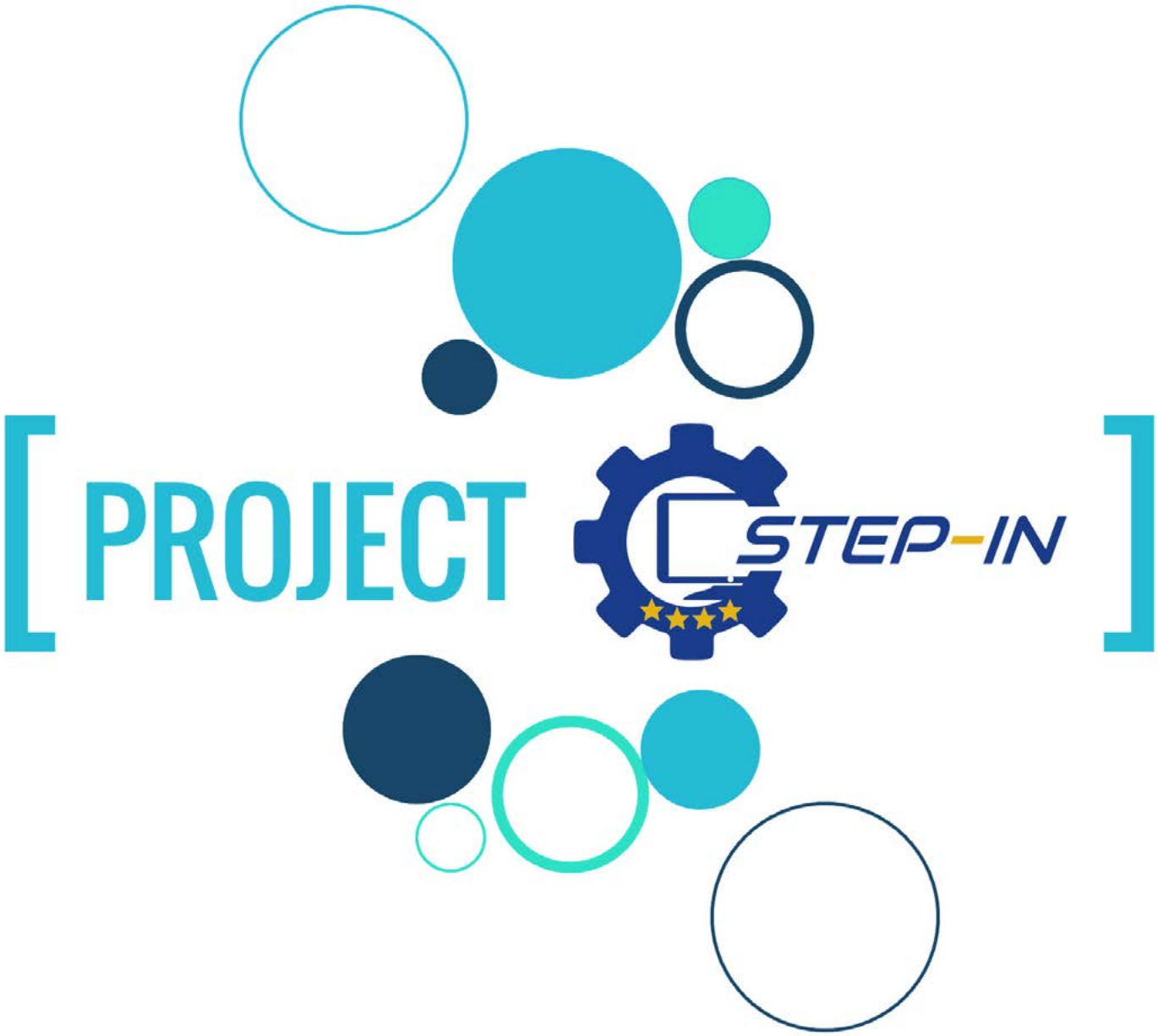
Name of the project:
STEP IN to the online world/virtual learning, Facilitation of access to Vocational practice through online teaching at secondary technical schools



Needs analysis related to online teaching and practical training in the field of Machining, Hydraulics and Pneumatics and Logistics

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ABSTRACT

You hold a NEEDS ANALYSIS in your hands focused on online teaching and practical training in the fields of Machining, Hydraulics and Pneumatics and Logistics. The aim of this analysis focused on a group of teachers and students of vocational schools in the relevant field of study, was to set priorities, content, methods and proven tools related to the online teaching of the above-mentioned vocational subjects while providing professional/vocational training, vocational practice, laboratory exercises, inspections and measurements, technical measurements within the topics of machining, hydraulics and pneumatics, and logistics.

The analysis resulted in selected topics for which 38 online modules with videos and 72 input and output tests were created as part of the project to evaluate the shift in knowledge and skills for 3 fields: machining, hydraulics and pneumatics, and logistics.

