

Pilot Run Report

DiSTT

D2.2.1

Digital Tools in Vocational Training: Empowering Tomorrow's Workforce

Project partner: PP3 Happylab, Vienna, Austria





Executive Summary

This report summarises the design, implementation and evaluation of nine Pilot Runs delivered by PP3 Happylab within the DiSTT project. Happylab tested one deliberately consistent and transferable re/upskilling format with apprentices from Wiener Linien, Jugend am Werk and A1. The programme introduced participants to CAD, 3D printing, laser cutting, robotics and basic programming through a compact, hands-on makerspace experience.

Across the nine runs, Happylab reached 67 apprentices and completed 189 scheduled pilot hours. The compact three-day format enabled the same programme to be implemented across several vocational contexts and group profiles. Repeated delivery provided a strong basis for testing transferability, refining facilitation and generating reusable implementation knowledge.

Evaluation findings across all nine Pilot Runs were consistently positive. Across seven comparable self-assessment items, the overall mean increased from 2.61 to 3.85 on a five-point scale, a gain of 1.23 points. The strongest changes concerned safe laser-cutter operation, independent 3D-printer use, robot programming and 3D modelling. Participants particularly valued the practical activities and supportive learning environment. The main opportunities for further development are additional experimentation time and differentiated support for programming tasks.

The Pilot Runs demonstrate that a compact makerspace programme can provide apprentices from different occupational backgrounds with accessible entry points into digital fabrication. The repeated implementation also generated practical knowledge about equipment preparation, pacing, differentiation, assessment and cooperation with vocational-training organisations. These findings provide direct input for future programme uptake and the DiSTT Digital Skills Transformation Toolkit.

1. Introduction

DiSTT addresses digital skill gaps and supports the development of transferable re/upskilling programmes connected to FabLabs, makerspaces, education providers and employers. PP3 Happylab contributes a practice-oriented learning environment in Vienna where learners can explore digital technologies through direct use, experimentation and the production of tangible results.

The PP3 programme, Digital Tools in Vocational Training: Empowering Tomorrow's Workforce, was developed for apprentices from different vocational fields and with different levels of prior technical experience. It responds to a recurring gap in conventional vocational training: many learners have limited opportunities to combine digital design, fabrication, electronics and programming within one interdisciplinary project.

Happylab chose to test one intensive programme repeatedly rather than create several unrelated formats. This made it possible to examine whether the same core learning design could work with apprentices from mechatronics, technical, commercial and other vocational pathways. The central transferability question was whether a common workshop structure could remain effective while being adjusted to different entry levels, group dynamics and organisational settings.

The programme combined technical skills with transversal competences. Participants were expected not only to operate tools but also to work in teams, develop and test ideas, solve problems iteratively and present a functioning prototype. In this way, digital fabrication became a practical vehicle for confidence, collaboration and technological self-efficacy.



1.1 Programme overview

The programme was delivered in person at Happylab Vienna, Schönngasse 15-17, 1020 Vienna. It was conducted in German and designed for beginners without formal prerequisites. Each run followed a three-day format. The programme concept comprises approximately 20 contact hours; the official Pilot Run overview records 21 scheduled hours per run, which is the basis used for the cumulative reporting in this deliverable.

Core learning activities included CAD modelling, preparation of files for digital fabrication, 3D printing, laser cutting, programming with the Calliope mini, assembly of robotic systems, iterative testing, team-based challenges and final demonstrations. Participants worked with 3D printers, a laser cutter, Calliope mini microcontrollers and Movement Sets, computers and standard workshop equipment.

1.2 Learning outcomes

- Create and prepare simple CAD models for digital fabrication.
- Start and monitor a 3D-printing process and understand basic production constraints.
- Operate a laser cutter safely under the workshop's operating procedures.
- Understand and apply basic programming concepts using the Calliope mini.
- Assemble, test and improve a functional robotic prototype.
- Apply creative problem-solving and iterative design.
- Work collaboratively, distribute tasks and communicate technical decisions.
- Build confidence in approaching unfamiliar digital tools.

