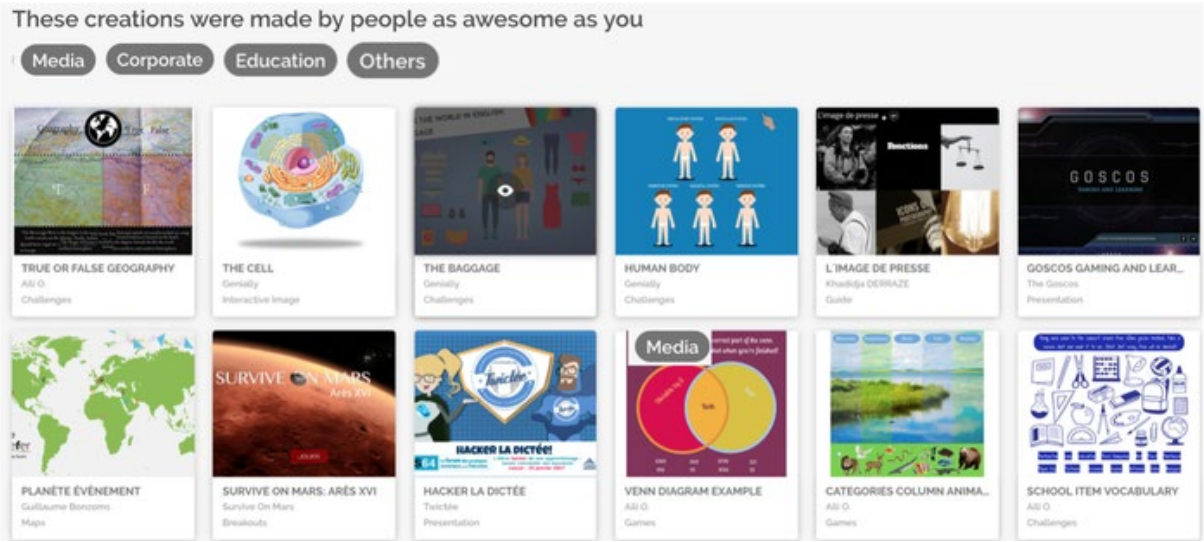
Once done, then you can start recording what happens on the screen.

Output formats
APowerSoft exports videos to a variety of formats: WMV, AVI, MP4, MOV, MKV, FLV, MPEG, VOB, WEBM.

From these saved videos it is then possible to upload them to cloud services, e.g. sharing them on YouTube.

GENIALLY
https://www.genial.ly/
Genial.ly is a free online platform that supports the creation of interactive presentations and infographics with personalized content.

The service, after a quick registration, allows users to create interactive content starting from a gallery of projects (posters, presentations, CVs, postcards and infographics) or from a blank canvas.



Examples	Video tutorial
https://view.genial.ly/56de86001561e801ac84eb33 https://view.genial.ly/5c002e4915745d241b51425d/interactive-content-guess	https://www.youtube.com/watch?v=xoWaX51zuKU&feature=emb_logo

COGGLE: TO CREATE AND SHARE MINDMAPS
https://coggle.it/

Coggle is a collaborative mind-mapping tool that simplifies complex concepts.

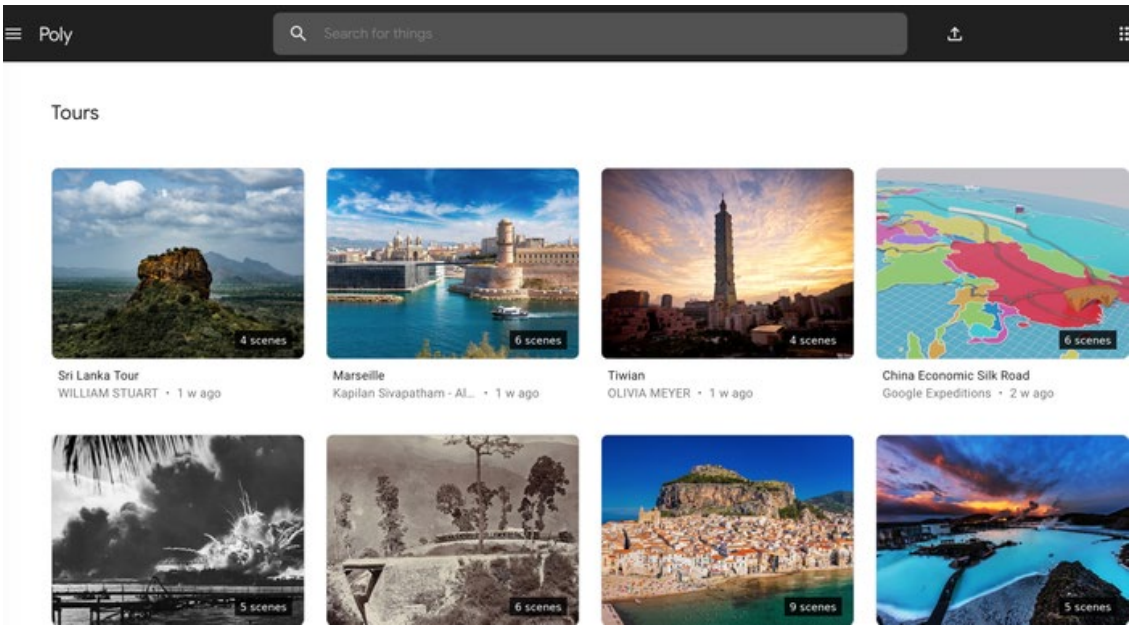
Coggle integrates seamlessly with Google Drive, so it is possible to organise mindmaps and readily share them with existing Google contacts.
Features:

- *Real-time collaboration*
- *Unlimited diagrams*
- *Unlimited image uploads*
- *Full change history*
- *Markdown support*
- *Download as PDF & Image*
- *Export as .mm and text*

Examples	Video tutorial
https://static.coggle.it/diagram/XKq5tz46Oz0dPuLG/t/motivation-and-emotion https://static.coggle.it/diagram/XARWtMH7rfIuMbMt/t/evil-vocabulary	https://www.youtube.com/user/CoggleIt (Coggle YouTube channel with several tutorials)

TOUR CREATOR: TO CREATE AND SHARE GEOGRAPHICAL MAPS
https://vr.google.com/tourcreator/

Tour Creator enables anyone with a story to tell, to make a VR tour using imagery from Google Street View or their own 360 photos.



Once a tour is created , it can be published to Poly, Google's library of 3D content.

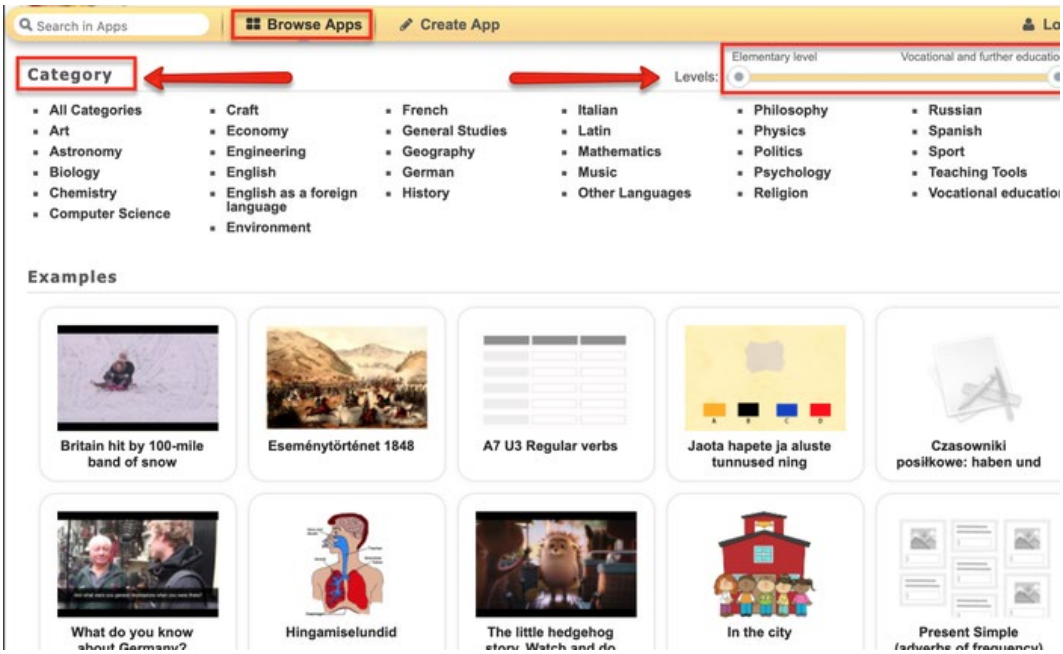
To view a tour one can open the link in a browser or view in Google Cardboard. The tour created can also be embed in a website.

Video tutorial
https://www.youtube.com/watch?v=fLzTJ7_KZGQ&feature=emb_logo

LEARNING APPS
https://learningapps.org/

LearningApps.org is an application that allows you to create interactive modules to facilitate learning processes.

It makes available a wide range of tools for the creation of graphically pleasing, interactive exercises into which you can readily incorporate images, videos and more.



LearningApps is free. It is also possible to create an App, without necessarily having any programming knowledge, using a template prepared for a variety of types of module.
It is also possible to perform all these functions without being registered, but the resources created are not stored in the site for future modifications. Their goal is to create a repository available to all with reusable and editable modules.

Examples	Video tutorial
https://learningapps.org/732876 https://learningapps.org/4569506	https://www.youtube.com/watch?v=hNgFXHv6eIs&feature=emb_logo

More details can be found on their web site.

GEOGEBRA
http://www.geogebra.org/

GeoGebra is an interactive geometry, algebra, statistics and calculus application, intended for learning and teaching mathematics and science from primary school to university level.

GeoGebra is available on multiple platforms with desktop applications for Windows, macOS and Linux, and Apps for Android, iOs and Windows. It is a web application based on HTML5 technology.

Its Wikipedia description:
"Constructions can be made with points, vectors, segments, lines, polygons, conic sections, inequalities, implicit polynomials and functions. All of them can be changed dynamically afterwards. Elements can be entered and modified directly via mouse and touch, or through the Input Bar. GeoGebra has the ability to use variables for numbers, vectors and points, find derivatives and integrals of functions and has a full complement of commands like Root or Extremum. Teachers and students can use GeoGebra to make conjectures and to understand how to prove geometric theorems".

Examples	Video tutorial
https://www.geogebra.org/m/WxYc7B4R#material/MFDPHCF5 https://www.geogebra.org/m/T5cPPUs5	https://www.youtube.com/watch?v=1cBXWi66-tY&feature=emb_logo

KAHOOT!

http://www.kahoot.com

Kahoot allows users to create games of three types:

- Quiz
- Jumble
- Survey

There is also an area named *Inspiring stories & and latest updates* rich with latest news, practical tips and inspiring classroom stories, plus a n area where teachers all over the world share their teaching activities with Kahoot.

Examples	Video tutorial
Climate change	https://www.youtube.com/watch?v=5mRzrjbM6aw&feature=emb_logo

4

Virtual Learning Environments (VLE)

Basics of course design; utilizing virtual classroom services.

