

# Report 3

## Successful adoption of mobile technology in practice-based learning



Digitalization in learning practice placement



Co-funded by the European Union





## Title: Report 3. Successful adoption of mobile technology in practice-based learning

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The 4D project is an EC-funded project (February 2022 to February 2025) to introduce mobile technology in practice placements, creating a bridge between the different actors involved learning contexts to foster the best experience in practice-based learning in healthcare settings. Our multidisciplinary team uses qualitative, quantitative and designs methods in order to help European Universities that are interested in introducing mobile applications in practice placements to design the best mobile app proposals based on the different actors involved (students, clinical and academic tutors, managers, and others) from different contexts (universities and centers of practices).

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Find out more: <https://4d.tecnocampus.cat/>

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## Executive Summary

This report summarises the results of work package 3 called “Co-creation and co-design to determine the key components of the App (LTB) in practice-based learning”.

Students, clinical tutors, academic assessor, link teachers and managers are just a few of the stakeholders involved in the learning process in clinical practice placements. Throughout this complicated process, tasks and mentorships must be carried out in a way that is coordinated with educational and clinical processes and entrenched in the appropriate contexts.

In this regard, WP3 was responsible for defining and conducting co-creation and co-design activities to determine with all project partners key components and features of possible mobile application(s). The goal of these applications is to support all involved stakeholders in practice-based student learning from different perspectives. In this regard the objectives of WP3 were defined in the proposal as follows:

- ❖ Introduce co-design and co-creation as a method to ensure participants’ ongoing active participation in the design process of educational innovations, which involve technology as critical support for practice placements.
- ❖ Focus on user-centred methods and scenario-based design processes to increase the usability of designs in practice learning contexts.
- ❖ Advocate for learner-centred design in workplace learning to motivate students to use mobile learning in practice settings.
- ❖ Develop mobile workplace learning technology reflecting users’ core values and needs to promote successful adoption in practice placements.
- ❖ Trace the co-design and co-creation process in design trajectories including all generated design artefacts to allow the uptake of insights beyond their instantiation in our designs.
- ❖ Provide a recommendations toolkit to ensure the introduction of mobile technology in different scenarios in higher education in the EU countries: 'A toolkit to introduce mobile technology in practice placements in higher education in the EU countries'.

The whole co-creation and co-design process was conducted with all project partners and relevant stakeholders to ensure a high fit of the designed mobile technologies to students’ learning at practice placements. The process encompasses altogether 7 different steps (described below) applying different design methods and tools such as the university innovation canvas (based on the business model canvas) that was used as an overarching tool throughout the whole design process. Additionally, we used different other tools in the co-design process such as the value proposition canvas, personas, scenarios, user journeys and mock-up development. The co-design process resulted in the following three trajectories:

- ❖ **Trajectory 1:** Onboarding, communication, and documentation - This trajectory was designed to offer onboarding material and documentation as well as communication opportunities for contacting the right persons.
- ❖ **Trajectory 2:** Reflective Practice and Feedback - This trajectory was designed to provide a mini-guide in a mobile application for giving/receiving feedback and to reflect individually or collaboratively about the learning activities and tasks.
- ❖ **Trajectory 3:** Assessment and Learning Goals - This trajectory was designed to present well-formulated learning goals related to the corresponding curriculum of the practice placement.

All three trajectories were implemented by using two applications - the Learning Toolbox (<https://ltb.io/eposters/>) and the prototypical Learning Goal Widget (<https://4dhostings.tecnocampus.cat>) together with the design trajectories, the recommendations toolkit ensures that our insights gained and tools used in the 4D project can be applied to introduce mobile technology in different scenarios and contexts.



# 1. Introduction

This report summarises the results of work package 3 called “Co-creation and co-design to determine the key components of the App (LTB) in practice-based learning”.

