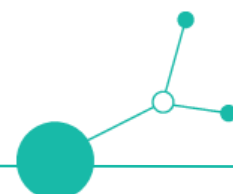


Re/Upskilling Programs PP2

D 2.1.1





General introduction

Re/UpSkilling programs are a part of Digital Skills Transformation Toolkit DiSTT. The “Toolkit” is defined by project proposal as a comprehensive solution to address the skills gaps and support the digital fabrication skills transformation process to foster labour market workforce. It consists of re/upskilling programs, designed by each DiSTT partner to meet the needs of target groups and to fill identified skillGaps in the regions.

The target is to enable educators (typically Fab Labs and Makerspaces) to offer structured, high-quality training inspiration and resources, which leads to the fostering innovation, bridging the gap between education and industry, and preparing individuals for the challenges of an evolving technological world.

This report presents the design and implementation of a re/upskilling program developed by PP2 (FabLab Brno) as part of the DiSTT project’s Digital Skills Transformation Toolkit. The program targets young people aged 15-19 entering the labour market and aims to equip them with practical skills in digital fabrication through a hands-on, project-based competition format (*Soutěž s FabLabem*). Rooted in the principles outlined in the Joint Blueprint, the program combines technical skill development (e.g. 3D printing, laser cutting, Arduino) with soft skills such as teamwork, problem-solving, and communication. This report outlines the program structure, learning outcomes, assessment approach, and reflections from the first pilot runs held in early 2025.

The Toolkit defined by Strategy document

To ensure consistency across outputs of the DiSTT project we provide summary of the key decisions valid for designing Re/Up programs - the core of the project

Conclusion for the Toolkit (sum-up)

The DiSTT Toolkit will be WEB based HUB, portal or application which will not be just a set of learning materials, but a **comprehensive framework for digital skills transformation** that:

- bridges hands-on learning with labor market needs,
- supports long-term sustainability of FabLabs as educational hubs,
- ensures transferability, openness, and scalability across Europe.

Key Components of the Toolkit defined in the Strategy document

1. Modular Educational Programs

examples:

- “**Learn-it!**” - technical and theoretical preparation
- “**Make-it!**” - hands-on workshops and project-based learning
- Ready-to-use curricula and learning units for different levels
- Localization options to suit regional contexts

2. Assessment and Feedback Tools

examples:

- Pre- and post-module self-assessment questionnaires
- Continuous formative evaluation by facilitators
- Criteria for evaluating prototypes, projects, and teamwork



- Recommendations for informal certification or skill recognition

3. Implementation & Methodological Guide

examples:

- Guidelines for program deployment in FabLabs
- Role of the facilitator and design of the learning environment
- Tips for cooperation with schools, industry, and local partners
- Best practice examples and sustainable operational models

4. Communication and Outreach Materials

examples:

- Templates for promoting training programs
- Messaging strategies for schools and companies
- Tools for community building and sharing results

5. Open Platform / Repository

examples:

- Online access to all materials (e.g., Moodle, Git, website)
- Possibility to adapt and contribute content
- Open licensing to support widespread adoption



PP2 UPskilling program

Title of the program:

High School Student Competition

The *High School Student Competition and TechSprint* implemented by PP2 (FabLab Brno) is a fully aligned re/upskilling program developed under the DiSTT Blueprint. Designed for young people aged 15-19 entering the labour market, the program follows the **Challenge-Based Learning + Competition** format as described in the Joint Blueprint. It provides participants with hands-on experience in digital fabrication technologies (3D printing, laser cutting, Arduino) while fostering creativity, problem-solving, teamwork, and presentation skills.

The structure, content, and assessment methods were designed according to the **GUIDE checklist**, ensuring:

- a clearly defined purpose (skill-building and industry orientation),
- targeted competencies (CAD, machine operation, teamwork),
- appropriate learning activities (project-based, mentor-supported),
- formative assessment (pre/post self-evaluation), and
- a final showcase (presentation before an expert jury).

There were no deviations from the Blueprint; instead, the pilot confirmed the viability and relevance of the planned approach for this target group.

Target group PP2:

The target group for this program is **young people aged 15-19** who are preparing to enter the labour market. The competition format is tailored to this age group by combining hands-on technical training with teamwork and creative problem-solving, offering an engaging introduction to digital fabrication and innovation.