1 VLE-Basic concept

INTRODUCTION

Before being able to choose an online learning environment (or virtual learning environment – VLE) it is essential to understand what they are and how they might be of use in education.

Virtual learning environments (VLE) are a component of the wider world of educational technology, which has been around for some time now. Educational technology, itself, is the study and practice of facilitating teaching and learning, and of improving performance, by the use and management of appropriate technological processes and resources. In the 1990s this was boosted by the ubiquity of personal computers, and devices such as laser discs and CDs, but the emergence of Internet-based information services significantly opened up the potential for educational technologies to do much more.

MAIN SERVICES OF VLES

VLEs are themselves world-wide web-based platforms that support the digital capabilities of online course creation, support and study. There are very many alternative systems – some open source, some commercial – and many are extremely functional and flexible. A VLE should at least be capable of:

- ***Administration and communications***

Many VLEs are used purely for administrative support, and not necessarily for teaching and learning. A VLE should be able to provide a service to registered student at least for purposes of administration (informing of dates, exams, etc) and for communications with tutors and peer students (messaging, chat, forums, wikis, upload/downloads, etc.). Structured communications, through such a managed service, can be significantly more effective than through potentially chaotic emailing.

- ***Managing resources***

Many VLEs are used as a simple 'file store' for useful resources (slides, PDFs, word files, pod casts, etc.), giving learners access to essential information and resources. These may also include collections of links to external resources on the world-wide web (or simply the web).

However, VLEs should also be capable of supporting activities more closely related, and relevant, to teaching and learning:

- ***Curriculum design, mapping and planning***

While many VLEs are used primarily as administrative tools, above, they should also be capable of supporting lesson planning, assessments and skills development. A functional VLE should have features that help with the planning and design of courses, and with an increased efficiency, e.g. through the use and re-use of shared resources.

- ***Personalisation*** *of the learning and the learning experience*

Among the students there are those that struggle while others want accelerated learning, some have specific learning preferences, and all want their learning to suit their circumstances (e.g. flexible with respect to manner, time and location). Learning technologies and VLEs begin to offer these options.

- ***Tracking student progress and achievement***

Use of the environment's resources, the level of student interaction (e.g. in forums), and evidence of understanding (e.g. through forum posts or computer-marked formative assessment) can – and should - be tracked to allow tutors to spot problems and the potential need for intervention.

VLEs should (and most do) also provide support for:

- ***Content creation and management***

At some point a teacher will almost certainly want to create new materials. These could be learning materials or simply information about the course needs. All VLEs provide content authoring tools, generally some form of web page authoring tool, i.e. a simple editor similar to the word processors.

- ***Provide tools for a variety of support functions***

A VLE will probably not support every feature you need (e.g. live video conferencing) but it should be able to provide seamless hooks to other, external systems that do provide what you need. Most of VLEs support the integration of digital contents from external resources, pictures, videos, links, etc.

Finally, for now, a VLE should ideally be able to support 21st century learning needs, and the development of associated skills:

- ***Improve digital literacy***

By their very web-based nature VLEs encourage students to use various technologies to find, study from and to present information and evidence of their understanding.

- ***Practical problem-solving***

VLEs generally support various structured discussion mechanisms (messaging, forums, etc.), some of which also support virtual group meetings and thinking. Ideally there will be a range of mechanisms to support group interactions, particularly if the VLE is being used in an international and/or cross-cultural context where students really can learn from each other.

HOW TO CHOOSE A VLE?

Given the range of options, how does one choose a VLE?

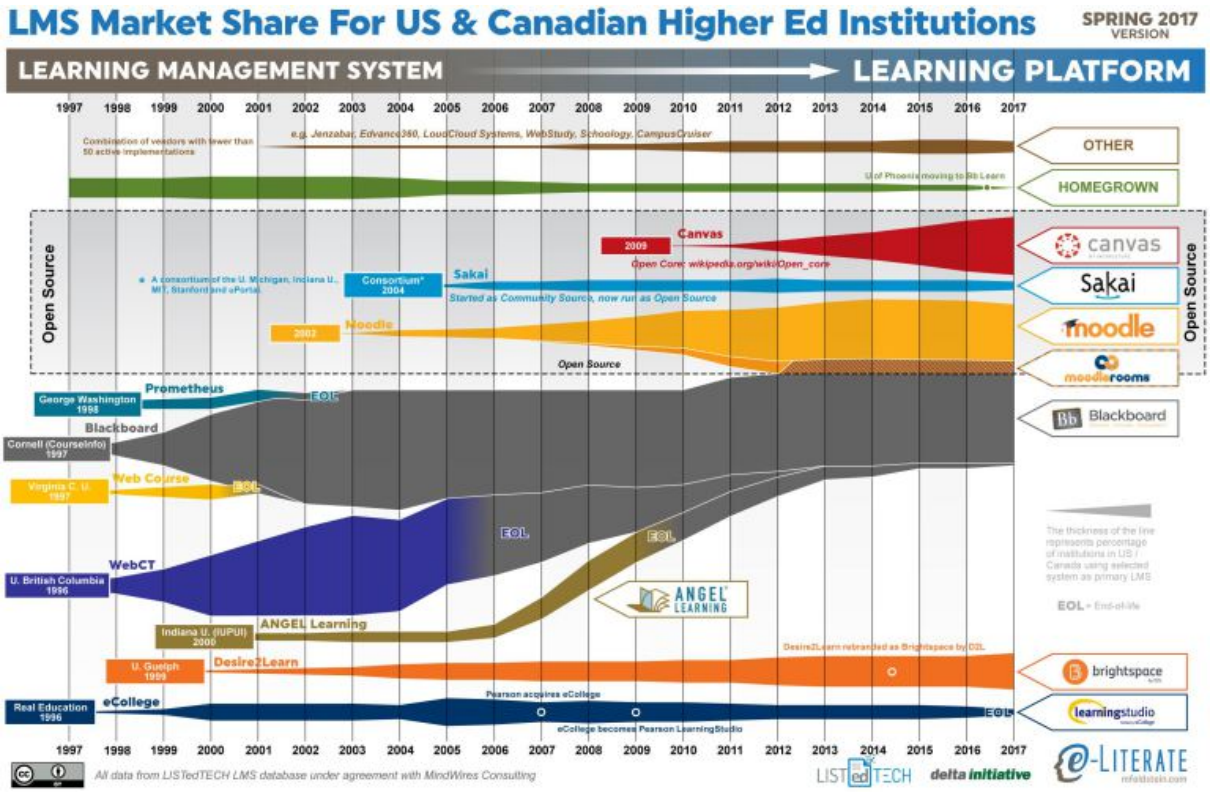


Figure: LMS use in the US 2017

Source: [Inside Higher Ed]

There are two fundamentally different approach regarding the solutions for VLEs used by schools and teachers. More and more educational institutes install their own e-learning system on their server, what might be a free (like Moodle) or a commercial (like Blackboard). These VLEs need usually an IT expert who is responsible for running the system and providing support for the users, for the teaching staff and the students. These kind of VLEs are the so called *Learning Management Systems*.

Now-a-days as the cloud-based technology proliferated, the teachers can build up their own virtual learning environment for their classes by integrating different educational applications (like OneNote, OneDrive or Google Classroom) and open educational resources (OERs). Working with such cloud based "mashup" VLEs might be easier for the teachers, especially because there is no need for IT experts, however these solutions don't offer such complex functions what are necessary for bigger educational institutions.

LEARNING MANAGEMENT SYSTEMS

Looking at the Market Share diagram you see that there are three quite different types of complex learning management system that are representative of the overall offerings:

- ***Moodle*** *– a very flexible open source environment developed by a very wide community of users in conjunction with Moodle.org.*
- ***Canvas*** *– an open source offering controlled by Instructure.*
- ***Blackboard Learn*** *– the most widely used commercial platform from Blackboard.*

There are obvious upfront differences:

- ***Moodle*** *is free. Moodle is very easy to access, completely open source and can be downloaded in minutes for all computer platforms – Windows, Apple OS or Linux. Moodle can be up and running on a laptop, desktop or server in minutes. There is a huge global community of Moodle users and developers, so expertise is relatively easy to find. This ensures that customisation is practically unlimited.*
- ***Canvas*** *is supposedly open source, but it is generally used as a 'cloud' service. It requires a high level of IT competence to use the open source and run it 'locally'. Developed by Instructure, the potential for customisation is relatively limited. Cloud services (and this is also offered by Moodle) are popular for many reasons – from ease of use and scalability, to simple economic sense. Canvas as a cloud service is free for individual teachers, but not for institutions which pay a subscription fee.*
- ***Blackboard*** *is a commercial offering, and not particularly cheap. It does have a very good reputation for reliability and has a number of features that support distance learning and remote classroom learning. Like Canvas, its development is controlled by a commercial organisation, so customisation is more restrictive than the community-driven Moodle. Blackboard's core features are lacking in places, though it has an impressive array of high-level add-ons for analytics, purchasing, accessibility, etc.*

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CLOUD-BASED, MASHUP VLES

Even if the school does not operate a Learning Management System, 21st century teachers definitely need an online space where they can

- *keep, edit and share digital teaching materials that they create(d) themselves,*
- *collect the links to Open Educational Resources they find and recommend to students,*
- *communicate and collaborate with students and colleagues,*
- *keep track of progress of the students.*

The cloud-based, mashup virtual learning environments represent a new approach to using technology in education. This approach tells us that there is no reason to use the word “e-learning” anymore (the first letter of "electronic" indicating technology supported learning), because in our digital era, learning and teaching can’t exist without technology. Learning can occur outside classroom walls; it happens everywhere in the online world. It is not a question anymore for teachers if they should or shouldn't utilize technology: the question is which online tools they should use in teaching and how.

- ***Google Classroom***

Google Classroom is a free web service, developed by Google for schools, freely available for teacher and students in several languages as a classroom management system. The teachers, who are using already the offers of Google Drive, can include their electronic documents into their Google Classroom: for each classroom the teachers can create a separate folder in Drive. The first version was launched in 2014 aimed to help teachers to collect and correct assignments paperless. For now, it supports not only to give out and evaluate assignments, but online collaboration among teachers and students, sharing and reusing learning materials online (word documents, sheets, presentations, etc.), planning and managing classroom work.

- ***Microsoft Education***

Microsoft OneNote, which is connected to OneDrive. http://www.onenoteineducation.com/. It is also recommended to use both. One Note for content management, and Google Classroom for managing assignments, student tasks, discussing questions.

PEDAGOGY SURELY

What none of this actually addresses, however, is how useful these systems are to support your specific aims and, in particular, your specific pedagogic ambitions.

Probably key to this decision is pedagogy! It is not unknown for people to be seduced by the technology, while forgetting that the most important thing should be the effectiveness of the learning experience for the students. Many teachers have been following a very effective pedagogical practice for many years so there is no reason to abandon proven practice just because of the availability and lure of technology.

There is an important corollary to this, namely that the technology should be able to adapt to your pedagogical practices – they should not be dictated by restrictions of the technology.