Students, clinical tutors, academic assessor, link teachers and managers are just a few of the stakeholders involved in the learning process in clinical practice placements. Throughout this **complicated learning process, tasks and mentorships must be carried out in a way that is coordinated with educational and clinical processes and entrenched in the appropriate contexts.**

Only a support structure that synchronises processes and respective communication across university and placement context can help to overcome existing learning problems and promote meaningful learning for students and appropriate care in the placement organisations. The “4D” Project, which stands for “Determinants, Design, Digitalization, and Dissemination”, aims to close this gap by creating a unique and tailored mobile application (app) for each participant organisation's students, tutors, supervisors, and teachers using practice-based reflective learning, mobile technology, and technology adoption.

In this regard, **WP3 was responsible for defining and conducting co-creation and co-design activities** to determine with all project partners key components or features of possible design and **develop the respective mobile application(s)**. The goal of these applications is to support all involved stakeholders in practice-based learning from different perspectives. The whole co-creation and co-design process was conducted with all project partners and relevant stakeholders to ensure that the developed results reflect the users’ core values and needs. In this regard the objectives of WP3 were defined in the proposal as follows:

- ❖ Introduce co-design and co-creation as a method to ensure participants’ ongoing active participation in the design process of educational innovations, which involve technology as critical support for practice placements.
- ❖ Focus on user-centred methods and scenario-based design processes to increase the usability of designs in practice learning contexts.
- ❖ Advocate for learner-centred design in workplace learning to motivate students to use mobile learning in practice settings.
- ❖ Develop mobile workplace learning technology reflecting users’ core values and needs to promote successful adoption in practice placements.
- ❖ Trace the co-design and co-creation process in design trajectories including all generated design artefacts to allow the uptake of insights beyond their instantiation in our designs.
- ❖ Provide a recommendations toolkit to ensure the introduction of mobile technology in different scenarios in higher education in the EU countries: ‘A toolkit to introduce mobile technology in practice placements in higher education in the EU countries’.

The **co-creation and co-design process encompasses altogether 7 different steps applying different methods and tools**. As an overarching tool that accompanied the whole co-design and co-creation process, we used the 4D innovation canvas (Step 1, 3 and 7) which explains the main factors of promoting digital transformation and sustainable innovation. We used this canvas three times during the co-design process: as a starting point, to elicit first ideas in the beginning of the process; in the middle of the process to align and streamline three emerging trajectories, and to consolidate all findings at the end of the process. Additionally, we used the value proposition canvas (step 2) to concretise several identified topics (in step 1) and that resulted in three different trajectories that were pursued throughout the rest of the co-design process. We used personas, scenarios (step 4), user journeys (step 5) and mock-ups (step 6) to develop concrete features, functions, stereotypes, look & feel etc. for all three trajectories

**The co-design and co-creation process resulted in three design trajectories that are summarised in the following and detailed in the later parts of this report:**

- ❖ **Trajectory 1: Onboarding, communication, and documentation:** This trajectory was pursued to design and use an existing mobile application for *providing onboarding material and documentation as well as offering communication opportunities in the practice placements* for contacting the right persons. From the perspective of a practicum's manager, the app should offer onboarding information so that the manager knows, which documentation, requirements etc. needs to be fulfilled by the students that got a respective practicum at the hospital or healthcare centre. From the students' perspective, the app should give him/her all information about the onboarding process, welcoming day, and other relevant information about the practice placement and the respective hospital. Additionally, the app should provide him/her communication possibilities to be able to contact the right person for respective issues or questions. This trajectory was implemented with the help of the Learning Toolbox (LTB).
- ❖ **Trajectory 2: Reflective Practice and Feedback:** The goal of this trajectory is to provide a *mini guide in a mobile application for giving/receiving feedback and to reflect individually or collaboratively about the learning activities and tasks*. From the clinical mentor's perspective, the app should provide a mini-guide on how to give feedback to his/her students in a positive and constructive way, additionally it should provide a guideline on how to be able to reflect with the students together about their learning activities. From the student's perspective, the app should present him/her the feedback and allow him/her to react to it. Regarding reflection, the app should provide him/her with a mini-guide to reflect on the clinical practice with peers or the academic assessor and link teacher in a seminar including the received feedback from the clinical mentor. This trajectory was implemented with the help of the "Learning Toolbox" (LTB).
- ❖ **Trajectory 3: Assessment and Learning Goals:** This trajectory was pursued to *support communication and coordination across university and placement context, and all involved stakeholders, with well-designed learning goals, structured learning contents and synchronised assessments*. The designed mobile application for practice placements presents well-formulated learning goals related to the corresponding curriculum. For each learning goal there will be added a detailed description about the learning activities, assessment criteria, and additional links. Clinical mentors and students should use the app likewise, mentors to know what they have to teach their students, and students to know what they have to learn in the practice placement. Additionally, the app provides the possibility to assess the learning progress - from the perspective of the clinical mentor, s/he can assess the students' performance, from the students' perspective, they can rate their own subjective learning progress. This trajectory was implemented with a newly developed prototype called "Learning Goal Widget" (LGW).