PP2 pedagogical approaches to the Upskilling program

The pedagogical approach of PP2 remains as planned in the Blueprint. The program is built on **Project-Based Learning (PBL)**, where high school students work in teams to solve real-world challenges through hands-on prototyping. **Experiential and maker-based learning** is central, as students actively use digital fabrication tools like 3D printers, laser cutters, and Arduino to create tangible outcomes. **Design Thinking** guides the creative process, encouraging iteration and user-centered design. The program also supports **student autonomy and reflective learning** through structured self-assessment and final presentations before an expert jury, promoting ownership of learning and soft skill development.

PP2 program main stakeholders

1. **Local technology companies** (e.g. Honeywell) - participate in the final jury, provide real-world feedback, and help ensure alignment with current industry needs. In the case of *TechSprint*, they also serve as challenge providers, defining real-world problems for students to solve.



2. **JIC (South Moravian Innovation Centre)** - offers insight into business potential, innovation, and entrepreneurship, supporting the real-world relevance of student projects.
3. **High schools and STEM educators** - engage students, support participation, and help integrate the program into broader educational frameworks.
4. **FabLabs and makerspaces** - can replicate or adapt the competition format to foster digital skills and hands-on learning in their own regions.
5. **Technical universities** (e.g. Brno University of Technology) - support the educational design and may serve as mentors, jury members, or partners for scaling the program.

PP2 main purpose of the program

The main purpose of the PP2 upskilling program is to equip high school students with practical digital fabrication skills and introduce them to real-world problem-solving through a hands-on, project-based competition. By combining technical training with teamwork, creativity, and presentation skills, the program aims to foster early interest in STEM careers, support personal growth, and bridge the gap between education and industry needs.

PP2 clear learning outcomes

- **Learning by failing** - students accept failure as a natural part of the innovation process and use it to iterate and improve. The amount of time given is not enough for a large project etc.
- **Standing by your ideas** - students build confidence to present, defend, and refine their own ideas in front of peers and experts.
- **Understanding the value of prototyping** - students learn why rapid prototyping is essential for testing and improving solutions.
- **Applied practical knowledge** - students use newly acquired digital fabrication skills in hands-on, meaningful contexts.
- **Time management** - students learn to plan and deliver a project within a fixed timeframe.
- **Working across different backgrounds** - students experience collaboration outside their usual environment (e.g., technical schools vs. general schools), gaining adaptability and broader teamwork skills.

PP2 target competencies

Technical Competencies

- **Digital fabrication skills** - using 3D printers and laser cutters to produce real, functioning parts.
- **CAD/CAM design** - designing for digital fabrication using tools like Tinkercad, Fusion 360, or Inkscape.
- **Basic electronics and coding** - using Arduino and components (LEDs, motors, sensors) to create interactive prototypes.
- **Time and project management** - planning, organizing, and executing tasks within a limited timeframe.



Soft Skills

- **Teamwork and collaboration** - cooperating in diverse teams, sharing responsibilities, and solving problems together.
- **Presentation and storytelling skills** - confidently presenting outcomes using structured, engaging narratives tailored to audience and jury.
- **Working outside comfort zones** - adapting to new tools, environments, and peer dynamics (e.g., cross-school teams in a FabLab setting).

Creative and Cognitive Competencies

- **Idea-to-concept thinking** - turning abstract ideas into tangible, testable solutions.
- **Design thinking and problem-solving** - identifying core problems, considering user needs, and iterating realistic solutions through prototyping.

3D Printing / Additive Manufacturing	Operating 3D printers 3D modeling and slicing software, Maintenance and troubleshooting of 3D printers
Laser cutting (CNC cutting)	Operating laser cutters Vector graphic design for laser cutting Material selection and settings adjustment
CNC Machining	Operating CNC machines (e.g., routers, mills) CAM software (e.g., Fusion 360, Mastercam, RhinoCAM, SprutCAM) Toolpath generation and machine setup
2D & 3D design (and computer simulation)	2D and 3D CAD software (e.g., AutoCAD, SolidWorks, Tinkercad) Algorithmic design Technical drawing and blueprint creation
Makers soft skills	Effective communication of ideas and concepts Prototype iteration and improvement Documentation and presentation skills Teamwork and collaboration Design thinking



PP2 developed Program Curriculum

1. Curriculum development: Based on the needs confirmation performed in A1.1, create a modular and flexible curriculum for each target group that covers needed digital fabrication skills. The curriculum will follow the structure defined by Activity A1.3 in the project proposal.

Program formats

This section explains the chosen formats in a deeper look.

Project Sprint + Mentoring Format

Structure:

- 3 months long run
- Weekly or bi-weekly consultations with a mentor (3 hrs total)
- Final presentation with jury (industrial partners, FabLab manager, university partner etc.)