2. Methodology

The evaluation followed a mixed-method, practice-oriented approach. It combined quantitative pre- and post-workshop self-assessment with open participant comments, trainer observations and evidence from practical activities. Because the same programme was repeated, the principal reporting unit is the programme as a whole. Individual runs are listed for transparency, while learning results and lessons are synthesised across the implementation period.

2.1 Data collection

Participants completed a short pre-survey at the start and a post-survey at the end of the workshop. Seven identical self-assessment statements were used for the combined analysis. Participants rated each statement from 1 (do not agree) to 5 (fully agree). The statements covered 3D modelling, 3D printing, laser-cutter use, robot programming, debugging, confidence in trying new digital tools and teamwork on digital projects.

The pre-survey also asked what participants expected from the workshop. The post-survey explored what they liked most and which elements could be developed further. Trainer observations and final prototype demonstrations complemented the questionnaires by providing evidence of engagement, practical application, teamwork and implementation learning.

The evaluation covers all nine Pilot Runs. The consolidated comparative dataset comprises 55 pre-responses and 49 post-responses and is complemented by the ninth-run analysis. The ninth-run results reinforced the overall pattern and confirmed the same conclusions.



2.2 Analytical approach and quality considerations

Results were analysed at programme level by comparing aggregate scores before and after the programme and reviewing shifts in the response distribution. Open comments were coded into recurring themes. The survey was structured for programme-level analysis rather than matched individual assessment, so the comparison focuses on the pre- and post-response groups. This approach is appropriate for identifying patterns across the repeated Pilot Runs.

The measures capture self-reported confidence and perceived competence. Their interpretation is strengthened through triangulation with practical workshop outputs, prototype demonstrations and trainer observations. The combined quantitative and qualitative evidence therefore provides a suitable basis for evaluating an introductory, practice-oriented pilot programme.

Signed attendance lists for all nine runs are retained by Happylab. They are not appended to this narrative report because they contain personal data, but they are available for project verification if required.

3. Pilot Run Data

3.1 Delivery scope and achieved results

Happylab completed nine Pilot Runs with 67 participants and 189 scheduled delivery hours. The consistent three-day format was implemented with apprenticeship groups from Wiener Linien, Jugend am Werk and A1, providing broad organisational and learner coverage.

This compact and repeatable delivery model enabled the programme to be tested across different vocational contexts while keeping participation compatible with company and vocational-training schedules. Repeated implementation also created a strong basis for comparing group experiences, refining support and assessing transferability.

3.2 Overview of PP3 Pilot Runs

1. Jun 3, 2025 - Jun 5, 2025 — Wiener Linien — 9 participants
2. Oct 27, 2025 - Oct 29, 2025 — Jugend am Werk 1100 — 5 participants
3. Nov 3, 2025 - Nov 5, 2025 — Jugend am Werk 1100 — 5 participants
4. Nov 17, 2025 - Nov 19, 2025 — Jugend am Werk 1100 — 6 participants
5. Nov 24, 2025 - Nov 26, 2025 — Jugend am Werk 1200 — 9 participants
6. Dec 16, 2025 - Dec 18, 2025 — Jugend am Werk 1200 — 7 participants
7. Feb 4, 2026 - Feb 6, 2026 — A1 — 8 participants
8. Mar 2, 2026 - Mar 5, 2026 — Jugend am Werk 1200 — 12 participants
9. Mar 30, 2026 - Apr 1, 2026 — A1 — 6 participants



All runs were delivered in person at Happylab Vienna and used the same core programme. Adaptations were made through pacing, facilitator support, optional extensions and the distribution of time between digital fabrication and programming rather than by changing the programme's central learning outcomes.

4. Pilot Implementation

4.1 Workshop structure

Day 1 - Foundations and digital design

The first day introduced the programme, workshop organisation and assessment process. Participants created simple CAD models and were introduced to 3D printing. They also prepared and laser-cut parts such as the robotic chassis and personalised elements. Short demonstrations were followed immediately by guided practical work.

Day 2 - Digital fabrication and robotics

Participants continued fabrication, prepared or printed connectors and learned programming fundamentals with the Calliope mini. Exercises introduced inputs, outputs, loops and conditions before the teams assembled, wired and decorated their robots. Depending on group progress, additional sensors or extensions were introduced.