Finally, we have developed a **recommendations toolkit to ensure that our insights gained, and tools used in the 4D project can be applied to introduce mobile technology in different scenarios and contexts**. To do so, we have used the Learning Toolbox to offer audiovisuals, education and training material, infographics related to the introduction of mobile technology in practice placements. This material is accessible (web platform or smartphone) for students, healthcare professionals, and third parties interested. It can be found at: <https://api.ltb.io/show/ABYDG>

This report is structured as follows: Section 1 has outlined the work conducted in WP3, including the co-design process and the corresponding results in the form of the three different trajectories. Section 2 presents the background literature relevant for the work of WP3. Section 3 presents the two results. The first result is a collection and description of different methods and tools used in the co-creation and co-design process. The second result describes the methodology applied, including all 7 steps





conducted and which tool or method was used to extract and collect which type of information. In Section 4, we describe the three trajectories including how they were developed in all 7 steps of the co-design process as well as their implementation and realisation. Section 5 reports the main findings and conclusions of relevance for future research. In the appendices we present mostly figures showing the different steps and corresponding results.

*In clinical practice placements, learning processes, tasks and mentorships must be carried out in a way that it is coordinated with educational and clinical processes and entrenched in the appropriate contexts.*



## 2. Background

### 2.1. Design based research and collaborative design process (Co-Design)

The application of participatory design methodologies has become commonplace in recent years as awareness of collaborative means of innovation has grown (Sanders & Stappers, 2008). Design-based research (DBR) is the foundation of our participatory research for iteratively developing Technology-Enhanced Learning (TEL) applications (DBRC, 2003; Dennerlein, Tomberg, et al., 2020; Fessl et al., 2020; Wang & Hannafin, 2005). DBR follows several goals in parallel, namely (i) to build upon and develop scientific theory, (ii) to design (technical) interventions, and (iii) to address stakeholder demands. This way, real-world (educational) issues are approached in a collaborative, evidence-based, contextualised research process.

DBR breaks down a complicated problem in several more tangible steps, so-called design iterations, and follows a design-build-revise logic from the initial design idea to a product that is ready to use (Dennerlein, Tomberg, et al., 2020; March & Smith, 1995). Through these design-build-revise cycles, designers can advance the underlying practice, obtain theoretical understanding, and continuously develop the design artefact in partnership with their stakeholders. The iterative and collaborative design process aims at increasing the chance of incorporating new TEL applications into working and learning practices, whilst decreasing the chance of wasting time and resources by following wrong assumptions (Dennerlein, Tomberg, et al., 2020; Kensing & Blomberg, 1998). This is supported by promoting the direct collaboration of designers with their customers, i.e. the users who will be utilising the designed product (Bødker & Grønbaek, 1991).

In order to guarantee that the product of the design process fits practice, DBR attempts to actively involve all pertinent stakeholders in a collaborative design process (Kensing & Blomberg, 1998). Co-design thereby specifically refers to the design process that centres each design iteration on the users and their needs and emphasises the significance of collaboration with all relevant stakeholders alongside the complete design trajectory (Durall Gazulla et al., 2020). To enhance the likelihood of a successful adoption in each of the four practice placements, we report on a co-design process that involved all pertinent stakeholders from the 4D project partners in the development of the new mobile applications.