Pedagogy: Project-based learning, industry-relevant skills from FabLab Brno technologies

Assessment:

- Post skill real-time questionnaire (Menti) - before/after questions
- Formative feedback from mentors/lecturers
- Peer reflection in final presentation

Best for: Bridging education and industry, focused team projects

Workshop title	High school student competition
Target audience	High school students (mixed background)
Prerequisites	work with computer no required skills needed (but are a plus)
Purpose & Learning Outcomes	Design thinking methods experienced, Effective communication of ideas and concepts, Prototype iteration and improvement, problem-solving)
Program Format	Structure: long term competition Duration: three months - bi-weekly consultations and work on their own
Skill Gaps	Operating 3D printers, 3D modeling and slicing software, Operating laser cutters, Vector graphic design for laser cutting, Material selection and settings adjustment, Effective communication of ideas and concepts, Prototype iteration and improvement, Documentation and presentation skills
Learning Activities	Frontal education - hard skill lectures, learning by doing - working on their own projects with the gained skills, mentoring sessions
Assessment	Post-workshop self-assessment (learning gains, perceived growth in hard and soft skills) Practical outputs (prototype, data, photos, presentation, pitch)
Roles & Support	FabLab Brno lecturers and JIC mentors (soft skills)



	Evaluator: industrial partners, project partners, mentors
Feedback	After the assessment survey
Showcase or Closure	Final 5 min presentation + 5 min discussion with jury
Documents, support materials	Presentation (incl. goals, timeline, rules of the competition) Soutěž s FabLabem JARO 2025.pdf Prezentační dovednosti pro studenty 1.pdf
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Project Sprint + Mentoring Format

Structure:

- 3 - 5 days long run
- Individual team work + additional workshops during the program
- Final presentation (in front of industrial partners, FabLab manager, university partner etc.)

Pedagogy: Project-based learning, industry-relevant skills from FabLab Brno technologies

Assessment:

- Post skill real-time questionnaire - before/after questions
- Formative feedback from mentors/lecturers
- Peer reflection in final presentation

Best for: Bridging education and industry, focused team projects

Workshop title	TechSprint: Idea to prototype
Target audience	High school students (mixed background)
Prerequisites	work with computer no required skills needed (but are a plus)
Purpose & Learning Outcomes	Design thinking methods experienced, Effective communication of ideas and concepts, Prototype iteration and improvement, problem-solving)
Program Format	Structure: short term challenge ("hackathon") Duration: 3 - 5 days
Skill Gaps	Operating 3D printers, 3D modeling and slicing software, Operating laser cutters, Vector graphic design for laser cutting, Material selection and settings adjustment, Effective communication of ideas and concepts, Prototype iteration and improvement, Documentation and presentation skills
Learning Activities	Frontal education - hard skill lectures, learning by doing - working on their own projects with the gained skills, mentoring sessions
Assessment	Post-workshop self-assessment (learning gains, perceived growth in hard and soft skills) Practical outputs (prototype, data, photos, presentation, pitch)



Roles & Support	FabLab Brno lecturers and JIC mentors (soft skills) Evaluator: industrial partners, project partners, mentors
Feedback	After the assessment survey
Showcase or Closure	Final 5 min presentation + feedback from mentors
Documents, support materials	Presentation (incl. goals, timeline, rules of the competition)
Language:	Czech

PP2 developed Instructional Design tools

At the beginning of the program, each team receives a [PowerPoint presentation](#) summarizing all key information: competition rules, workshop schedules, expectations, and project guidance.

A dedicated website - www.soutezsfablabem.cz - functions as the central platform where teams can:

- Order necessary materials
- Check project workshop hours
- Review competition rules and updates

Participants receive **digital study materials** with summaries of important lectures and practical instructions, which they can keep and use after the program.

The **FabLab University YouTube channel** provides **video tutorials** on:

- How to use FabLab machines (e.g. 3D printer, laser cutter)
- CAD and slicing software
- Arduino programming basics

These resources support both the current project work and **future self-directed learning**.

As an incentive for further learning, selected participants are awarded **FabLab memberships**, enabling them to continue practising and developing their digital fabrication skills.