Day 3 - Testing, challenges and presentation

Teams programmed and tested robot movement, corrected errors and completed progressively more complex challenges. Typical tasks included driving a defined distance, navigating curves, entering a target area, drawing geometric shapes or transporting an object. The programme concluded with team demonstrations, feedback, the post-survey and certificates.

4.2 Pedagogical approach

Project-based learning provided the overall structure: participants worked toward a concrete, visible outcome rather than completing disconnected exercises. Experiential learning ensured that technical explanations were immediately applied. Formative assessment was integrated throughout the process through trainer feedback, peer exchange, testing and iterative improvement.

The makerspace setting was essential. It allowed participants to move between digital design, manufacturing, electronics, programming and physical testing within one learning sequence. This made dependencies between the technologies visible and supported a stronger understanding of the complete prototyping workflow.

The programme was deliberately non-academic and accessible. Short inputs, demonstrations, structured exercises and practical challenges reduced barriers for beginners. Optional extensions allowed faster groups to explore sensors, wireless control or more advanced programming without making those elements prerequisites for successful participation.

4.3 Materials and practical safeguards

Instructional resources included slide decks, printed worksheets, concise step-by-step instructions, CAD templates, example code and practical demonstrations. Participants had access to computers, fabrication



equipment, Calliope kits and general workshop facilities. Consent procedures were used for photography and video, with particular attention to youth protection and parental consent where participants were minors.

5. Communication, Outreach and Participant Materials

Recruitment was organised primarily through the participating organisations—Wiener Linien, Jugend am Werk and A1—which nominated apprentices and integrated the workshop into their training schedules. This direct route ensured that the programme reached its intended audience and that group participation was coordinated with vocational-training requirements.

Public communication was supported through the Happylab DiSTT project page. The core message emphasised practical experience with 3D printing, laser cutting, robotics and programming, the opportunity to produce a functioning result and the suitability of the programme for beginners. Photographs and videos from the first run document the makerspace setting, teamwork and practical activities and can be used in the final dissemination version subject to the applicable consent records.

Participants received concise programme information, workshop instructions, files and templates during delivery. Final demonstrations and certificates provided a clear conclusion and recognised participation. The compact teaching package provides a strong foundation for a reusable facilitator guide containing preparation checklists, timed activities, starter files, code examples, troubleshooting guidance and the harmonised assessment instrument.

6. Evaluation

6.1 Pre- and post-assessment results

Average scores increased on every one of the seven analysed items. Across all items, the mean rose from 2.61 before the workshop to 3.85 afterwards, an increase of 1.23 points on the five-point scale.

Safe operation of the laser cutter showed the largest gain, increasing from 1.69 to 3.90 (+2.21). Independent starting and monitoring of 3D printing increased from 2.13 to 4.00 (+1.87). Robot programming increased from 2.00 to 3.63 (+1.63), and creating a 3D model increased from 2.42 to 4.00 (+1.58).

Debugging confidence rose from 2.53 to 3.31 (+0.78). Confidence in trying new digital tools increased from an already comparatively high 3.62 to 4.10 (+0.48). Teamwork started at the highest baseline and remained high, moving from 3.91 to 3.98 (+0.07).

The pattern is consistent with the programme design. The strongest changes occurred in skills for which many participants had little prior experience and which they practised intensively during the workshop. Smaller changes in teamwork and openness to technology reflect high starting values rather than a lack of programme relevance.

Detailed item-level results

Assessment item	Pre mean	Post mean	Change	Interpretation
Safe laser-cutter operation	1.69	3.90	+2.21	Very strong increase



Independent 3D printing	2.13	4.00	+1.87	Very strong increase
Robot programming	2.00	3.63	+1.63	Strong increase
Create a 3D model	2.42	4.00	+1.58	Strong increase
Debugging	2.53	3.31	+0.78	Clear positive development
Try new digital tools	3.62	4.10	+0.48	Improved from strong baseline
Teamwork on digital projects	3.91	3.98	+0.07	High level maintained