### 2.2. Reflective Learning

The power of reflective learning is in enhancing personal and professional development. Reflective learning is a transformative process that enables students and professionals to gain deeper insights into their experiences, fostering personal and professional growth. Reflective learning is a deliberate and systematic process of examining and interpreting one's experiences, thoughts, and actions. It involves critical thinking and self-awareness, aiming to gain a deeper understanding of past experiences and how they inform future decisions and actions (Boyd, 1983; Baker, 1996; Bourner, 2003; Brockbank, 2007). This introspective approach encourages individuals to explore the why and how of their experiences, rather than simply recalling what occurred (Barbagallo, 2019; Schooler, 2004; Thorpe, 2004).

Reflective learning, with its foundation in key principles such as metacognition, continuous improvement, self-awareness, and critical thinking, fosters personal and professional growth. At its core, metacognition empowers learners to explore their cognitive processes, undertaking a thorough examination of their thoughts, assumptions, and biases, thus gaining valuable insights into how these mental processes shape their learning experiences (Lai, 2011; Anderson, 2017). Furthermore, reflective learning embodies an enduring journey marked by a commitment to continuous improvement. This journey encourages learners to proactively seek opportunities for growth,

learning from both their successes and failures, and ensuring that their educational activities remain dynamic and adaptable in front of the practice placement challenges in healthcare settings.

Additionally, self-awareness serves as a foundational pillar of reflective learning. It requires an honest self-assessment, prompting learners to self-evaluate their strengths, weaknesses, values, and beliefs. This self-evaluation leads to a profound understanding of oneself, fostering personal growth and self-realization. Simultaneously, critical thinking is another integral component of reflective learning, entailing the ability to evaluate information, ideas, and experiences from diverse perspectives. Engaging in critical thinking empowers learners to make well-informed decisions and navigate complex problems correctly (Rutkowski, 2007; Bassot, 2015; Chesser-Smyth, 2005).

In higher education, educators recognize the significance of reflective learning and feedback in practice placements (Carless, 2011; Calkins, 2009). These principles not only enhance the learning experience but also prepare students for the challenges they will encounter in their practice placements as a professional journey.