For example, one possible reason why the popular e-learning platforms (MOOC[1]) developed by famous universities all over the world, have struggled to scale and be applied to higher education programmes is because of their limited content creation capabilities and their limited pedagogical features. They are certainly useful for creating a web page with a video link, but a simple, but typical,

study pattern of “watch this video, do the quiz, post to the forum” does not constitute a rich pedagogy.

MOOC: Massive Open Online Course. A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web (Wikipedia)

CHOOSING THE RIGHT LEARNING ENVIRONMENT

While there is no right way to go about choosing a learning environment, there are some obvious considerations that should be given.

1. *Know what you want from a VLE.*

   There are many reasons to choose a VLE. For example, you may just want to use it for predominantly administrative tasks and as a platform for allowing managed communications to take place. This functionality could be provided by any VLE and by almost any web-based ‘portal’. However, if your intentions are to support online distance learners, and possibly blended and face-to-face learners, then you will be making significantly more teaching and learning demands of a system. So, before you begin to look for a suitable VLE, the first step is to consider the needs of your teaching & learning, your students and your institution. Questions to answer include: who are you teaching and what are their learning objectives; what skill sets are needed and what are you trying to improve; what end result would constitute success; how will you introduce the system into your institution? Having a clear idea of the end learning goals will prove vital in selecting a platform for the present and for the future.

   Other key factors include scale and content. Keen, pioneering individuals may make seemingly great use of a simple platform, but their approaches may not scale up to providing support across an institution. Sourcing suitable content is also an issue, particularly if an online course is to offer an alternative study mode for face-to-face course.

2. *Check against the capabilities of the candidate VLEs*

   VLEs can have many features and be customised or augmented to fit many more. Once your pedagogical aims and learner needs have been enumerated then you can begin to evaluate these against requirements of, the technical capabilities and the limitations of candidate VLEs. Even at the simplest level of purely administrative use there will be a need to evaluate how easy and effective it is to integrate into your institution’s administrative systems (e.g. for authenticating logins) and how easily it can be adopted by your various administrators. If the system is too complex or awkward, then many features will not be used; too simple and your administrators will not see benefit from it

   If the VLE is to be used for teaching and learning, then it is important that it supports all content needs (creation, delivery, updating, etc.) and all types (text, audio/video, simple or complex assessments, and interactions). While all VLEs will handle simple text page, with embedded videos and other media types, most are poor at scaling to handle substantial volumes of text across many pages, and few support question types beyond a basic set. If your needs include quite esoteric question types (e.g. for maths, chemistry, music) then your choice is more limited – but should nevertheless be able to be met. Do not be tempted to adopt a restrictive pedagogy because of the failures of the technology to support it.

Finally consider your support needs - for students, tutors and the institution. Support is something you will want to minimise, but when required it should be effective.

3. *Prioritise*

It is easy to be seduced by the technology, but even the smartest of features may actually be unimportant to your learning style and needs. It is important to know which ones are effective, which ones should be used to support your pedagogy and which ones are well supported. That way you can begin to prioritise.

For example, you may see the organisation and operation of assessments and assignments as the key reason for using a VLE, including marking and feeding back to the students. If so, then being able to author and offer computer marked assessments, linked to a grade book, may be your priority. This could also support progress tracking and be a key mechanism for spotting the need for interventions by the tutor. Alternatively, you may wish to select a system that has a rich and scalable content creation capability, to ensure that all students – irrespective of location, time and circumstance – have access to all the content needs of the course. Prioritise the needs, and match to features that will deliver you the functionality you need.

4. *Consider the Future*

The adoption of a VLE represents an investment – in people time if not financially (though beware that 'free' still comes with a cost). People will have to be trained in its use, content may have to be developed and maintained over time, and systems may have to be migrated. All are important long-term considerations.

There is a huge amount of subjectivity in educational technology, and in technology in general. This has to be recognised and put aside. Just because a teacher or an e-learning developer can knock up a sample course quickly is no a priori reason for adopting a particular system without considering scalability, repeatability, quality control and future administrative, teaching and technical support issues. Will your choice of VLE be able to serve your objectives for the next few years? Do think strategically about your needs now, and how they might develop and grow in the foreseeable future. Also ask yourself if you might be locked into a particular methodology or set of tools if, in particular, you adopt a proprietary solution.

Financial cost is a factor to be considered – direct costs (purchase) and indirect (operational) – particularly over the years. Commercial or subscription-based systems have to be budgeted for on an annual basis, including for maintenance. Open course systems are generally freely available and equally well-supported by a community. Don't underestimate the value of regular updates, bug fixes and user communities. These are factors that can significantly ease the adoption and usability-costs of a VLE, including offering access to expertise and resources to manage, exploit and operate the system

5. *Test by trial.*

There is no substitute for experience, and there is no better way to understand the capabilities of a VLE than by using and exploring it in earnest. A trial can give you the opportunity to test the features and capabilities of a VLE, but only if it is representative of the

context in which it will be used. A trial should test all of the pedagogical needs identified in the first step above.

Reiterating, be sure to test all the technical features of a VLE within the context of your pedagogic aims, and do not be seduced by the technology. Some of the technology may be impressive up front, but once more fully tested it may prove to be shallow. For example, it is generally easy for the experienced eye to instantly recognise which system a web site is making use of. Customisation features of many VLEs are very restrictive. This is true of functional features (e.g. quiz question types, page management, student profiling features, etc.), but it is also true of user interface and styling. The proprietary systems tend to be much less customisable, and also offer fewer functional features (though heed the warning above about subjectivity). For a scholarly article that compares popular proprietary systems, see: Indiana University LMS Pilots.

SUMMARY

There are many potentials uses for learning environments and there are many potential choices of learning environment, therefore there is no 'one size fits all' approach. What is essential is that requirements are specified in advance, taking into account the flexibility and functionality that might be needed. If your needs are more administrative in nature, then the requirements of a learning environment will be quite different from that of an organisation that has strong pedagogic ambitions.

In the case of the latter, flexibility is crucial else ambitions may be limited to whatever the platform provides. Your teaching and learning needs should be the driver, not the technology. These needs may vary from posting a few PDF and Word files to support reading, to operating all formative and summative assessments online, to having powerful progress tracking and personalised feedback to students. As we will see in later sections, the learning environment can also help support the design, development and monitoring of content within an overall curriculum that maps to industry or other competency frameworks.

This is a quite lofty ambition and use of a learning environment but, as education strives to be more relevant for employability, and for the development of specific skills and competences, it is a direction that will become more important in the future.

2 Course Design

INTRODUCTION

As you might expect the range of online courses on offer from educational establishments, training organisations and many other providers is as varied as there are possibilities.

However, there are certain factors and challenges that they all should (but don't necessarily) take into account. These include designing for time, pace, structure, multimodality, platforms, study modes and accessibility. They should also consider market factors such as price, availability, and the circumstances of the students involved.

So, there is no single right way to approach course design – but there are many wrong ways. For example, some institutions still persist on giving every course an online presence (i.e. create an administrative space) and encourage academic staff to use these areas to post slides, PDF and Word

files, etc. Successful implementation of online learning of any sort involves much more than using an online environment as a simple file store space.

Any school or a teacher introducing online learning should be aware of the many strategic and operational questions that they might have to address if online learning is going to become effective, sustainable and an integral part, or extension of, the teaching and learning culture of the institution.

WHERE TO START?

A good starting point is to understand something about how learning actually works, then:

- *use technology to implement and enhance good solutions – no technology for the sake of technology*
- *use evidence to make progress – build on what provably works*
- *change practices at scale – look for genuine added value that is sustainable and repeatable.*

There are also various factors and possible approaches to online environments that might have to be considered, for example:

- *where to position online learning on the learning spectrum (see figure below). There is a range of possible offerings, from:*
  - *supporting face-to-face learners*
  - *adopting a blended learning approach where multiple methods are used to deliver learning, but generally combining face-to-face teaching with online activities*
  - *offering true distance online learning*
  - *or a combination of all three?*
- *training synchronously or asynchronously*
- *offering CPD (continuous professional development) or fully accredited courses and programmes*
- *in case of institutional VLE, outsourcing or developing in-house.*

Consider these questions:

- *are the materials going to be used collaboratively in class, individually over the Internet, or both?*
- *are the materials to form some sort of 'bricolage' that can be orchestrated into a unique blended learning experience each time, or should they be complete, containing everything ready an individual wold need to study and learn from?*

The answers to these questions will greatly influence your chosen learning design. The diagram below illustrates that there is actually a spectrum of learning and delivery options, and that while online, eLearning technologies can be applied to them all, the careful placement of your course design on this spectrum is crucial to successful use.

The Flexible Learning Spectrum of study modes

Your chosen course design will fit somewhere along this spectrum and will be influenced by the age and self-motivated studying abilities of your students, and by your desire to support more delivery online.

For example, if you are designing materials for use exclusively in a classroom with a teacher (left-hand side of the spectrum diagram above), you can ensure they have features to aid teachers more than students – revealing information step by step for example. Many team-based e-learning simulations use this approach.

THE RIGHT CHOICE

There are many others, so it is important to make the right choice. There are three important factors, however, to consider:

1. *how to scale up to adopt online learning strategically – to offer a range of different models and course types, and to embrace the challenges and implications of implementing online learning at an institutional level*
2. *curriculum design - teaching and learning online can be very different from face-to-face methods (though not necessarily so) so curriculum design is key to make the most of opportunities and of managing risks, e.g. through effective staff-student partnerships, involving learners as active partners, and using digital media in new learning models*
3. *use of technologies - making courses and content more engaging, improving access to learning for students, and embracing opportunities to reconsider how to teach, engage with and involve learners.*

Developing online learning provision is an obvious tactic for widening participation in education, but learners have a range of preferences and expectations. It would be wrong to assume that all learners want to learn in the same way, so offering flexibility and options is a consideration.

Developing online education also require supporting the staff involved, and many will find the experience strange, challenging and a burden that they don't like. Developing, and teaching and managing learners in an online environment, requires a particular skill set – one that teaching, and support staff need help with to develop.

Note: there are many tools out there that can be used for e-learning development. Some are good, some are poor, but all are technology tools with a finite lifetime, and a lifetime shorter than your teaching and learning challenges. Treat the many claims (e.g. "… you'll be able to deliver mobile and accessible courses with enhanced interactivity faster") with a pinch of salt. They may make production of a solution or approach easier, but they are not the solution to the challenges of online education. Use them with awareness of why you are using them.

Student learning must become more oriented to employability, as well as developing knowledge and skills within the learner. The competences that are gained should match the competency requirements of industry and society, many of which are detailed in multi-level competency frameworks. This final section will look at how course design and content development might be carried out to ensure a fitness-for-purpose. This section will:

- *show how all the earlier elements can be aggregated to provide tools to support competence-based learning*
- *illustrate how personalisation can be introduced into active learning and social learning on an online learning platform.*

LEARNING OBJECTIVES VERSUS LEARNING OUTCOMES

It is important to understand the difference and the intent of Learning Objectives and Learning Outcomes.