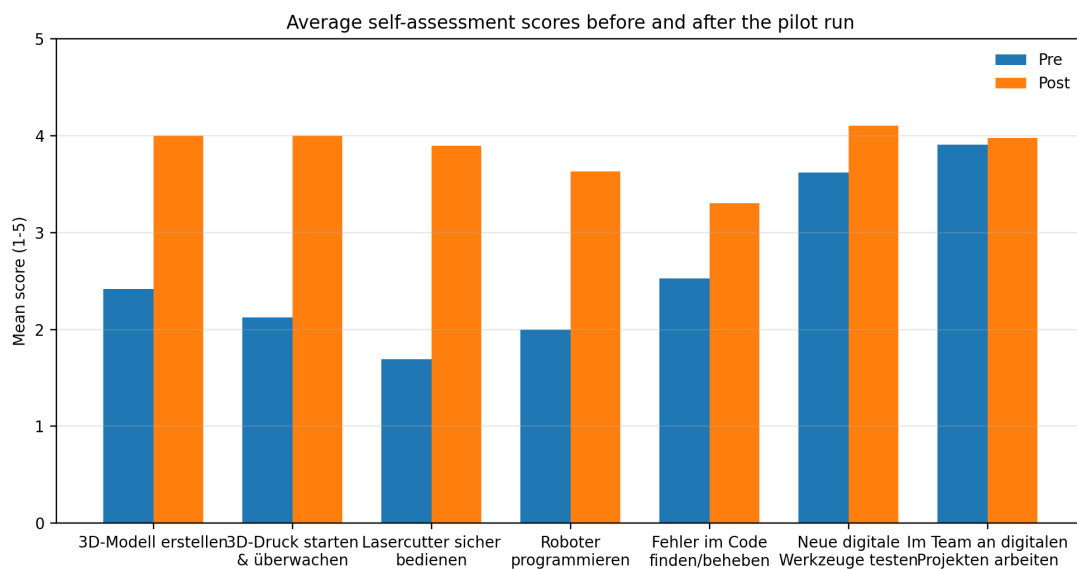


Figure 1. Mean self-assessment scores before and after the pilot runs.

Overall response distribution

The response profile moved substantially away from ratings 1-2 and toward ratings 4-5 across the full set of answers. This confirms that the improvement was broad-based and not driven only by a small number of high-scoring responses.

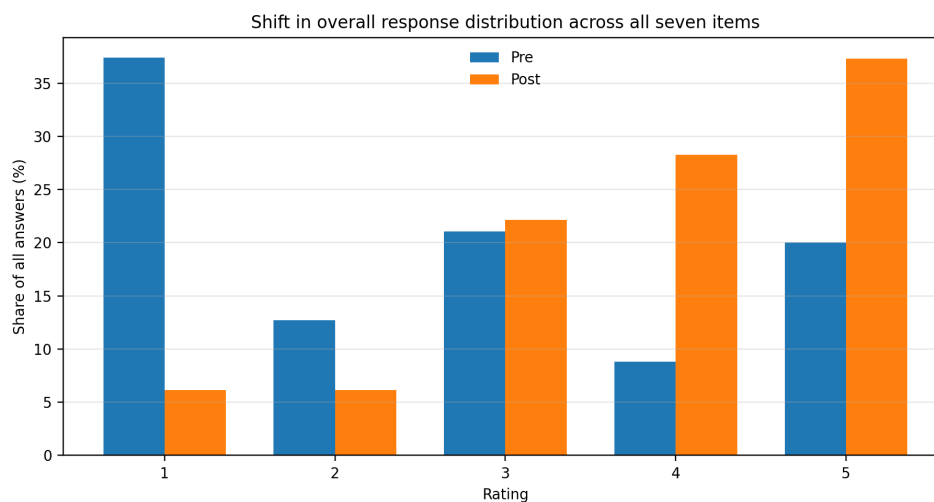


Figure 2. Distribution shift across all seven items combined.



6.2 Participant feedback

Before the workshops, expectations focused on learning something new, gaining practical experience with digital fabrication and enjoying collaborative work. Post-workshop comments were predominantly positive. Participants most frequently highlighted 3D printing and modelling, followed by laser cutting, the robot activity or final race and the support provided by the trainer.