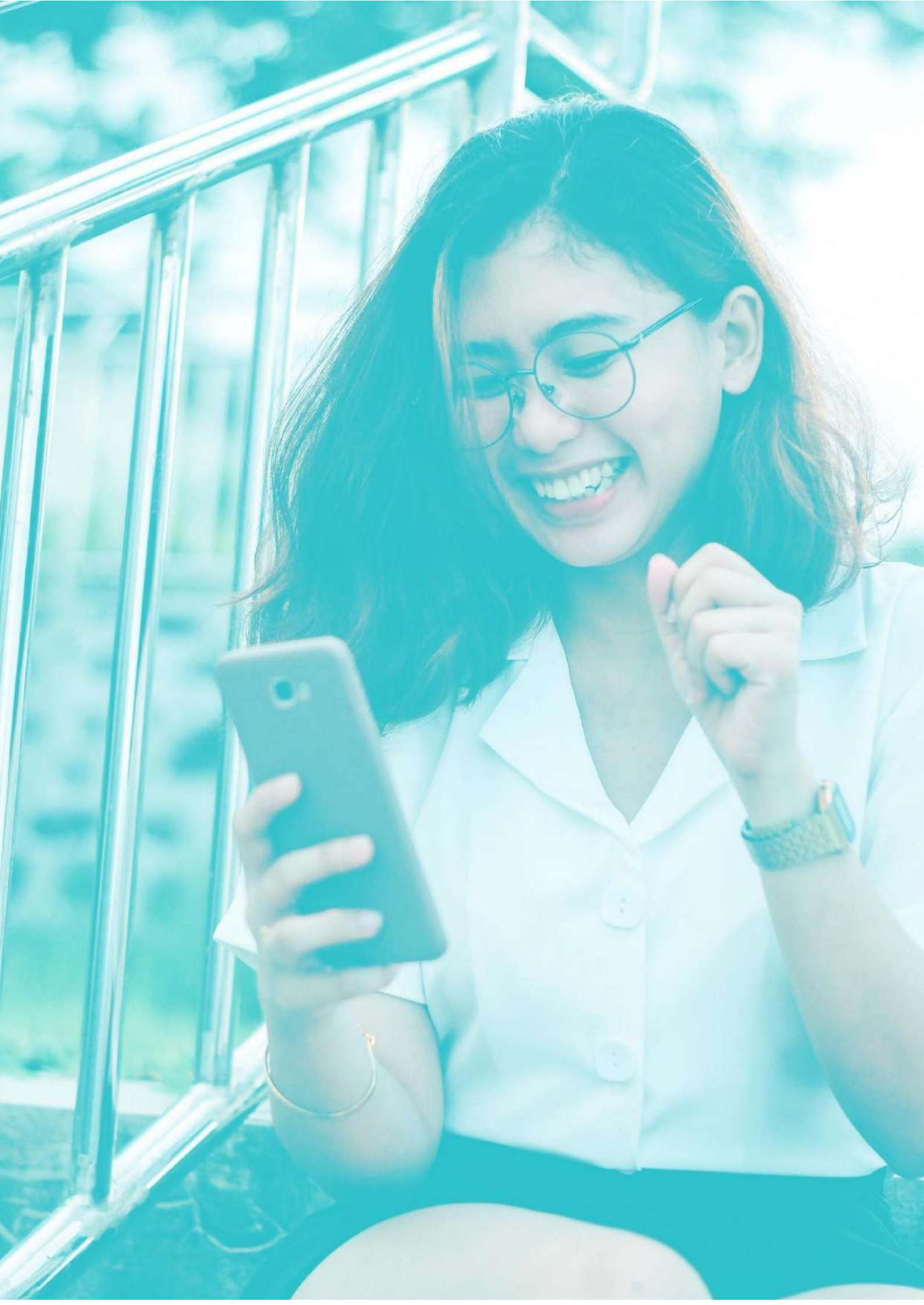
### **2.3. Learning Goals**

"Instructional design" offers direction for planning teaching procedures, developing learning materials, providing learning opportunities, and assessing effectiveness. Thus, a lot relies on how learning outcomes—also known as learning goals—are defined (Marzano, 2010; Stronge, 2018; Gagne & Lesslie, 1992; Gagne et al., 2005). These goals specify what a student ought to be able to accomplish following a learning opportunity, such as a college course or learning in a more self-directed manner (Bloom, 1956; Krathwohl & Anderson, 2010; Mager, 1962).

Higher education instructors usually view learning objectives as an essential part of their courses and as a starting point for student evaluation (Fessler et al., 2021; Gulga et al., 2013; Fulkerth, 2009; Towns, 2010). For the formulation of learning goals, there are many taxonomies and guidelines available (e.g. Bloom, 1956; Krathwohl & Anderson, 2010; Mager, 1962; DeLong et al., 2005). Learning objectives in higher education are frequently of low quality despite the existence of taxonomies (Fulkerth, 2009; Hadwin & Webster, 2013; Fessler et al., 2021). A plausible reason lies in the intricate nature of taxonomies, rendering them difficult to implement for educators with minimal or no experience in didactics and instructional design. Thus, setting effective and efficient learning goals can be difficult, and organising and preparing a course requires a lot of work from teachers (DeLong et al., 2005).

Determining and establishing learning goals is regarded as a critical component of good teaching in higher education (Marzano, 2010; Stronge, 2018; Casey, 1997). Pre-established learning goals help students understand what is expected of them and what they need to learn (DeLong et al., 2005). Learning goals also encourage self-regulated students to strategically approach their academic assignments and make appropriate adjustments in order to help them acquire the knowledge and skills needed (McCardle et al., 2017 based on Winnie & Hadwin, 1998). Thus, learning goals serve the regulation of the learning process and are critical to self-regulation (ibid). This is in line with Hadwin and Webster's (2013) assertion that learning goals serve as personal benchmarks by which students can assess themselves in their continuous learning cycles. Goal orientation and (self-set) achievement goals may as a facilitator for self-regulated learning and related success (Zhou and Winne, 2012).