The needs analysis was carried out at the international level, in 4 European countries - in the Czech Republic, Finland, Italy and Slovakia in the spring of 2021. The analysis was conducted among 87 teachers and 265 students in the relevant field of study in secondary vocational and technical schools. The needs analysis was carried out as part of the international project "STEP IN to the online world/virtual learning, Facilitation of access to Vocational practice through online teaching at secondary technical schools", within the ERASMUS+ programme, the aim of which is to facilitate access to vocational practice through online teaching at secondary vocational and technical schools.

In terms of content, the analysis was divided into a part for teachers and a part for students.

TEACHERS
PART 1: ONLINE TEACHING

Online teaching has become the main form of teaching in many schools around the world during the pandemic. As part of the survey, we therefore asked teachers about their opinions on this form of teaching. Approximately half of the respondents implement (or implemented in 2021, at the time of the COVID-19 pandemic) online teaching every day, and only 7 respondents said that they have not yet implemented online teaching. 76% of the respondents started to implement online teaching only during the pandemic, and only 4% confirmed that they have more than 5 years of experience with online teaching. Regarding the countries involved in the survey, teachers from Finland use online teaching the longest (more than 3 years), while teachers from Slovakia and the Czech Republic use it the least (less than 2 years).

We were also interested in what tools they used for online teaching. 94% of respondents confirmed that they teach through online platforms, such as MS Teams, ZOOM, Webex, etc. 93% of respondents agreed that while online learning has its limitations, it is better than no learning during lockdowns. The teachers expressed the biggest problems in the absence of personal interaction between the teacher and the students and among the students and the impossibility of providing sufficient practical teaching, since the students did not get to the workshops during the online teaching. Thus, they could not acquire the desired practical skills, which in later years turned out to be a major deficiency, and students had to catch up with practical teaching. Another problem was the lack of skills with ICT tools, which were to be used day by day for online teaching - platforms for communication, sharing materials, tools/apps for creating videos, etc. In the future, they would therefore appreciate video materials that they could use during online teaching, but also during independent student work or individual study. This need was confirmed by 93% of respondents.

Those who had no previous experience with online teaching were asked about their strongest impression of online teaching. The vast majority took it as a new personal challenge, they also appreciated the possibility of quickly adapting to the current situation. They liked to communicate and pass on knowledge to students. They took it as an excellent solution to an emergency situation and ensured communication. Some teachers are planning to implement more a combination of face-to-face and online teaching/blended learning in the future.

However, some teachers complained about the poor response of students, who rather understood online teaching as an opportunity not to work. Those who criticized online teaching justified their position mainly on the impossibility of imparting practical skills to students, which are essential for their future profession in their fields of study - machining, hydraulics and pneumatics, and logistics.

TEACHERS
PART 2: MACHINING

In the Machining section, we focused on topics that teachers would need to have processed in the form of video materials and tests to compare students' input and output knowledge. For machining, the teachers chose the following 4 areas and within them sub-topics in the modules, namely:

TOPIC 1: Manual metal working
- MODULE 1: Measurement and drawing
- MODULE 2: Measurement and types of gauges
- MODULE 3: Cutting
- MODULE 4: Filling

TOPIC 2: Turning
- MODULE 1: The main parts of the center lathe
- MODULE 2: Clamping of tools on the lathe
- MODULE 3: Turning of front surfaces and drilling
- MODULE 4: Turning of cylindrical surfaces

TOPIC 3: Milling
- MODULE 1: The main parts of the milling machine
- MODULE 2: Clamping of tools and workpieces on milling machines
- MODULE 3: Basic milling work

TOPIC 4: Grinding
- MODULE 1: The main parts of the grinder
- MODULE 2: Balancing the grinding wheel
- MODULE 3: Grinding of cylindrical surfaces

It is worth mentioning that up to 83% of the respondents consider it crucial to learn about safety when working with the given machines through videos.

At the end of this section, we asked what teachers think definitely cannot be learned during online teaching compared to classroom and workshops. In addition to the practical skills mentioned several times, the teachers also pointed out the impossibility of teaching students to persevere at work and overcome their laziness through online teaching.

TEACHERS
PART 3: HYDRAULICS AND PNEUMATICS

Also in the Hydraulics and Pneumatics section, we focused on topics that teachers would need to have processed in the form of video materials and tests to compare students' input and output knowledge. For hydraulics and pneumatics, the teachers chose the following 4 circuits and within them sub-topics in the modules, namely:

TOPIC 1: Pneumatic and hydraulic schematic circuits design
- MODULE 1: Pneumatic and hydraulic valves
- MODULE 2: Schematic symbols involved in compressed air distribution and typical for pneumatics
- MODULE 3: Schematic symbols typical for hydraulic systems

TOPIC 2: Typical pneumatic circuits
- MODULE 1: Pneumatic circuits with single-acting cylinder
- MODULE 2: Simple pneumatic circuits with double-acting cylinder
- MODULE 3: Controlling speed of a piston