The open-response analysis identified approximately 15 positive references to 3D printing or modelling, six to laser cutting, five to robot activities and five to the trainer or supportive atmosphere. Approximately three comments identified programming as the area where additional guidance would be most helpful, while two requests for more time or practice indicate interest in deeper engagement. Together, the comments reinforce the quantitative finding that hands-on fabrication produced particularly strong confidence gains.

6.3 Instructor observations

Practical tasks generated strong engagement and made progress visible. Clear demonstrations and close facilitator support helped participants approach unfamiliar equipment with confidence. Combining several technologies around one shared prototype gave the workshop coherence and encouraged teams to distribute responsibilities.

Repeated delivery enabled Happylab to identify practical optimisation opportunities. Pre-checking wheel alignment and wiring can further increase productive workshop time, while optional sensors are most effective when introduced after participants have mastered the core robot functions. The experience also confirmed the value of differentiated programming support, staged challenges and flexible time for design and experimentation. These implementation insights have been translated into concrete recommendations for future delivery and toolkit transfer.

6.4 Impact on skills development

The combined evidence indicates substantial perceived development in practical digital-fabrication skills and increased confidence in approaching unfamiliar technologies. The programme was particularly effective as an entry point: participants moved from limited prior experience to completing a connected workflow involving design, fabrication, assembly, programming and testing.

Transversal development was visible through team-based planning, shared problem-solving, iterative testing and final demonstrations. Because teamwork started at a high self-assessed level, its quantitative change was small, but it remained a central mechanism through which the technical learning occurred.

6.5 Effective assessment tools

The most effective assessment arrangement combined a short harmonised pre/post survey with observation of practical work and a final prototype demonstration. The survey made perceived progress visible, while the practical output showed whether participants could apply the workflow collaboratively. Open comments provided actionable information about pacing, facilitation and participant preferences.

The pilot confirmed the value of retaining the same seven items and five-point scale across all groups. Future evidence can be strengthened further through a stable anonymous participant code that enables paired analysis without collecting unnecessary personal data. A short facilitator observation checklist covering safe tool use, task completion, debugging, collaboration and prototype functionality would complement the already effective mixed-method assessment approach.



7. Best Practices and Implementation Learning

7.1 What worked well

- A tangible shared project connected several technologies into one coherent learning journey.
- Immediate hands-on application reduced barriers and increased motivation.
- Small groups enabled close support and rapid troubleshooting.
- The three-day format was compatible with apprenticeship and company schedules.
- Repeated delivery showed that the same core programme can serve different vocational backgrounds.
- Final challenges and demonstrations gave participants a visible sense of achievement.
- Direct cooperation with training organisations supported recruitment and practical relevance.

7.2 Implementation insights

- Tiered programming support can make the format even more accessible to participants with different starting levels.
- Standardised equipment checks can maximise productive practical time and support smooth testing.
- Advanced sensors work best as optional extensions after participants have completed the core functionality.
- Requests for additional time suggest interest in deeper CAD work, experimentation and follow-up activities.
- Anonymous matching codes offer an opportunity to add individual-level analysis to the existing programme-level evidence.

7.3 Recommendations for scaling and transfer

- Use a standard preparation and function-check list for every robot kit.
- Provide tiered programming exercises with tested starter code and visual challenge cards.
- Provide flexible opportunities for individual design and repeated practical trials.
- Offer optional follow-up or advanced modules for interested participants.
- Use identical assessment items and anonymous matching codes in every run.
- Consolidate all facilitator files and troubleshooting guidance into one transferable package.

8. Stakeholders Report

8.1 Stakeholder involvement

The programme was embedded in vocational practice through cooperation with Wiener Linien, Jugend am Werk and A1. These organisations provided apprentice groups and enabled the Pilot Runs to be integrated into existing training schedules. Their participation demonstrated demand for compact external learning experiences that complement company- or provider-based apprenticeship training.

A stakeholder exchange with the Federation of Austrian Industries (Industriellenvereinigung) took place on **Apr 1, 2026**. The discussion explored further use of the DiSTT pilot with Viennese industrial companies and possible later expansion. Three application areas were identified: project-based formats supporting recruitment and apprenticeship selection; a longer accompanying programme during apprenticeships; and



a makerspace offer for employees to explore technologies, collaborate across disciplines and prototype ideas.