There are many, seemingly competing, definitions but the following clearly delineate their roles:

- ***Learning Objectives*** *are used to organize specific topics or individual learning activities to achieve the overall learning outcome. Courses should be structured with specific learning objectives in mind*
- ***Learning Outcomes*** *describe the overall purpose or goal from participation in an educational activity. Courses should be planned with a measurable learning outcome in mind.*

So, Learning Objectives are statements that define the expected goal(s) of an educational activity. Learning objectives can therefore be used to structure the content of an educational activity

Learning Outcomes are statements that reflects what the learner will be able to do as a result of participating in the educational activity. The outcomes address the educational need (knowledge, skills, competences), and achieving the learning outcomes results in a narrowing or closing of the knowledge/skills gaps. Learning outcomes are associated with assessment, and generally assess the overall impact of an educational activity over multiple objectives. The former is about structure; the latter about achievement.

Examples
Course for bricklayers

Learning objective of a course for builders:
Upon successful completion of the course, participants will be able to construct and repair wall structures and walls, partitions, concrete and reinforced concrete structures, chimneys, vents and ducts, as well as plastering and treating building surfaces.

Learning outcomes
The participants will be able

- *To list the different materials for plastering a building,*
- *To build a brick wall,*
- *Etc.*

If you imagine a course common to different institutions and using the same basic course materials (e.g. a core text) then they will have similar structures, hence similar learning objectives. However, the different institutions may have very different assessments, or written learning outcomes.

COMPETENCE-BASED DESIGN

There was a genuine attempt above to make clear the differences between Learning Objectives and Learning Outcomes. The two are often used to mean the same thing, but there is a fairly clear case to be made for attaching different meanings to them.

In a similar vein, it is worthwhile spending a bit of time attaching a clear definition to ‘competence’ as, again, different interpretations abound. In this module we will assume:

- ***Competence*** *- the proven ability to use knowledge, skills and attitudes, in social or professional situations for achieving observable results.*

A European **Council recommendation of 22 May 2018 defined key competences for lifelong learning** *as a combination of knowledge, skills and attitudes, where:*

- *knowledge is composed of the facts and figures, concepts, ideas and theories which are already established and support the understanding of a certain area or subject*
- *skills are defined as the ability and capacity to carry out processes and use the existing knowledge to achieve results*
- *attitudes describe the disposition and mind-sets to act or react to ideas, persons or situations.*

The EU's European Qualifications Framework (EQF) further defines:

- ***Knowledge Learning Outcomes*** *- statements of what a learner knows and understands on completion of a learning process: facts, principles, theories and practices.*
    - *Make use of verbs such as: define, describe, indicate, illustrate, summarize, explain, distinguish, associate, match*
    - *Do not use: know, learn, understand*
    - *For example: "At the end of the Module participants will be able to: describe the Creative Commons licences, list the principal OER repositories, etc."*
- ***Skills Learning Outcomes*** *- statements of what a learner is able to do on completion of a learning process to complete tasks and solve problems.*
    - ***Make u****se of verbs such as: analyse, apply, calculate, solve, debate, distinguish, generalize, summarize, choose, compare, evaluate, plan, realise, implement, produce, carry out, develop, measure, test, draw, publish, create.*
    - *For example: "At the end of the Module participants will be able to: make a video interactive by inserting questions, draw a mind map, publish a video on Youtube, create a playlist, etc."*

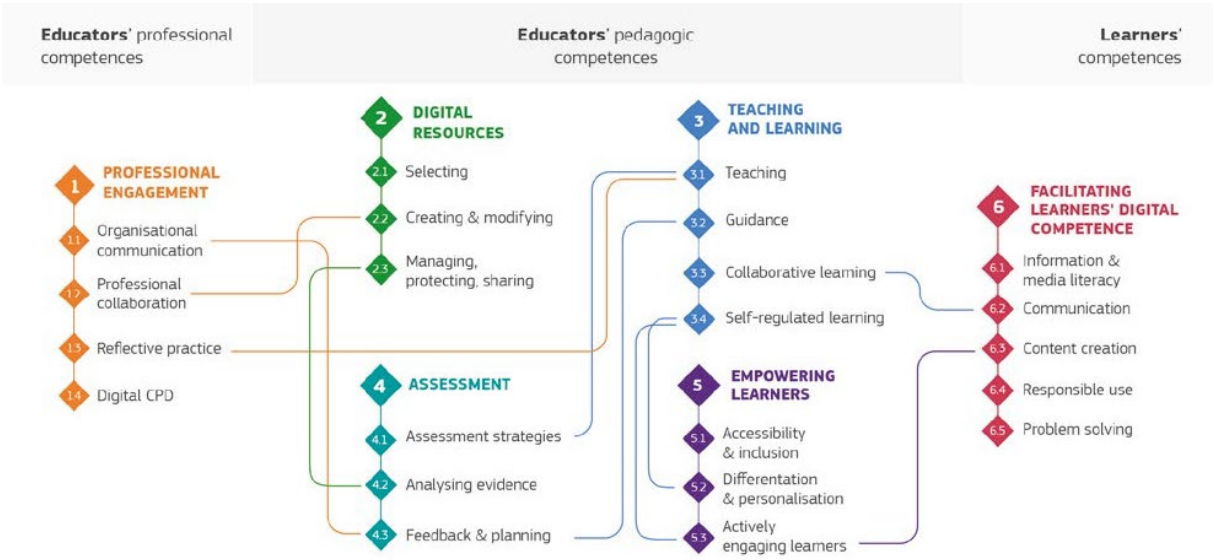
Finally, a last word on Learning Outcomes. These should be a measurable result (e.g. through assessment) of a teaching process, hence it is important to give a definition of each Learning Outcome that makes it measurable. This implies that use of terms such as 'knows' or 'understands' should be avoided because they do not actually say anything about how a Learning Outcome can be measured.

COMPETENCE FRAMEWORKS

A competency framework (CF) is a (generally hierarchic) structure that defines the individual competencies required by individuals working in a certain position in an organisation. The framework is built up from a number of competencies, which can be applied to a broad number of roles within the organisation or sector.

An example for that is the European Digital Competence Framework for Citizens (DigComp) (mentioned already in Module 1), which includes tools to improve and measure citizens' digital competence. It has become a reference report for the development and strategic planning of digital competence initiatives both at European and Member State level.

Based on DigComp a new a framework – DigCompEdu – was developed for describing what it means for teachers to be digitally competent and it provides a reference frame to support the development of teacher-specific digital competences.



DigCompEdu competencies (2)

5

Project Management and Collaboration Online

Planning and delivery of projects using digital devices; project-based approaches in the development of basic skills; design and implementation of pedagogical and development projects using digital tools.

1 Introduction to Project-Based Learning

SCHOOLS & PROJECTS

Efforts in active learning date back to ancient times - to when Socrates used '*questioning'* to stimulate inquiry and critical thinking in his students.

Since then, many problems in education have stayed with us through the centuries: how to get schools closer to the real world, how to motivate students, how to make them take the responsibility for their own learning process, etc. Following theories and practical methods, as suggested by reforming pedagogues, project-based learning (PBL) has recently received special significance at all levels and in all fields of education. It is particularly relevant for vocational education, where a primary goal is to respond quickly to the needs of the labour market and to ensure employment of their students.

Projects are used not only as pedagogical methods in the classroom, but also as part of everyday life in a school. Educational organisations frequently include projects - such as developing new curricula, building new infrastructure or starting a collaboration - as a means of introducing new teaching methods into their pedagogical practice. However, the school leadership needs high level project management skills to operate the organisation effectively, as teachers often do too. This is true not only when they are involved in organizational level projects, but also for driving the learning process and organising classroom work with students.

Teachers have to act as facilitators in the classroom, and to design lessons and classroom activities. In the implementation of these plans, monitoring a student's progress is similar (or more difficult) to the way a project manager monitors the ongoing processes for delivering projects and products. Teachers have to manage students and parents, and they need to have transversal skills when encouraging collaboration in problem solving, creating teams of students and coordinating the work of the teams.

2 Project Tasks vs Project-Based Learning

At present there are two basically different approaches applied to managing projects in schools:

1. one is the implementation of a complex pedagogical project in intensive collaboration with students and teachers, i.e. Project Based Learning (PBL). This is about developing complex projects with clear learning goals and didactic aims as defined by the standard curriculum.
2. the other project-based method involves handing out project tasks to students for practice and for assessment of the learning outcomes at the end of a particular learning phase.

Project task	Project-based learning
The task is defined by the teacher; the students have no opportunity to change it.	Students receive pre-approved guidelines and have the freedom to make choices in defining their own project, but usually starting with specific, focusing questions based on the content they need to learn.
Students can work on the project at home, without guidance from the teacher. The teacher's work is focused on evaluation after completion of the project.	Teachers have significant input to the planning phase, but the main work of the project goes on the collaboration of students.

The focus is usually on a simple project, after the close of a learning phase. It is not necessarily related to the learning process. It is seen as a closing action - like a 'dessert' after the main course.	May be highly complex, and usually covers standard, but relevant, knowledge, skills and competences. It plays a crucial role, like the 'main course', in the learning process. However, it is unique and even the planning needs time and collaboration.
The project task is not necessarily about a real-world problem, and it may be the same from year to year. It also may be the same for every student.	The project is strongly related to a real-world problem, and it has to be relevant to students' lives or future lives.
There are often no strict guidelines about how and when to do the project task.	The project is carefully scheduled, follows a project plan and is delivered as the collaborative work of students and teachers.
The project task is submitted according to rules as defined by the teacher.	The final results are often presented to a public audience including invited external guests.
The project task is assessed only by the teacher. Students have little information about the evaluation process and the grades of other students.	The assessment of the project and the work of the team members follows an open and accepted rubric.

Video
Project Based Learning: An overview

PROJECT-BASED LEARNING – AIMS AND BENEFITS

PBL should be seen as an integral part of the curriculum, nothing else, though an option that delivers new knowledge, and develops skills and competences during the teaching/learning process.

It is a way of delivering something fundamentally different from that of traditional frontal teaching method. It is based on a relatively complex pedagogical strategy of putting the students, and teams of students, at the centre of the learning process and establishing active learning with teachers who act as facilitators on the side. Do keep in mind, though, that both project tasks and PBL serve only as technical tools used to achieve pedagogical aims.

PBL is not a particular easy option job for teachers but, if well-organised, it is a valuable experience for the students and potentially rewarding for teachers as well. Here is a short summary of the main features and the benefits of the method, and hopefully motivation for why it is worth applying.

FEATURES & BENEFITS

One of the crucial impacts of PBL is that the development of 21st century skills in students is highly supported in all phases of the project period.

When reading the features below, do recognise that the 4Cs (Critical thinking, Creativity, Communication, Collaboration) are present behind the scenes in all kind of PBL related activities, together with such key competences such as digital literacy and a responsibility for effective use of digital resources.

