STEP-IN

**E-learning
and distance learning
of vocational subjects**

DIGITAL TOOLS,
APPLICATIONS
AND
PEDAGOGICAL METHODS

CONTENT

In this overview, we present several digital tools, modern applications and pedagogical methods suitable for e-learning and distance learning of vocational subjects which were recommended as part of the STEP IN Project Needs Survey among 87 teachers and trainers from 4 various European countries.

All these methods/tools/applications have been already tested and recommended by teachers and trainers in their daily practice.

What you will find here:

Part 1. Online tools for vocational teaching

Part 2. Platforms for sharing materials

Part 3. Platforms for communication

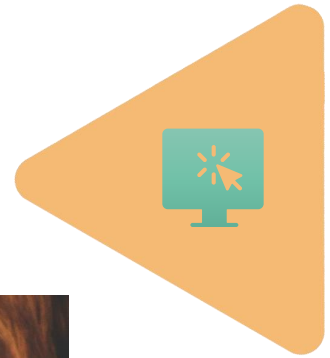Part 4. Pedagogical methods for e-learning/distance learning

Part 5. Tools for evaluation of learning progress

Part 6. ICTs & Apps for vocational teaching

Part 1: Online tools for vocational teaching

SYNCHRONOUS LEARNING

Students are required to participate in online class at a specific time, real-time learning.

ASYNCHRONOUS LEARNING

Allows students to view educational materials at any time they choose, whenever needed.

Synchronous learning

Synchronous instruction replicates live, traditional teaching as closely as an online class can. With adequate tools and methods teacher support real-time learning and discussion.

Examples   **Live-streamed lessons/online classes, online webinars, live chats**

Description   Teacher streams presentations and students can ask questions via webcams and chat rooms. They may work in smaller virtual rooms for group work.

PROs   Interaction between teacher and students, exchange of experience, real-time feedback, fixed schedule, similar to traditional classes

CONs   Fixed schedule, required good internet connection

Asynchronous learning

Asynchronous classes offer learners the flexibility to study in a self-paced manner. Students can access and complete lessons, homework and other learning materials at any time during a certain period.

Examples

Online courses, pre-recorded lessons, downloadable presentations, forums, message boards, online quizzes, video tutorials

Description

Students can access their studies on their own schedules, independently and repeat, if necessary. Most classes have submission deadlines. The teacher can monitor whether the student has already solved the task, for example by filling in the feedback. To communicate between the teacher and students, forums and message boards can be used.

PROs

Schedule flexibility, more accessible, more time with educational material

CONs

Disconnected social environment, less motivational, independent learning difficulties, delayed feedback

Part 2: Platforms for sharing materials

Enable teachers to share educational materials with students. There are many different types of educational platforms available, each with its own set of features and capabilities. Here is the list of the most frequent platforms recommended by teachers.

01 Google Classroom

02 LMS Moodle

03 Padlet

04 MS Whiteboard

05 MIRO

06 Google Drive

Google Classroom

Description

Free learning platform enabling to share the files between the teacher and students and managing workflow and communication. Each class creates a separate folder, where the student can submit work to be graded by a teacher.

More information

https://support.google.com/edu/classroom/answer/9582854?sjid=39968790367125865-EU&authuser=0

Cons

Difficult account management, difficult learner sharing

Feedback from teachers

This is a great tool because it enables the teacher to post everything without a single use of a pen. For students, everything is published on the dashboard and students enjoy discussing to relevant topics via digital tools.

Part 2. Platforms for sharing materials

Moodle

Description

Learning management system used for creating and management of online learning courses. It uses only an internet connection and a browser and can be used for sharing materials, assigning homework and uploading the results or creating online tests, that can be automatically reviewed. Free of charge.

More information

https://moodle.com/

Cons

The more students access the platform, the slower the system becomes, website shut down on occasion, blocking the opportunity for students to access materials

Feedback from teachers

Moodle is a very useful tool for organizing teaching. It can be used both, in online and in-person classes, and materials can be prepared in advance. For working with Moodle, it is best to use a unified structure of courses in the whole organization.