The Industriellenvereinigung discussion also highlighted the value of presenting Wiener Linien, Jugend am Werk and A1 as practical examples, adapting future offers to individual company needs and inviting industrial companies to Happylab for further exchange. The exchange identified an opportunity to offer both advanced formats for digitally interested participants and accessible entry formats that build confidence among learners with less prior exposure.

Happylab also held a dedicated stakeholder meeting with Jugend am Werk, represented by Desiree Müller and Milan Barac. The meeting complemented the ongoing cooperation around participant recruitment and pilot implementation and formed part of the stakeholder dialogue on the programme's future use. As a concrete follow-up, Happylab prepared an offer for a further three-day workshop for apprentices and trainers. The offer also included an optional discounted annual group membership designed to support continued access to digital fabrication equipment, independent practice and integration into regular training activities.

8.2 Regional and EU relevance

At regional level, the programme connects Vienna's makerspace infrastructure with apprenticeship providers and large employers. It offers a low-threshold environment where young people can encounter digital manufacturing outside the constraints of a formal examination setting. The format can support vocational orientation, modern apprenticeship training and confidence in relation to technological change.

At EU level, the programme responds to the need for accessible digital upskilling, practical STEM learning and stronger cooperation between non-formal learning environments and employers. Its compact design, modest prerequisites and modular exercises make it transferable to other FabLabs, training centres and vocational systems, provided that suitable equipment and facilitator competence are available.

8.3 Key recommendations for policymakers and innovation stakeholders

- Support partnerships between vocational-training organisations, employers and open digital-fabrication facilities.
- Fund practical introductory programmes that allow learners to test several connected technologies.
- Recognise makerspaces as complementary learning environments within regional skills ecosystems.
- Enable modular progression from introductory workshops to advanced technical specialisation.
- Combine technical training with teamwork, problem-solving and confidence-building.
- Encourage common evaluation instruments that allow programmes to improve while protecting participant data.

9. Conclusion and Next Steps

PP3 Happylab successfully implemented nine Pilot Runs of Digital Tools in Vocational Training: Empowering Tomorrow's Workforce, reaching 67 participants. The programme generated consistent evidence of increased self-reported competence, particularly in laser cutting, 3D printing, 3D modelling and robotics. Participants valued the practical tasks, tangible outcomes and supportive learning environment.



The repeated format provided strong evidence of transferability. It showed that a common three-day learning design can serve different apprenticeship groups while being adapted through pacing, support and optional extensions. Further development can build on this success through differentiated programming support, standardised equipment preparation and optional additional time for experimentation.

9.1 Further development and scaling

Future versions can build on the successful robot-project structure by providing differentiated entry points. A short diagnostic survey can support team composition and targeted facilitation. Pre-checked core components, progressively structured programming challenges and clearly signposted optional advanced tasks will make the format even more accessible and efficient. Where organisational conditions allow, a follow-up day or advanced module can help interested participants deepen CAD, programming and independent project work.

9.2 Inputs for further implementation (A3.3)

The PP3 Pilot Runs contribute a tested workshop concept, learning outcomes, a three-day schedule, instructional resources, equipment requirements, assessment questions, evaluation results and implementation lessons for further DiSTT activities. These elements can be incorporated into the Digital Skills Transformation Toolkit as a reusable model for introductory digital-fabrication training in vocational contexts.

For transfer, the toolkit entry should contain the facilitator presentation, participant worksheets, CAD and laser-cutting templates, Calliope starter code, robot assembly instructions, equipment and safety checklists, tiered challenge cards, the harmonised seven-item survey and a short observation rubric. Guidance should explain which elements are essential and which may be adapted to local equipment, learner profiles and available time.

The stakeholder discussions point toward continued development with apprenticeship providers and industrial companies. Potential routes include repeat delivery of the compact programme, longer apprenticeship-accompanying modules, recruitment-oriented project formats and makerspace-based employee training. Further uptake should preserve the programme's central strength: learning digital technologies through practical creation, collaborative problem-solving and visible results.