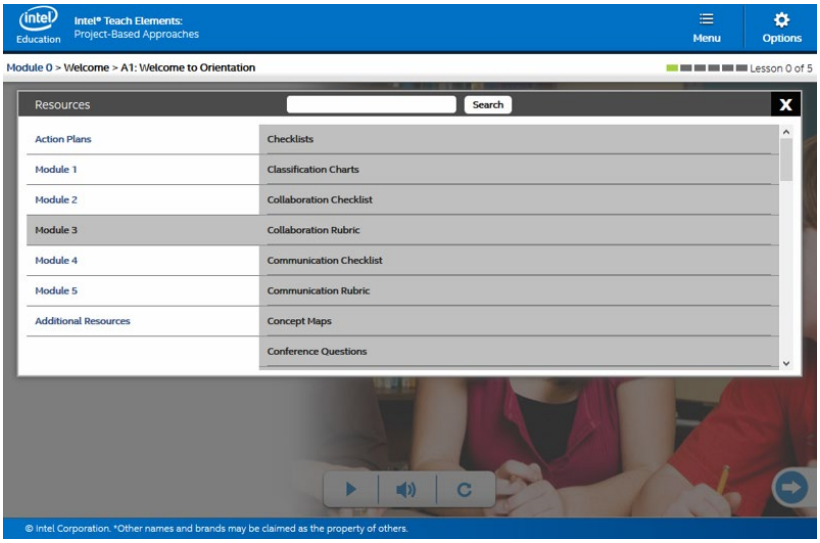
- The basis of a pedagogical project is the standard curriculum. When starting a project, teachers must take learning outcomes, pedagogical aims, and skills and competences into account, to develop these as defined by the standard curriculum.

- The students are involved in the planning and implementation of the project. The initial impetus has to be generated by the teacher, who must stir interest in the topics with motivating content (stories, websites, videos etc.) that inspires students to formulate questions. Afterwards they can discuss ways to find answers and what kind of resources they might use (books, articles, websites, experts, ask the teachers, etc.). After selecting the topics and answering any leading questions, students can make a choice on the direction of their learning.

- The teacher defines only the main frame of the project. It is not the teacher, though, who should decide on the focus and the details. The teacher facilitates students to utilize team building skills, helps them assign tasks, and plans how they might work together. However, the students play a creative role in the construction and planning of the project itself. They should be motivated to add new and innovative ideas to the process since the project is theirs. The underlying student-driven learning process should inspire them to ask and answer questions based on their own knowledge.

- Final product. The students are free to decide what the final product will be, in what form it will be delivered, and which digital tools (PPT presentation, digital timeline, video, infographics, etc.) are best for publication. At the end of their projects they may be asked to make a public presentation of their results and conclusions. They might present the outcome to a public audience - people from outside the classroom/school, parents, peers, representatives of the community and other schools, or even to the representatives of businesses.

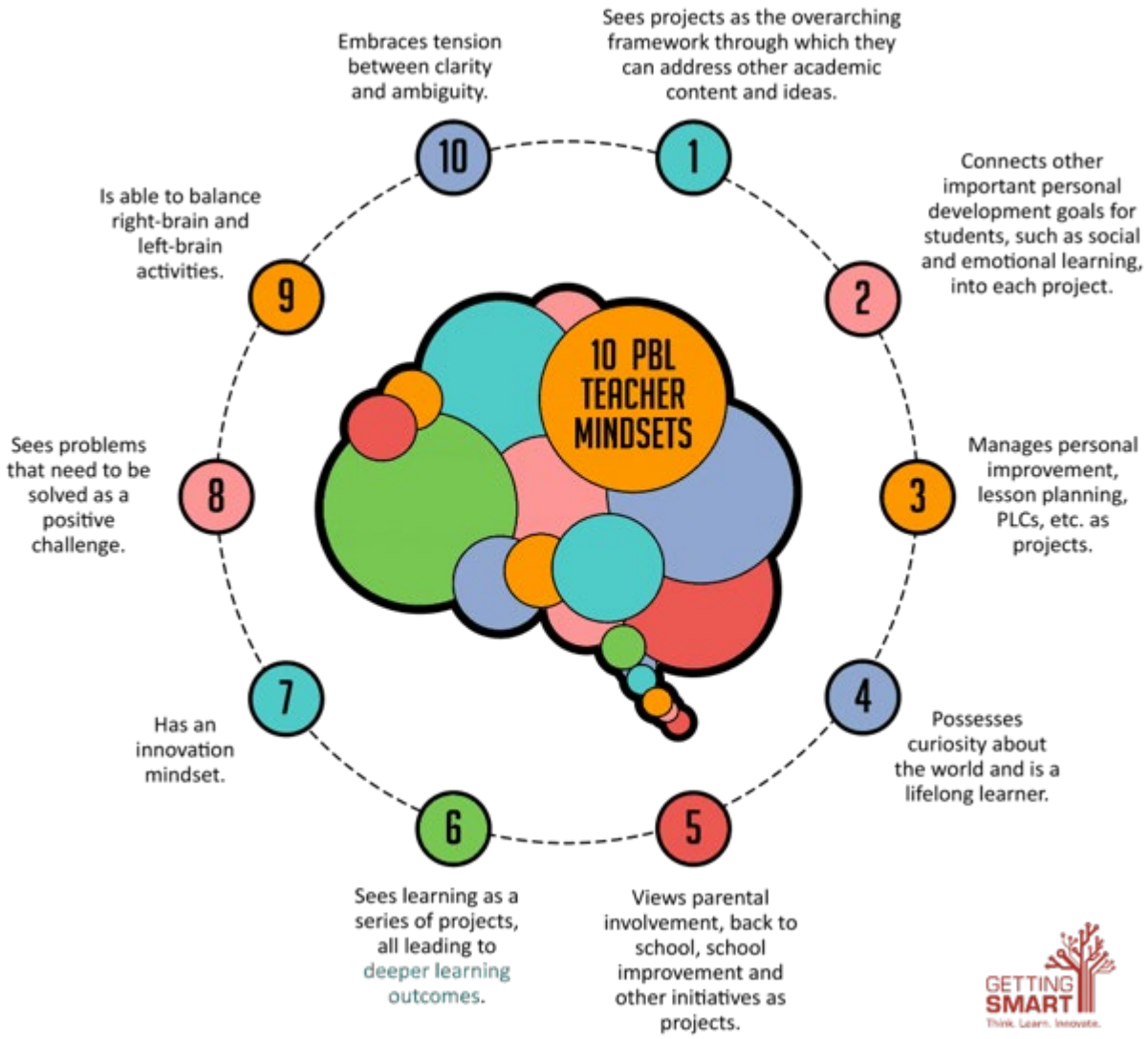
- Reflections, feedback, assessment. Students may take part in assessing their own performance and that of their peers. Assessment is not only about the final presentation of the product but may be a crucial part of activities throughout the project. Evaluation will be based on rubrics developed and approved in a collaboration of teachers and students. There are many re-usable tools in this checklist for Project-Based Approach courses developed by Intel Education:



Intel Teach Elements

Finally, do be aware that the project is potentially unusual in teaching.

It does not necessarily fit neatly into the daily routine - it is about discovery, about sudden change, and it can carry some risk. PBL has shown itself to be a valuable teaching method but it should be applied with caution.

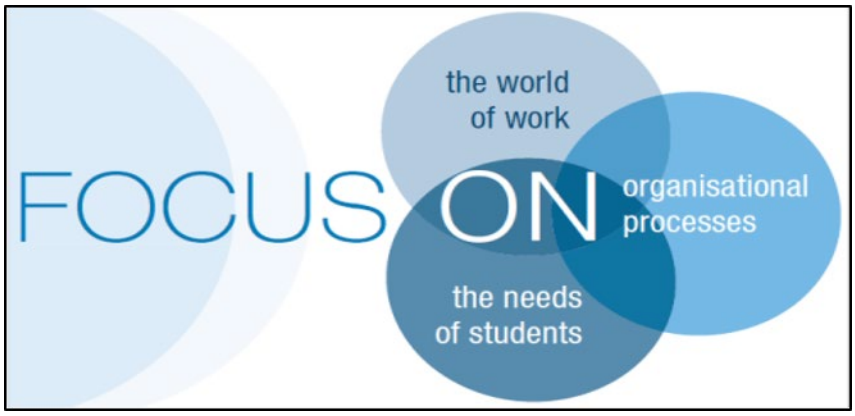


It is also not necessarily a task for a single teacher: it won't work without the collaboration of all staff or without the support of the school leadership.

PROJECT BASED METHODS IN VOCATIONAL EDUCATION

VET schools have to develop close contacts with the world of work, in order to be able to understand new trends in professions, to adopt the content of their training programmes, update new technologies for teaching and align with professional profiles to meet the labour market's emerging needs.

"*While cooperation with employers is a valuable asset for VET schools in general, it becomes a 'must' for institutions that include practical training in companies.*" (Cedefop, 2016)



Source: CEDEFOP

The main activities should be about promoting frequent and intense contact with employers and representatives of business organizations, implementing training programmes adapted for the changing needs of the world of work, and on the demands of learners.

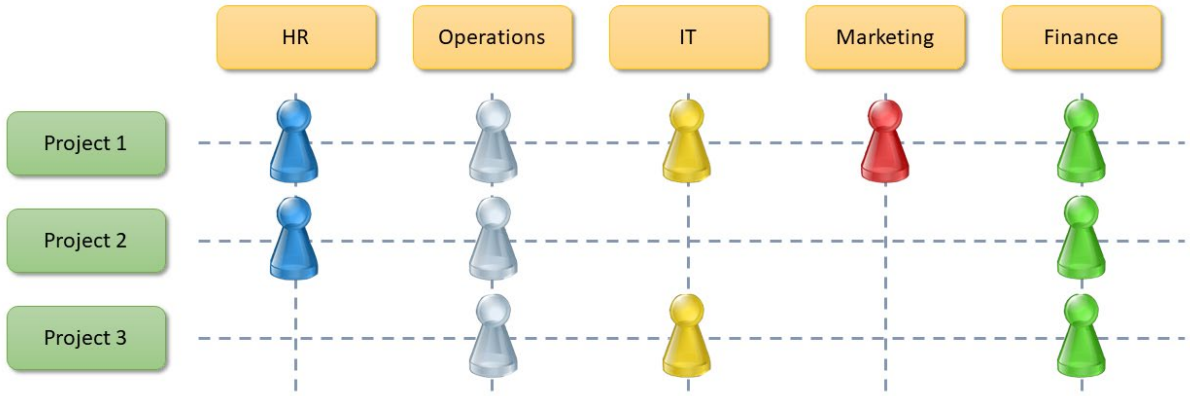
Amongst a VET institution's most important activities are:

- inviting employers and company representatives to events, the presentation of student work to the public, visits to companies, and establishing **joint projects** with companies
- engaging with chambers and employers' associations for mutually beneficial collaboration
- organising reflective workshops, or focus groups, encompassing all stakeholders to better prepare of students, reinforce coordination of work-based, and focus school-based training.

COMPANY PROJECTS
Companies can be categorized as: project-based (a service company) or product-based.

Traditionally, only certain industrial sectors made use of a project-oriented business model, e.g. the manufacturing, business services, construction and IT sectors. The trend, though, is for other industries to begin to adopt that model, including healthcare, publishing, entertainment and even education.