Part 2. Platforms for sharing materials

Padlet

Description

Digital communication platform that allows a teacher to create and share a wide variety of multimedia posts. Online notice board for teachers and students that can be populated with rich media, including images, words, videos, links, ...

More information

https://padlet.com/

Cons

A paid platform for more than 3 boards / 25 MB of uploaded materials, no way to regulate what students post

Feedback from teachers

I have used Padlet to extend our classroom conversation for things like sharing facts, posting projects, and brainstorming ideas. The students were super excited to share their experiences via this tool.

Part 2. Platforms for sharing materials

MS Whiteboard

Description

Collaborative digital canvas in Microsoft 365 for effective meetings and engaging learning, enabling real-time collaboration between users. Help the teacher and students to visualise some topics, and work creatively with notes, shapes, templates, and more.

More information

https://www.microsoft.com/en-ww/microsoft-365/microsoft-whiteboard/digital-whiteboard-app

Cons

Doesn't have all the features of other whiteboard applications, it doesn't integrate with other apps either.

Feedback from teachers

It is very easy to use, and I love it, perfect for allowing students to get involved in a project.

Part 2. Platforms for sharing materials

MIRO

Description

A collaborative visual platform to connect and create common content. Free of charge for limited features. It has integrations with other tools widely used.

More information

https://miro.com/

Cons

It's a bit confusing who added what to the project/board, making it difficult to know what was changed.

Feedback from teachers

This great tool reduces my effort and improves the productivity.

Part 2. Platforms for sharing materials

Google Drive

Description

Personal cloud storage and platform for sharing files. It allows the teacher to share access to the documents with students, to manage it, or to add more presentations, ...

More information

https://www.google.com/drive/

Cons

Privacy and Data security concerns, limited offline access, storage limitations

Feedback from teachers

Overall, I'm happy with Google Drive. It's user-friendly and as someone who isn't tech-savvy, it's nice to be able to use it without having to contact support.

Part 3: Platforms for communications

Enable teachers to easily communicate with students. There are many different types of communication platforms available, each with its own set of features and capabilities. Here is the list of the most frequent platforms recommended by teachers.

01 Zoom

02 Microsoft Teams

03 GoTo

04 Webex

05 Google Meet

06 Trello

Part 3. Platforms for communications

ZOOM

Description

Video conferencing platform used to host „face-to-face" meetings, audio conferencing, webinars, meeting recording, and live chat.

More information

https://zoom.us/

Cons

Limited Features and Usability on free plan

Feedback from teachers

ZOOM makes it easier for me to facilitate online lessons, which I could also record and offer to those who couldn't attend the live session.

Part 3. Platforms for communications

Microsoft Teams

Description
Online communication platform, that can be used for organizing meetings and classes and sharing documents.

More information
https://www.microsoft.com/en-us/microsoft-teams/group-chat-software

Cons
Confusing file structures, limited flexibility

Feedback from teachers
Teams is great tool, especially if the organization uses Microsoft 365. You can organize classes into teams, communicate with students, or students can communicate between themselves. It is recommended to use desktop version as it offers more tools and stability. In the future Microsoft is planning to add more AI into Teams, so a lot of activities will be automated.

Part 3. Platforms for communications

GoTo

Description

Online communication platform, that includes video conferencing, webinars and phone system solutions. It allows you to share documents in real-time.

More information

https://www.goto.com/

Cons

Pricing, not permitted to create chat rooms before the meeting

Feedback from teachers

GoTo is easy to navigate, and a great tool for online teaching, with the possibility to share the screen or make someone else/student a presenter. Once you get familiar with the environment, you have no problems navigating. For teachers, it is better to have a desktop app, but students can join via browser only, without any problem.

Part 3. Platforms for communications

Webex

Description

Solution for video conferencing, online meetings, screen share and webinars. Enable to upload files as attachments so attendees in a live webinar can see and download them directly.

More information

https://www.webex.com/

Cons

Pricing, free for 40 minutes every meeting, not good for the limited time of the meeting

Feedback from teachers

Usually, it is enough for one lesson because the free version of Webex lasts only 40 minutes. Every person has his own link, which is not good for the limited time of the meeting.

Google Meet

Description

Solution for video conferencing of the greater Google Workspace ecosystem, for up to 100 participants and for up to 60 minutes at no cost.