PP2 developed Assessment tools

General principles of the Assessment

We do self-assessment before and after the workshops to estimate the impact of the workshops. Other approaches are individual for each RE/UPskilling program (each DiSTT project partner and their target group)

Objective/Subjective assessment



Assessment of the trainee

- A. self (central pre/after assessment through skillNest)
- B. by authority (for LP1 only with hackathons or bigger events)

Assessment of the pilot/workshop

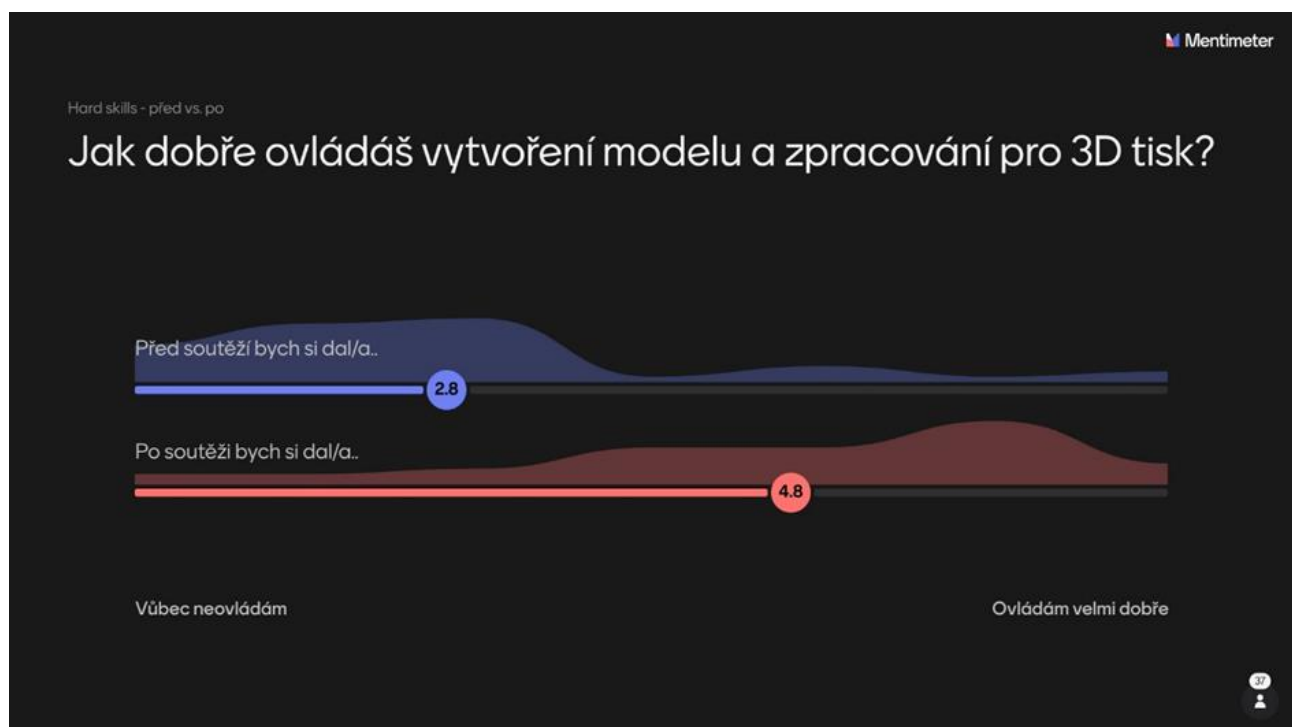
- A. by trainee (optional on the skillNest - post-assessment)
- B. by external authority (not planned)