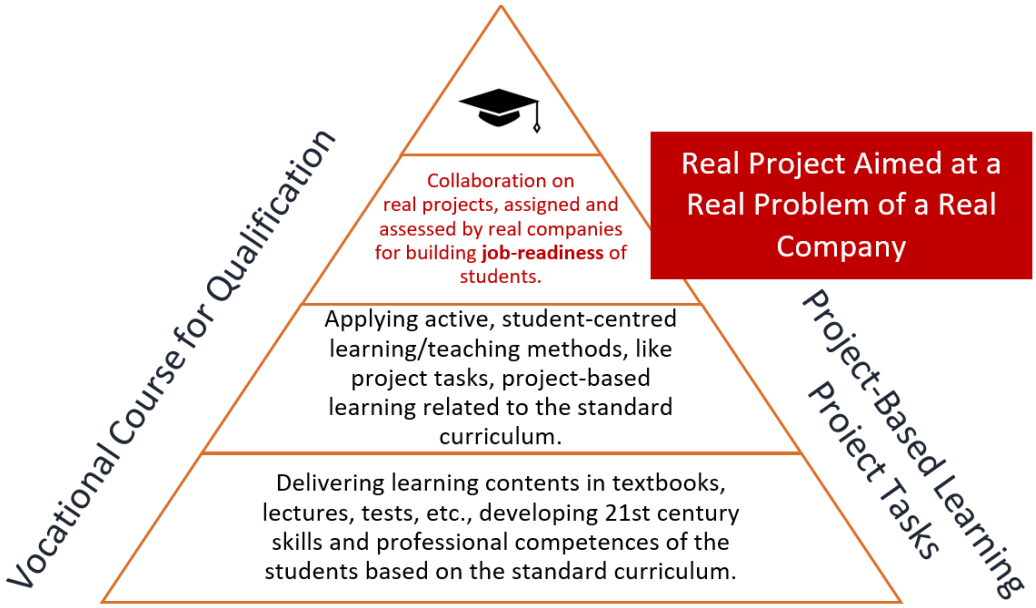
Even smaller companies may now organize around projects, where employees with different skills are brought together to develop new products or new services within well-defined time scales. Project-oriented companies - also known as matrix-based organizations - tend to group employees into teams. Each team works to complete a task, which might be a project, product or programme that benefits a specific organization.



PROJECTS IN VET SCHOOLS WITH COMPANIES
Both PBL and project tasks are particularly useful for vocational education.

Both relate to the standard curriculum, and as such they are applied (applicable) in all phases of the learning period of a vocational course.

A VET school with close contacts in local companies (following new professional trends and collecting information on the actual needs of the labour market) can offer a perfect opportunity for their students, by involving representatives of companies to work in a project-based collaboration. What is more valuable than a project with a company just before the final exams, particularly if the focus for the students is about finding a job?



A project with a company may not necessarily be a typical PBL (like a 'main course') or a typical project task (like a 'dessert'), as described above.

While both types of project-based methods strongly relate to the standard curriculum, a real project with a company is an opportunity for students to test their ability to learn and to experience knowledge and skills beyond their curriculum. It gives them experience of what 'life-long learning' means, what knowledge and skills they have acquired during a course, and it prepares them for solving real-world problems.

How might a project with a company work?

1. In collaboration with the representatives of the company, teaching staff identify a specific topic important to a particular job but not covered by the standard curriculum.
2. The representatives of the company define a project task related to the topic identified as a gap.
3. After self-evaluation by the students, the teaching staff design a short up-skilling mini-course covering the knowledge needed for the project task, involving all stakeholders (teachers, students, companies), to help the students to build a team to implement the project task.
4. In parallel with the mini-course, the students start working on the project and ask for any help required of teachers and representatives of the company.

5. The students present the results of their project to an audience and in the presence of the representatives of their future employers.

PROJECT WITH COMPANIES VS PROJECT BASED LEARNING

- The main goal is not to teach or learn, but to test the job-readiness of students. They should discover how well they are prepared for solving real problems. The students have to utilize the knowledge and skills gained during their course, but for the project task they also need to search, collect and learn new information.
- Real projects are about following the normal steps taken in a project within a business environment.
- Real projects are not obligatory! Projects are not integrated into the standard curricula, so this means extra work for teachers and students as well!
- While the students may learn much and develop new skills and competences (such as the 4Cs) during a project, these are not the primary goals but desirable 'side effects' that are present in all types of projects.

By working on real projects, all participants, teachers, students and companies should find their own particular benefits.

- The collaboration helps students to evaluate their own job-readiness, they can test themselves by working within teams and in the solving of real problems. Some might even be offered a job with the company after presenting their project results.
- The company will be able to preview the incoming cohort of new graduates, so the project may be used as a recruitment tool to find potential employees.
- Teachers play a crucial role in the process since they are the engine of the whole project. They are the crucial players who build up networks with the companies. They also have to motivate students to join the projects and to elaborate the learning material for the knowledge gap identified at the beginning. Throughout the project they are crucial in facilitating teamwork. **The benefit for the teaching staff is the very success of their students.**

In the following sections the focus will be on the basics of project management and related online tools, to prepare you for the effective planning and execution of your own project(s).

3 Project Management Basics

PROJECT INITIATION

WHAT IS A PROJECT?

> *„A project is a unique system of process with a group of activities undertaken, coordinated, and controlled to meet specific requirements - time, cost, resource - with management tasks and completion deadline." (ISO 8402, 1994)*

People have been undertaking projects since the earliest days of organized human activity, and there have been projects of high complexity with us for a long time.

Activities as diverse as going hunting or building pyramids all have the characteristics that make them projects. Projects are generally temporary - they are not an everyday business process - so they differ from the daily, repetitive operation of an organisation.

In this sense, then, a project is **unique**, meaning that it has never been done before. For example, consider a company that deals with the design and assembly of cars.

The design and marketing of a new model is a unique project. However, the process is repetitive as the actual assembly of the cars based on the new model is considered an operation. Whilst operations keep the organisation functioning, the aim of a project is to meet its goals, and it is completed when its goals and objectives are accomplished.

By a project, we mean **well-defined, complex tasks** in time and space, which are achieved through the coordinated, rational use of activities that are consistent with the clear **objectives** set and the available **resources**.

A project, by definition, has a **clearly defined start and end** date and has defined, measurable results.

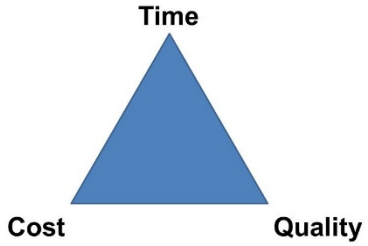
The definition of a project implies that **time** is an important factor, as the deadline for completion is generally always fixed. In order to achieve the project aims, using the **resources** of the desired **quality** and within the given time frame, very **careful planning and continuous monitoring and evaluation** of the intermediate results are required. Balancing and continuously harmonising these three factors to achieve the right quality performance is the key to the success of your project!

A project should have:

- an established aim
- a defined lifespan determining the beginning and the end
- a group of professionals working together
- specific time, cost and quality requirements.

Time in project management is closely related to the project **costs** and resources, so must be monitored along with other parameters during the whole project.

Changes in timing will typically imply changes in costs and potentially **quality**: "*Yes, we can do it in shorter time, but them we have to pay overtime to the workers.*"



source: Ablesim

PROJECT INITIATION

Once an idea is outlined, the aims and objectives should be defined together with the timeline and associated resource needs (human resources as well as costs). All of this has to be discussed with the stakeholders before going into detailed planning of tasks.

SCOPE

The scope of the project must be defined at the beginning, to avoid later misunderstandings. In the case of a School you have to say, for example, that your project will concentrate only on students just before their graduation. The scope should not creep to involve others, even if they would like to join in part way through.

AIMS AND OBJECTIVES

The **project aim** is a statement of what you intend to do, e.g. to match graduates' skills and knowledge with the demands of the job market, to provide them with the knowledge and skills necessary to get better jobs.

- Project **aims** set out what you want to achieve by the end of the project
- Project **objectives** are specific statements that define measurable outcomes (e.g. developing new teaching material in accordance with the company's needs and delivering an upskilling course).

INDICATORS, ACCEPTANCE CRITERIA

Having defined the objectives, you need to think about (and agree on) how you will measure the success of the completion of various tasks and milestones during the project.

Specify meaningful **indicators** for various outputs of the project, to ensure they are delivered to a high quality. For example, in your plan put down some indicators for an up-skilling course, such as:

- number of students enrolled - **target**: 10, **data source**: online course platform
- number of students completing the course - target: 6, data source: online course platform
- satisfaction of participants - target: above 4.5 points out of 5 - data source: satisfaction questionnaire (online web form)

This way all project members can work together to achieve, or even better, the target, and you - as a project manager - will be able to present data quickly to show stakeholders that the project is on track.

Avoid indicators that are not useful or where data collection requires too much effort.

For the major results of the project, set some acceptance criteria in collaboration with the project sponsor and the stakeholders. In our School's case, the project leaders involved should specify the criteria by which they will assess the assignment given to students. The project can only be closed and considered to be successful if the pre-defined acceptance criteria are met.

STAKEHOLDERS

Stakeholders are individuals (within and outside the organisation) who are in some way affected by the project - either because they are interested in it, they work in it, or because the outcome may result in specific gains or losses for them. A project is successful when it achieves its objectives and meets, or even exceeds, the expectations of the stakeholders.

In the context of this Reacti-VET project, consider the following stakeholders and make sure they are represented in your project team:

School Management
The project plan and its major modification have to be approved at a strategic level (e.g. by a school director). Involving representatives of the school management is beneficial for the project manager and team members because their work becomes more visible. It is advisable to agree with the management on how often and to what depth they need reports about your project. Do not forget to notify them about any risks that might endanger the achievement of objectives.

Peer teachers (colleagues)
Your colleagues need to also have an interest in the final product of your project and their support is essential.

Students
It is very important to have students involved from the very beginning, as the whole project serves their interest. Try to establish an environment for them where they feel like partners in developing a unique collaboration for their own benefit.

Parents
Parents certainly want to see more and better opportunities for their children in the job market. They will surely support a project, and encourage their children to work hard in it, if they see the benefits. They might also have useful ideas as they are typically all working in a variety of jobs and may have experienced difficulties in entering the job market for themselves. Providing transparency for parents is a good way of promoting your school as well.

Representatives of the job market (companies, HR professionals, chambers etc.)
They will be the key stakeholders for your project as they will take an active part in defining any gaps in the curriculum and any students' competences to be developed. They will also be able to provide a final assignment for the students to prove that they have gained the competences. They will be the stakeholders who ultimately accept or reject the final product of the project.

THE PROJECT BRIEF
The product of the initiation phase is a **project brief** - a document that includes the key elements mentioned above and serves as a basis for detailed planning, after getting approval from the stakeholders.

PLANNING THE PROJECT

In planning a unique activity that has not been delivered before we must be prepared for a continuous repetition of the **planning, acting, reviewing** and **re-planning** cycle.