More information

https://meet.google.com/

Cons

Pricing, for more than 100 participants and for longer sessions than 60 minutes

Feedback from teachers

Usually, it is enough for one lesson because the free version lasts only 60 minutes and you usually work with less than 100 students. However, sometimes we experienced some browser freezing problems.

Part 3. Platforms for communications

Trello

Description

A visual tool empowering the class to manage any type of students work, suitable for project management, assigning the tasks, monitoring the workflow. Possible to add files, checklists, and more.

More information

https://trello.com/

Cons

Pricing, limited free features, not easy to find/add attachments

Feedback from teachers

I used this tool to assign tasks to students as part of a complex project that they worked on independently. Within the tool, we shared finished partial projects. But the tool was quite confusing for some, if not everyone was using it, we were missing data.

Part 4: Pedagogical methods for e-learning / distance learning

Online teaching has paved the way for new models of teaching and learning. Many methods that are used in the traditional classroom are also suitable for teaching online. Others just need a little modification. We present a list of pedagogical methods that were positively evaluated by teachers and lecturers during online classes.

Frontal Teaching

The teacher faces a class and the material is taught using explanations and presentations, without any individual or group work.

When to use the method in the online class

It is advisable to include the method when explaining the subject matter, but not longer than 15 minutes. Ideally combined with activities that also involve students.

Part 4. Pedagogical methods for e-learning / distance learning

Demonstration

The method used to communicate an idea with the aid of visuals, e. g. posters, presentations, flip charts. Step-by-step process how to make or do something.

When to use the method in the online class

It is advisable to include the method when explaining the subject matter, ideally combined with activities that activate students.

Presentation

Delivers content through oral, audio and visual channels allowing teacher-student interaction and making the learning process more activating and engaging.

When to use the method in the online class

It is advisable to include the method when explaining the subject matter, the students themselves can also present it in different forms.

Part 4. Pedagogical methods for e-learning / distance learning

Discussion

Open-ended, collaborative exchange of ideas among a teacher and students or among students for the purpose of furthering students thinking, learning, or understanding.

When to use the method in the online class

The method can be used at the beginning of the lesson to evoke the topic, or at the end of the lesson for self-reflection and a summary of the memorized knowledge.

Case studies

The method that refers to assigned scenarios based on situations in which students observe, analyse, record, implement, conclude, summarize or recommend.

When to use the method in the online class

Use during the knowledge acquisition phase. It is advisable to assign the topic to students in advance so that they can prepare for the topic and process it for others.

Part 4. Pedagogical methods for e-learning / distance learning

Simulations

Instructional scenarios where the learner is placed in an imaginary „world" to represent a reality within which students interact, to help students achieve better learning outcomes.

When to use the method in the online class

Use during the phase of acquiring knowledge and getting to know the environment. Often the activity begins with the words "imagine that …".

Problem-based learning

Student-centered approach in which students learn about a subject by working in groups to solve a problem. This problem drives their motivation and the learning process as such.

When to use the method in the online class

Use during the phase of acquiring knowledge in the form of independent work or work in groups. At the end, students present their findings, which helps them consolidate their own knowledge.

Part 4. Pedagogical methods for e-learning / distance learning

Game-based learning

The pedagogical method brings strategies, rules and social experiences of playing a game into the classroom. Allows a teacher to target certain activities that will benefit the real-world application of concepts.

When to use the method in the online class

Consolidation of learning in the form of a game, for example, showing the operation of some part of the machine, when others guess what the representation represents.

Brainstorming

Allows students to think critically about ideas and solutions, and share ideas with peers. There are no wrong answers when brainstorming. A variation of traditional brainstorming is reverse brainstorming, using „reverse" questions, e.g. „How could I cause the problem?" instead of „How do I solve the problem?"

When to use the method in the online class

At the beginning of the lesson, when it is possible to find out what the students know about the topic. Or during class to gather ideas for the next step, for example, how would students secure a load to a trailer.

Part 4. Pedagogical methods for e-learning / distance learning

Mind mapping

A strategy that helps students study with the help of a diagram that is used to visually outline key information.