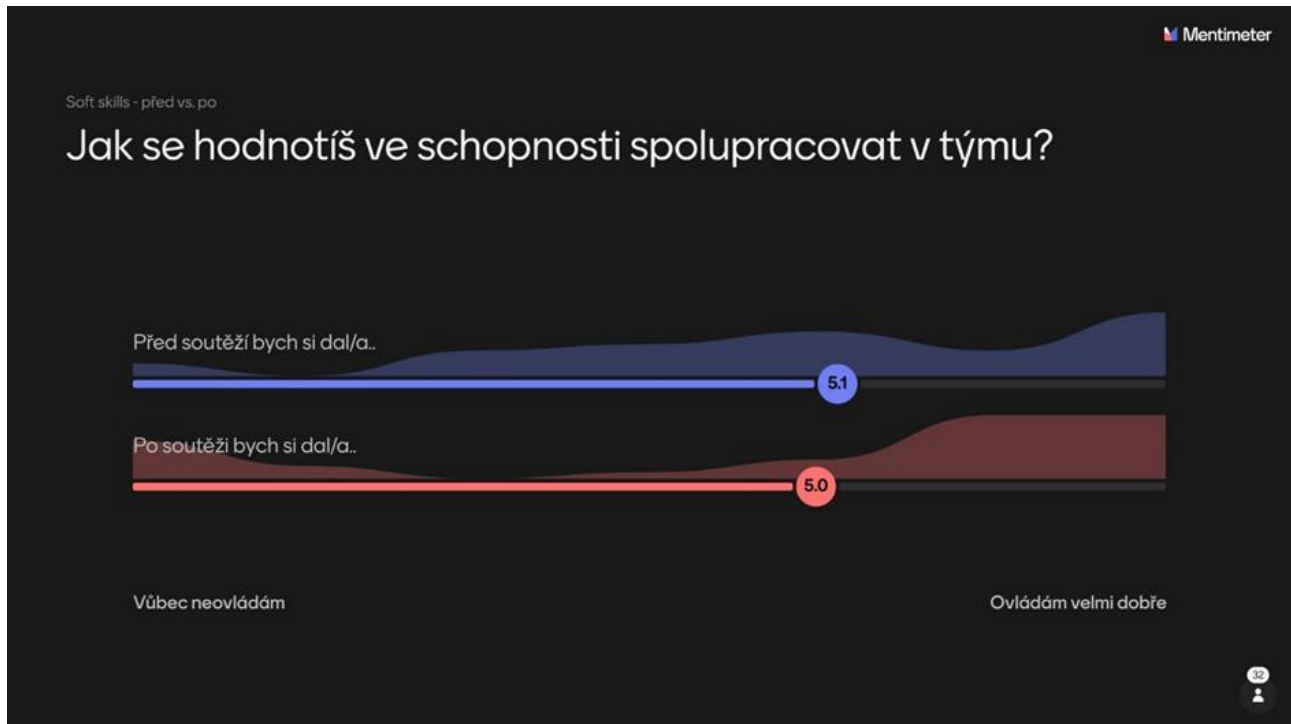
Structure of the skillNest assessment surveys

As general principle for each partner: to provide common base for the assessment by the participants first 3-6 questions mandatory regarding selected skillGaps to be covered by PilotRUN/workshop

General principles of the Assessment of PP2 - High School Student Competition

In the PP2 program, assessment is carried out through a **self-evaluation model** where students rate their skill levels on a **1-5 scale** before and after the program. This method covers both **technical skills** (such as 3D modeling, machine operation, and basic electronics) and **soft skills** (including teamwork, communication, and presentation). The approach enables participants and instructors to **visually monitor growth**, identify areas of improvement, and evaluate whether the program has successfully **bridged initial skill gaps**. Rather than using formal grades, the focus is placed on **reflective learning**, **practical competence**, and **individual progress**, with outcomes clearly illustrated through comparative pre- and post-program data.





Here is example from pilot run we had and how we interpret the findings.

Hard Skills - Clear Improvement

Participants showed significant progress in technical competencies:

- **3D modeling and design preparation** - a strong increase from 2.8 to 4.8
- **Operating a 3D printer** – greater confidence in setup and usage (2.6 → 4.7)
- **Laser cutter operation** – the largest leap, indicating it was a new skill for many (1.3 → 3.8)
- **Basic electronics (e.g., circuit assembly, soldering)** - improved from 3.7 to 5.1
- **Arduino programming** – notable progress in a more advanced area (2.6 → 3.3)

These results confirm that the program **effectively built practical technical skills**, even for participants with limited prior experience.

Soft Skills - Mixed Outcomes

- **Team collaboration** remained nearly unchanged (5.1 → 5.0), possibly due to initially overestimated self-ratings.
- **Project leadership or co-leadership** improved slightly (4.2 → 4.6), but not significantly.
- **Role distribution in a team** slightly decreased (4.2 → 4.0), suggesting discomfort or unfamiliarity with defining team structure.
- **Communication during problem-solving** showed a modest increase (4.3 → 4.6).

These results indicate that **soft skill development did occur**, but to a lesser extent. For many students, working in teams was a new experience, highlighting the value of such programs in preparing them for **real-**



world, collaborative work environments. More structured group work and targeted facilitation could support deeper growth in future editions.

Similarly as in the assessment for the longer *High School Competition*, in our shorter version of the program, *TechSprint*, assessment is carried out through a **self-evaluation model** where students rate their skill levels on a **1-5 scale** before and after the program. This method covers both **technical skills** (such as 3D modeling, machine operation, and basic electronics) and **soft skills** (including teamwork, communication, and presentation). We use Google Forms, where both the pre and post assessment questionnaires contain the same questions, with additional overall program feedback questions in the post-program questionnaire.