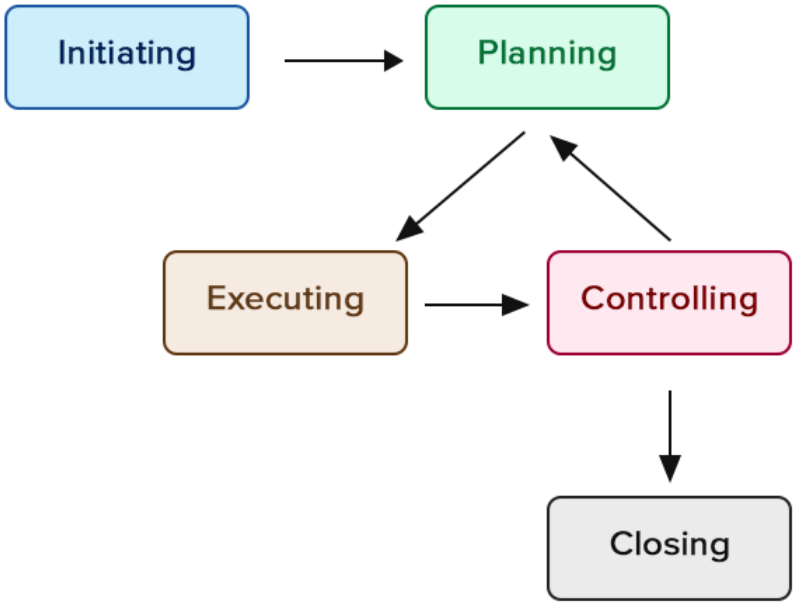
Before you start planning, ask (and answer) a few basic questions:

- What actions are needed?
- When do these actions have to be completed?
- Who is going to do them?
- What resources are required?
- How will you know that you have been successful?

The task is therefore to work out how the results will be achieved successfully by the desired end date, to the required quality, and within the budget.

Each project is different, so there are a number of possible ways of looking at them. The project life-cycle below is a useful way of understanding the different phases of a project.

The **project cycle** begins with the definition of a project idea, which is developed into a feasible work plan. Implementation is performed according to the plan, which is regularly reviewed and modified as a result of monitoring / controlling activities.



Source: Business 2 community

There are some common **elements** that will be included in any project plan:

- a work breakdown structure showing the separate tasks and activities,
- the team structure and responsibilities,
- an estimation of efforts and durations of tasks,
- timing of activities,
- resources to be allocated to tasks,
- details of the budget,
- a contingency plan to deal with risks.

We recommend a **top-down approach** to planning:

- start with the major blocks of work that will need to be carried out, and then
- break them down into smaller tasks, then
- work backwards starting from the project end date.

Remember: detailed, thorough planning is the basis of a successful project.

The project manager might prepare an initial plan, but it is important to create the detailed project plan with the involvement of the project team members and representatives of all stakeholders.

Organise a **project kick-off meeting**, inviting the representatives of all stakeholders, project team members and the project sponsor.

- Prepare an agenda and send out invitations well before the planned date to make sure that all key persons can attend.
- At the meeting present the project brief and the initial plan**.**
- The start of the kick-off might be formal (welcoming participants, presenting the project etc.), but make sure you include some opportunities for teamwork in the agenda when participants can elaborate the project plan collaboratively.
- Start working on the details like task allocation, responsibilities, etc. with the team so that a common agreement is reached on the objectives.
- Ensure all team members leave the meeting with a clear idea of tasks to be delivered within the next phase of the project.

PROJECT ROLES AND RESPONSIBILITIES

The **project sponsor** is usually a manager who takes part in the definition of the project aims and objectives and approves the project plan, including the related budget.

- The sponsor is responsible for supplying the resources for the project, so if we want to involve our colleagues, we have to get approval from the school management (represented by the sponsor).
- The sponsor has to be informed regularly about the progress of the plan. Our work will be much easier if we have a supportive sponsor behind us, empowering us with authority and making it clear to the other team members that their cooperation is expected.

The **project manager (PM)** is responsible for the entire project and for achieving the goals. The PM manages, monitors, evaluates the work of the team(s) and regularly informs the sponsor about **progress** as well as any **issues** that need to be tackled. A project manager (PM) is a person who is experienced in managing a project and leading a team.

An ideal project manager has the following characteristics:

- positive thinking
- strong general management skills
- adequate organizational skills
- excellent communication skills
- extensive professional knowledge
- thorough knowledge of design, control and documentation methods
- proper knowledge of the organization
- ability to delegate responsibilities
- ability to lead a team
- skills to connect, analyse and group facts and draw conclusions
- ability to distinguish what is important and what is not
- ability to keep an eye on the long-term goal and quickly identify strategic issues
- confrontational and non-evasive behaviour in conflict situations
- expertise in handling personal issues effectively.

A project manager's tasks include:

- ensuring seamless communication between project actors
- defining responsibilities
- managing conflicts
- participating in the project design: setting the goals, defining tasks, resources, and timing
- reporting on project results
- managing teamwork
- monitoring and documenting the implementation of the project.

The **project team members** should ideally be selected in a way that includes different work styles, i.e. there should be someone who is up to date in the specific profession, another who is practically minded, one who is creative, and others who are precise and/or have a critical attitude.

The members are usually involved in the project at different stages and times. In our case the team should have members from external organisations (companies) as well. The team will be established on a temporary basis only, so it is important for members to quickly learn how to work together and communicate with each other effectively.

Team members' tasks include:

- performing the tasks allocated on time, within the specified budgets, using the available resources, in accordance with the quality requirements.
- defining of the inputs required for the task
- providing information to the project manager on changes occurring during the execution of specific activities and tasks
- delivering the end product of the activities and tasks
- reporting to the project manager as agreed.

Project team members can make proposals towards the PM to modify the project plan if it is justified.

Team member are usually dedicated to the project on a part-time basis. However, be aware of some potential **difficulties** associated with managing team members:

- Team members might not report to you, meaning they have other priorities
- They may be working on other projects as well as doing their full-time jobs, and therefore might be having difficulties in meeting other deadlines
- Personal conflicts may arise.

We **recommend** the following to help you in managing your team members:

- Involve them from the start and do the planning together
- meet with them individually once in a while, in a less formal environment
- be available for them and ready to listen to any concerns.

MILESTONES & TASK ALLOCATION

Milestones are major stages, or sign-posts, in the project cycle that may refer to a deadline, a need for external review or input, submission of a major deliverable, etc.

Milestones are used:

- to contribute to the transparency of the project
- to create checkpoints
- to signal decision making.

Work breakdown: list of tasks

The Work Breakdown Structure is a to-do list, containing all the tasks of the project and their timing. There are several techniques for visualizing the schedule, out of which the most commonly used is the **Gantt Chart** - a visual overview of tasks scheduled over time.

It can be created in a spreadsheet, but various free templates are also available online.

For more details, watch this video tutorial about creating a Gantt Chart in Excel:

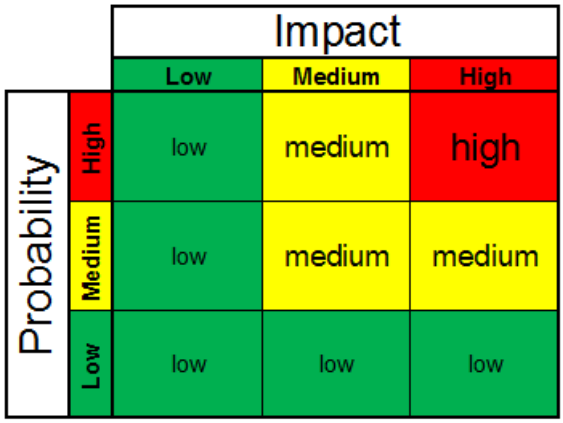
RISK MANAGEMENT

A risk is an uncertain event or condition having an effect on at least one project objective.

It can affect anything involved in the project: people, processes, technology, and/or resources.

Risk management focuses on **identifying and assessing** the risks and **minimizing their impact** on the project by carrying out the following key activities:

1. Identifying **potential risks**. You should create a list of every possible risk and you can think of. Do not solely focus on the threats, because risks that turn out to be positive can add unexpected values to the project. During the planning phase **ask your team members** to help you brainstorm as more people might see more possibilities.
2. Determining the **probability** of an identified risk occurring. Rate each risk with a high, medium, or low probability.
3. Estimate the **impact** of the risks that are likely to occur. Identify which risks have the biggest effect on your project's outcomes, and rate them as high impact. Rate the rest as medium or low impact risks.



Risks with high probability and high impact will require closer attention.

In our case an **example** of a possible risk is that a project member is unable to accomplish the assigned task due to some unexpected reason, e.g. illness.

Listing the possible risks is not enough though. There should always be a **contingency plan** to minimize the damage a risk may cause in the event that it actually happens at some point. Continuing with the example of a team member becoming ill, our action plan would the simple one of re-allocating of the task to other team members in a pre-planned and timely fashion.

Risks should be reviewed together with the project team on a regular basis, and the ratings of impact and probability modified if necessary. New risks may also have to be addressed. It is important that all team members are aware of the risks, improving the chances of preventing the occurrence of risks and aiding the reaction to them if they become reality.

If a risk turns into a problem to be solved, notify the sponsor without delay and propose a possible solution (or even an alternative).

COMMUNICATION & REPORTING

Simply achieving the goals set is not enough. It is important to **share information** about the work you do with students, parents, companies, peer teachers, partner schools or even the public.

Communication should not just be one-way. You should ask your audience for valuable **feedback** that you might subsequently use for improving the quality of your project results.

Set up a project communication plan at the beginning as part of your project plan. It will enable you to communicate effectively throughout the project via **different channels**, towards **different target groups**, internally and externally. It should provide clear guidelines as to how information should be shared with the target audience, as well as who is responsible for it.

Consider all the important milestones and define what type of information you would like to share with various target groups, through which channels, and with what regularity.

We recommend that you plan **status reports** after major milestones. These can be sent in the form of an e-mail, or a document uploaded and shared with project members, stakeholders and the sponsor.

In the status report you would give:

- a short and clear overview of the actual status: tasks completed, outstanding tasks, any issues, etc.
- together with some explanation of actions implemented to solve any issues, foreseen risks etc.

Conclude the report with a statement about the project is on track or in delay. If the latter is the case, make sure you explain how the delay will be handled, and whether it might affect the delivery of the final result in the agreed quality.

The management might have specific reporting needs. Agree those at the beginning and include them in the plan.

IMPLEMENTATION

Once you have developed a project plan, setting the aim, the objectives, the team, tasks and responsibilities, the milestones, the schedule, the possible risks, etc., then the only thing left is to carry it out - according to the plan.

However, the plan will need to be revisited regularly, and it should be handled as a 'living' document.

Activities during implementation

1. Monitoring & controlling
    - follow-up (data collection)
    - analysis of differences (comparing planned figures with facts**)**
    - intervention based on differences
    - documenting
    - briefing the management

2. Reporting
    - project review meetings
    - status reports
    - documenting changes

3. Change management

    - development and application of decision levels & criteria
    - application of contingency plans
    - identifying and documenting changes

4. Quality management, evaluation

    - internal and external evaluation of project results (through surveys, focus groups, interviews)
    - evaluation of the process by project team members after each major phase
    - identification of areas for improvement
    - implementation of corrective actions

PROJECT CLOSURE

The project is considered to be completed when its aims and objectives are achieved. Project results should formally be signed off and **accepted by the project sponsor**.