When to use the method in the online class

The method is suitable for consolidating knowledge, when it is possible to structure concepts and functions and thus find connections between them.

Role playing

Give students the opportunity to assume the role of a person/object or act out a given situation.

When to use the method in the online class

Increasing students' activity and motivation through role-playing. Ask the students to show/play a situation - without words, only with movements, for example, how a hydraulic circuit works. Let them be creative.

Part 5: Tools for evaluation of learning progress
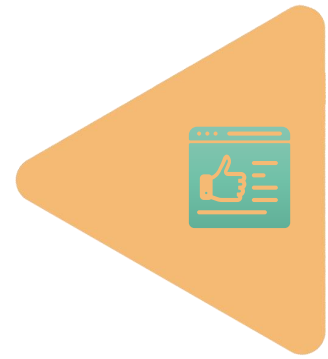
Some learning methods and tools are also suitable for assessing learning progress. The methods listed below are used and recommended by teachers and lecturers during online classes.

Online quiz/test

Quizzes/tests give the teacher an instant idea of what learners already know about the topic.

How to use the method in the online class

The quiz can be included in the assessment phase, the teacher sends the students an online quiz prepared in any online tool, e. g. Kahoot to have instant information about what they have learned. The quiz can also be included at the beginning of the lesson to find out what the students already know. The disadvantage lies in the risk of cheating and requires much more work to make the quiz cheat-proof.

Part 5. Tools for evaluation of learning progress

Online interview

Remotely through an online chat, video, or platform for communication. Contact between the teacher and a student, where teacher asks questions to the student and records the answers.

When to use the method in the online class

In the evaluation phase, preferably only in pairs - teacher and student. Most closely the traditional interview.

Essay

A method where the teacher assigns a topic to the student and the student has to describe the topic based on their own opinions and knowledge.

When to use the method in the online class

In the phase of finding out what students know about the given topic. The method supports students' expression and presentation skills, which they will need in their professional life.

Part 5. Tools for evaluation of learning progress

Dialogue simulation

Interactive exercise imitating a real conversation between two persons. It helps students master communication skills without any risk. Ideally, the second person is a teacher who determines the direction of the dialogue as needed.

When to use the method in the online class

In the phase of finding out what students know about the given topic. The method supports students' expression and presentation skills, which they will need in their professional life.

Peer review

A method of evaluation by students or peers. It helps students develop lifelong skills in assessing and providing feedback to others, and also equips them with skills to self-assess and improve their own work.

When to use the method in the online class

Can be used to evaluate group projects. Students evaluate each group member's contribution to the project in specific way (e. g. on a scale of 1 – 5).

Part 6: ICTs & Apps
for vocational teaching

There are applications and ICTs on the market that can be used in vocational education. Some of them are limited by price. All applications are used and recommended by teachers and lecturers who participated in our survey.

Therefore we think it is worth mentioning these tools that can facilitate and enrich professional teaching.

Tinkercad
Scratch
Micro:bit
PhET
Openshot
Onshape
iTNC 640 Programming station
SMC eLEARNING-200
Fluidsim
Logistic hal VR application

Part 6. ICTs & Apps for vocational teaching

Tinkercad

Description

Autodesk's tool for testing Arduino circuits and creating 3D objects online with only using browser.

More information

https://www.tinkercad.com/

Feedback from teachers

Great tool to use when you want to create 3D objects without expensive software, even better for Arduino as you can program it, connect circuits and test them without having Arduino physically. Tool is fully compatible with Arduino IDE, you can switch between block and code programming. Code can be copied into a physical Arduino.

Part 6. ICTs & Apps for vocational teaching

Scratch

Description

Online tool for teaching basics of programming and algorithms using blocks with only using a browser.

More information

https://scratch.mit.edu/

Feedback from teachers

Scratch is intuitive and complex. Don't be discouraged by the cartoonish look, it can be used for older students too, depending on what you need. Scratch has perfectly prepared materials on their website - https://scratch.mit.edu/ideas. Plus, each project is "editable" and can be remixed into your project, so you can learn from it.

Part 6. ICTs & Apps for vocational teaching

Micro:bit

Description

Micro:bit is tool similar to Tinkercad and can be used for simulating physical device online. This time the micro:bit microcontroller. UI is easier and looks like Scratch, so it can be used for younger students.