TOPIC 3: Typical hydraulic circuits
- MODULE 1: Simple hydraulic circuit
- MODULE 2: Application of pressure control valves
- MODULE 3: Flow control valves

TOPIC 4: Introduction to electropneumatics and electrohydraulics
- MODULE 1: Electric control of a electropneumatic and electrohydraulic valves
- MODULE 2: Relay control of electrically actuated valves
- MODULE 3: Relay latching circuit

At the end of this section, we asked what teachers think definitely cannot be learned during online teaching compared to classroom and workshops. During online education, students will not learn how to practically connect circuits, they will not learn how to troubleshoot real devices, how to remove dirt from a tube, or how to fix a cracked valve. They do not try to assemble the circuit according to the schematic. However, they can learn peripheral components, or the marking of pneumatic elements and their function, which will facilitate their later work in the workshop.

TEACHERS
PART 4: LOGISTICS

As in the previous topics, also in the Logistics section we focused on topics that teachers would need to have processed in the form of video materials and tests to compare the input and output knowledge of students. For logistics, the teachers chose the following 4 areas and within them sub-topics in the modules, namely:

TOPIC 1: Swap body
- MODULE 1: Operation equipment and preparation of swap body
- MODULE 2: Removing the swap body container from the vehicle
- MODULE 3: Taking a swap body container into a vehicle

TOPIC 2: Coupling and uncoupling of trailers
- MODULE 1: Semi-trailer
- MODULE 2: Full-trailer
- MODULE 3: Dolly

TOPIC 3: Counterbalance forklift
- MODULE 1: Driving start check
- MODULE 2: Driving
- MODULE 3: Loading and unloading the vehicle

TOPIC 4: Ensuring the load
- MODULE 1: Use of a load strap
- MODULE 2: Turnbuckle
- MODULE 3: Supporting and covering the load

At the end of this section, we asked what teachers think definitely cannot be learned during online teaching compared to classroom and workshops. In addition to the lack of practical skills mentioned several times, the teachers also pointed to the benefit of video materials and online teaching. Through the videos, students have the opportunity to familiarize themselves with the working environment, with the machines (such as a forklift) before they get to them, and for example, the maintenance of these machines and the pre-operation check is better shown in the video than it can be shown sometimes in reality.

STUDENTS

As we mentioned, 265 students from 4 countries – Slovakia, the Czech Republic, Italy and Finland – took part in the analysis, mostly second and third-year students.

The students thought that the scope of the curriculum and tasks for online teaching were appropriate for the given form, and they also rated the difficulty of the tasks as correctly set. 68% of the respondents thought that the assessment of their knowledge was objective, and only 4% said that it seemed unfair to them.

They did not have significant problems with online teaching as such, as they themselves assessed their ICT skills as sufficient (up to 87% of students). Up to 74% of respondents consider online webinars and video conferences to be the best method of online teaching, and they also appreciate vocationally focused video material. According to 75% of respondents, teaching took place via the MS Teams platform, the others named were Moodle and Webex.

As an advantage of online teaching, students saw the opportunity to save time travelling to school, up to 75% of respondents. Up to 85% of respondents consider the absence of practical teaching and interaction with classmates to be the biggest disadvantage. They mentioned that the student is not forced to pay as much attention as in regular teaching and therefore does not learn as much from the lessons as in the classical form of teaching. They also consider the environment at home to be unstimulating, which disturbs them more since there are many other things to do.

In the end, we were interested in how students perceived their teachers during online teaching. 46% rated them very positively, according to 37% some were better, others worse. Only about 7% of the students were quite critical of the teachers and said that they did not manage online teaching at all and that they have to improve in the future. However, 72% of the students appreciated that they were given all the necessary theoretical knowledge, they only lacked the practical skills.

Despite all the shortcomings of online teaching, up to 75% would welcome a hybrid learning model, online teaching from the comfort of home and practical activities at school. At the same time, up to 81% of students expressed that they would welcome professionally oriented video materials.

FINALLY, ...

From the mentioned survey of needs within the project "STEP IN to the online world/ virtual learning, Facilitation of access to Vocational practice through online teaching at secondary technical schools" it is clear that both teachers and students are aware of the advantages and disadvantages of online teaching. In the future, however, they would appreciate appropriate materials that would facilitate their online learning, especially professionally focused video materials and educational materials such as tests and examples.

You can learn more details about the individual topics and the advantages of online teaching from the perspective of both the teacher and the student from the documents and materials located on the project website https://stepintolearning.eu

Finally, on behalf of the STEP IN project partnership, we would like to thank all respondents from Slovakia, Finland, Italy, and the Czech Republic for participating in the survey, and we hope that our analysis will serve others as an answer to their possible questions, or will be an inspiration for them in their own professional pedagogical practice.

On behalf of the STEP IN partnership:
Adriana Kováčová, INAK Slovakia, project coordinator
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