The following tasks should be considered in the final (closing) stage of the project:

- completing the final status report
- performance evaluation of team members
- announcing the closure of the project (internally and externally)
- completing the project documentation/records.

Organize a project **closing meeting** (with a similar audience as that of the kick-off) where you review the results together, agree on follow-up activities, and thank the work of the team, the support of the sponsor and the stakeholders.

Closing a project can be quite an emotional experience for team members who have worked together for some time, particularly if close bonds have developed.

Organize **individual interviews** with key members of the project team, encouraging them to evaluate their own performance and identify what they have learned. A structured debriefing process can be helpful, to include stakeholders as well as members of the project team.

Make sure you formally recognise the contribution of project team members and spend time on **celebrating success** together.

4 Online tools for project management

ONLINE MANAGEMENT TOOLS

Many, very usable, online tools can be found to make it easy for the project manager to assign tasks, create checklists, set deadlines, upload related documentation, etc.

Many are good for team working, with project team members (even in different locations) being automatically informed about tasks, deadlines and changes, and able to add their own comments, report on progress, etc. They make the process transparent for all participants.
They are all designed for:

- faster collaboration
- easier delegation
- accurate project tracking
- central data storage
- seamless communication
- quick file-sharing
- time tracking
- quick reporting.

A number of online interfaces and tools have been (and are constantly being) developed that are suitable for communication, collaboration, and there are many for organising and managing projects.

The **diversity of available tools** is well-illustrated in the following video:

Some tools are free - usually with registration - while others may make small monthly charges for upgrades. How do you make a wise choice?

For our purposes (managing school projects) it is important that any tool be **easy to use**. In particular, the interface should be clear and not too complicated. After all, we are not responsible for executing major construction work within a huge budget.

WHAT ARE THE BENEFITS OF USING MANAGEMENT TOOLS IN A SCHOOL ENVIRONMENT?
By implementing a simple and **central management framework**, a school can meet the demands of timely **organisation**, **communication** and **monitoring** of implementation. Tasks can be readily shared and teachers can work more productively and collaborative effectively on creating or revising documents within such a framework.

Such tools help to eliminate the problems of communications, ensuring people receive important news or items of information in time. They generally work across different platforms, so they can be truly mobile. However, they offer a central location for all staff being able to find what they need, with simple access and notifications.

Users can see how tasks are being managed and who is responsible for each, and they can track the status of implementation. One big advantage of a task sharing function is that you can re-delegate a job over if a team member leaves the project or a new member takes over. This is particularly important for new teachers or for those who need to be brought up to speed with a process.

A project management system makes it possible to **delegate tasks** to new team members quickly and easily, tracking who is responsible and accountable through a transparent process. These benefits help to save time and effort, and to use resources effectively.

For more information, this related blog post - 5 ways to apply project management methods in your school - is most informative.

Everyone will have their own particular favourite tool but, based on the considerations above, MeisterTask was chosen within the Reacti-VET project to present the typical details that might be expected.

MeisterTask is available at https://meistertask.com/. There are several versions, including a free project management version for educational purposes.

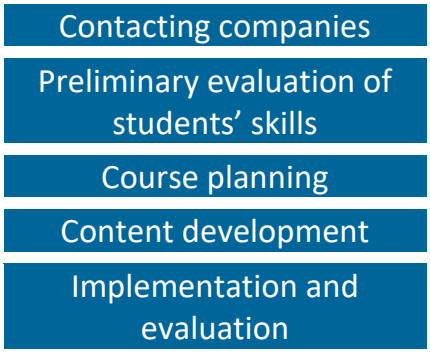
As well as using a specific project management tool such as MeisterTask, we can augment it with other online tools for different daily tasks such as:

- **planning** - to search for information and to visualize initial ideas on concept maps
    - Tools: web browsers, online databases, Bubbl.us, etc.
- **management and collaboration** - to work on files as a team, to organise meetings, etc.
    - Tools: Google Diary, Google Drive, Google Docs, Excel, etc.
- **graphic design** - to support communication with visual aids, to create infographics, posters
    - Tools: Piktochart, Easel.ly, etc.
- **communication** - to disseminate project results, to keep in contact with project team members, to inform stakeholders.
    - Tools: Social media (e.g. Twitter, Facebook), YouTube, Skype, e-mail, etc.
- **presentation and reporting** - to present project ideas, to prepare status reports.
    - Tools: PowerPoint, Prezi, MS Word, video maker applications.
- **conducting surveys** - to collect feedback from stakeholders.
    - Tools: Google Forms, SurveyMonkey, etc.

At its most fundamental, project management is about people getting things done. This section has offered guidelines for project management in an educational context, and highlighted some of the very many tools that make the overall task manageable. If starting out in project management seems daunting, then there is an ideal starting guide here (https://www.apm.org.uk/resources/what-is-project-management/) at the Association of Project Managers. There are also many other pointers to ease you into the job.

Postscript - Dedication

We encourage everyone to put into practice the knowledge acquired here at the earliest opportunity. As mentioned in the introduction, this e-book is the first part of two volumes resulting from the Reacti-VET project.
In this first volume we have dealt with teaching methods suitable for enabling vocational education to readily and rapidly evolve to meet contemporary labor market demands, plus the digital tools that help with the necessary adaptation.
In the second volume we present practical implementations from the resulting responsive teacher projects and we provide a detailed methodological guide that was followed in the implementation of these projects.



In the methodology guide we go through each of the steps depicted above, starting from the identification of skills gaps, through to the planning and delivery of a mini-course and to the evaluation and presentation of the resulting student projects to the public.

Seven such training-courses were delivered at six vocational training institutions in Hungary at the beginning of 2021, including in the fields of informatics, logistics, horticulture and pedagogy.
In the second volume we also share the results and experiences from the experimental courses, in the hope that they will serve as inspirations for leaders and teachers at other vocational training institutes to do similar.

We present concrete examples of how to identify skill gaps, compile topics for a mini-course, develop learning materials in collaboration with companies, and evaluate the student projects and products from different perspectives.

We hope that the Reacti-VET approach and methodology, that we have presented and tested, will appeal to many and increasingly be used in vocational training in order to ensure that graduate students develop to be more responsive to the ever-changing demands of the labor market.

6
Annexes

Aligning Vocational Educational with Labour Market Needs

Do you believe that it is difficult to keep up with the ever-changing demands of the labour market, that traditional teaching methods are often unsuitable, and textbooks frequently outdated?
Would you like to join an international team-based, VET experiment along with your colleagues and students?

Here is your opportunity!

It is in our common interest to align graduate skills and competences closer to the labour market, to make it easier for employers to find suitably qualified workers, and to avoid graduates facing shortcomings in their first job. The ongoing transformation of vocational education and training (VET) is responding to the challenges by adopting a "demand-driven" approach, but this requires the active involvement of teachers. Launched in 2018, the Reacti-VET Erasmus+ project aims to equip VET teachers with effective digital tools and new ways of responding quickly to the demands of the labour market. Teachers should *not only participate in developing a 21st century VET culture of greater creativity, but can also be co-creators of that culture.*

What does the training offer?	What effort does it require?
☑ A change in attitude and practical methodologies; ☑ Facilitating involvement of companies and other external stakeholders, expanding the professional network; ☑ Enriching the professional portfolio: experience of a collaborative international experiment; ☑ Project approaches in the classroom and at school level; ☑ Expanding the range of digital tools used for pedagogical purposes; ☑ 30 credit points in the Teacher further education system	Corresponding to 30 contact hours, the training can be completed in an online learning environment in 5-6 weeks, with 5-6 hours per week study with the support from trained mentors. Mentors facilitate communication among participants, encouraging peer learning. Teachers from the same institute can perform most of the assignments with groups of two or three.

After completing the course, participants will have the opportunity to engage in a jointly designed experiment in close cooperation with employers, teaching staff and students. They can implement what they have learnt and develop, organize and deliver an upskilling course for their own students (over one semester, maximum 30 hours). The upskilling mini-course is aimed at filling the knowledge and skill gaps, as defined by the labour market, exploiting modern pedagogical methods and the potential of digital technologies.

The Training Topics

Module 1 - The networked 21st century school The opportunities for, and responsibilities of, teachers in networking; digital tools for external and internal communication; data collection and data analysis
Module 2 - Active learning with digital devices Practical application of collaborative, active teaching-learning methods, supported by digital tools.
Module 3 - Free digital tools, Open Educational Resources Integration of freely available learning resources into the teaching of professional and general subjects; joint curriculum development with stakeholders
Module 4 – The Virtual Classroom Basics of course design, utilizing virtual classroom services.
Module 5 – Planning and delivery of projects using digital devices Project-based approach in the development of basic skills, as required by the 4th Industrial Revolution Labour Market (Communication, Collaboration, Creativity, Critical Thinking); design and implementation of pedagogical and development projects using digital tools

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ABOUT THE PROJECT

Teachers for Reactive and Responsive Vocational Education

PROJECT BACKGROUND

VET schools simultaneously have to meet two opposing requirements: to remain true to tradition, delivering stable, tested knowledge approved by relevant parties in society and the economy; and to equip students with a set of skills and competencies relevant to newly emerging demands.
Despite great efforts by national and European policy makers to drive VET schools into 'rethinking' their curricula and teaching methods, changes have been slow to keep up with labour market requirements. In most European countries VET qualifications are based on standard curricula that precisely define what is taught, leaving little freedom for teachers and schools to train for just-in-time labour market demands. Most systems also have lengthy and complex accreditation procedures, so the approval of a new curriculum - or even the modification of an existing one – can take a long time.

AIMS AND OBJECTIVES

The project aims to provide effective and necessary training and support for VET teachers to enable them to identify and respond to skill-gaps in the labour market, but also involving other relevant stakeholders - students, parents, teaching staff, and particularly employers experiencing difficulties finding skilled workers to fill vacancies. The consortium will develop, test and deliver standardized, comprehensive toolkits packaged as a set of teaching, collaboration, and communication methods and a rapid curriculum development methodology for VET teachers, to be used in conjunction with potential employers to identify skill-gaps, and to design, develop and deliver up-skilling training for students. The toolkit will be tested within the IT sector, but the standardized version will be equally applicable to other vocational education subjects.

TARGET GROUP

Teachers and trainers in Vocational Education
Beneficiaries: VET students, industrial partners, companies

PROJECT BASICS

Title:	Teachers for Reactive and Responsive Vocational Education
Acronym:	Reacti-VET
Program:	Erasmus+ KA2
Project type:	Strategic partnership
Participant countries:	Hungary, United Kingdom, Estonia, Italy
Duration:	1 September 2018- 28 February 2021
Web:	http://reactivet.itstudy.hu/
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Fondazione ITS per le nuove tecnologie del Made in Italy – JobsAcademy (Italy)
BCS Koolitus AS (Estonia)
SZÁMALK-Szalézi Szakgimnázium (Hungary)
Veszprémi Szakképzési Centrum Öveges József Szakgimnáziuma, Szakközépiskolája és Kollégiuma (Hungary)
CAPDM (United Kingdom)

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