More information

https://makecode.microbit.org/

Feedback from teachers

Micro:bit online tool is easier than Tinkercad, but it is locked into its ecosystem. Arduino is more versatile, but micro:bit is easier to connect as there are prepared sets. There are multiple materials on micro:bit website, which can be viewed in Teach section of it - https://microbit.org/teach/for-teachers/.

Part 6. ICTs & Apps for vocational teaching

PhET

Description

PhET is a collection of mostly HTML5 interactive applets from various areas of science and technology. It can be used as a interactive experiments in case of online teaching.

More information

https://phet.colorado.edu/

Feedback from teachers

Interactive simulations are great for substituting real experiments in case of online teaching or not having the equipment. As the applets use HTML5, they can be run on majority of devices, including mobile phones. PhET has vast teaching subsection on their website - https://phet.colorado.edu/en/teaching-resources*.*

Part 6. ICTs & Apps for vocational teaching

Openshot

Description

Open source video editing software, easy to use, quick to learn, with animation framework, unlimited tracks, video effects, title editor, 3D animations and more. Free of charge.

More information

www.openshot.org

Feedback from teachers

Useful to the teachers to make video lessons and for the students to make video presentations. It's free. You have to download only and install it on your pc.

Part 6. ICTs & Apps for vocational teaching

Onshape

Description

Suitable for teachers of machining. Cloud-native CAD to draw mechanical parts. Very useful, it's free and there is an educational registration for teachers and students so that you can organize the work of your student in classes.

More information

https://www.onshape.com/en/

Feedback from teachers

Very useful; free; On cloud (so no download and installation is needed); Useful for Online teaching because the students can share their work directly from app; User friendly environment.

iTNC 640 Programming station

Description

Suitable for teachers of machining. Simulator of the mill control center. It has all the functions of the control center. It is the best tool for the CNC programming education, because it does not represent only the missing link between learning and working on a real machine, it is 1:1 same copy of what the programmer will find in the real machine.

More information

https://www.helmancnc.com/heidenhain-program-example-milling-for-beginners/

Feedback from teachers

It is the best tool for CNC programming education because it does not represent only the missing link between learning and working on a real machine, it is 1:1 same copy of what the programmer will find in the real machine.

FluidSIM

Description

Suitable for teachers of hydraulics & pneumatics. FluidSIM has a wide range of pneumatic, hydraulic, electrotechnical, electronic and digital components that are contained in libraries. These are divided into the three areas of pneumatics, hydraulics and electrical engineering and are available separately or together in FluidSIM.

More information

https://www.festo.com

Feedback from teachers

PROS Very useful; Useful for Online teaching because the students can simulate the pneumatic and hydraulic systems; User-friendly; CONS not free.

Part 6. ICTs & Apps for vocational teaching

SMC eLEARNING-200

Description

Suitable for teachers of hydraulics & pneumatics. An elearning tool from SMC company with a focus on industrial automation. This licensed online tool is divided into 10 sections (main topics) and next divided into several chapters (vocational topics). Each chapter has its own interactive learning content and test. There are more topics than just hydraulics, e. g. electric current, electromotors, sensors technology or PLC.

More information

https://digital.smctraining.com/

Feedback from teachers

Intuitive and useful online e-learning tool. You can see animated or video materials and test your knowledge. It is easy to track your student's progress. License is transferable during a valid time period. Disadvantage: approximately 200 EUR per license (depending on your local SMC trader in the country). Purchase the license here: training@smctraining.com

Logistic hall VR application

Description

Suitable for teachers of logistics. Virtual environment where it is possible to learn how to load a truck, build a pallet or load a bus cargo. Only in Finnish.

More information

https://www.tts.fi/tutkimus_ja_kehitys/tutkimushankkeet/paattyneet/digivirtu/aineistot

Feedback from teachers

PROS: Very useful; Useful for online learning because students can simulate some specific jobs that they will definitely use in their next job; CONS: in Finnish only.

STEP IN to the online world/virtual learning, Facilitation of access to Vocational practice through online teaching at secondary technical schools

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