Only exact, understandable, and attainable learning goals can be meaningful to both teachers and students. Clearly defined learning goals, according to McCardle et al. (2017), offer teachers guidance in the selection of learning contents and the development of student assessment. Students, on the other hand, view learning goals as a template for their learning activity and a reference point for assessing their progress, which allows them to act if they feel that they are not on track in terms of their academic ambitions (Winne & Jamieson-Noel, 2003).



### 3. Result: Methodology

In WP3, we have achieved two major results. The first result is related to the overall methodology applied throughout the whole co-design process. This result consists of two parts: Part 1 is our “Mini-Book” in which we have collected a set of methods and tools we used for our co-design activities. Part 2 is the whole co-design procedure in which we applied these methods and tools throughout the three co-design trajectories during WP3 runtime. Therefore, we will first present our Mini-Book (see Section 3.1) followed by the description of our applied overall procedure (see Section 3.2).

#### 3.1. Mini-Book

##### 3.1.1. Methods/Tools of Co-Design Activities

For co-creation / co-design processes, there exists a plethora of artefacts - methods and tools - that can be used to guide and facilitate a design process. These artefacts are ranging from simple reviews or observations of existing material, technologies and processes, over questionnaires and interviews to workshops with diverse participants, and applied methods, tools, or mock-ups, and prototypes (Kensing & Blomberg, 1998). For our work, we differentiate between artefacts that serve as overarching guidance for the whole design process like, for example, the university innovation canvas (Dennerlein, Pammer-Schindler, et al., 2020), and artefacts that are used in specific design steps like, for example, the value proposition canvas (VPC), personas, scenarios, user journeys or mock-ups, to name only a few of them.

In the following we will present those methods/tools that we have used in the design process of our mobile learning applications for the project’s practice placements.

##### 3.1.2. University Innovation Canvas (UIC)

The university innovation canvas (UIC) (see Figure 1) is inspired by the business model canvas developed by Osterwalder and Pigneur (Osterwalder et al., 2010) and the lean canvas by (Maurya, 2012). The overarching goal of the business model canvas is to investigate how to create value for businesses. In analogy, the University Innovation Canvas (Dennerlein, Pammer-Schindler, et al., 2020) supports reflection on how “value” is created in a university setting.

The 4D Innovation Canvas (4DIC) is derived from the UIC and specified for the 4D project context for their twofold context, namely the one of the universities and the one of the placements. During the co-design of researchers and stakeholders, the 4DIC serves as a means for the continuous collaboration in and monitoring of the design of the innovations/ pilots. They iterated versions of the 4DIC provide an overview of their addressed problems and added value (also informed by WP2) as well as key issues and requirements in their implementation. They support the embedding of the innovation in the practice placements from the very beginning. In addition, the 4DIC is the basis for exchange and communication with WP3.

The 4DIC supports in

- ❖ Identifying problems in focus and the value the innovation/ pilot should provide (What is the added value?)
- ❖ Identifying relevant stakeholders (Who will benefit from the innovation/pilot?).
- ❖ Identifying resources needed (Who do we need support from?)
- ❖ Identifying barriers and promoters of sustainable innovations (How to arrive at sustainable solutions?)
- ❖ Goal of the 4DIC
- ❖ Support in the collaborative innovation process: visualisation and monitoring of key points.

- ❖ Tracking changes over the life of the project (learning from problems, explaining why something changed from the original plan, incorporating feedback, etc.).
- ❖ Evaluation of the innovation process: where are gaps, what went well, what had to be changed and why?
- ❖ Disseminating the project: people get a quick overview of the project.

For adoption of the UIC for the 4DIC project, we needed to respect the contextualization of the designated mobile technology in the educational and organisational world that students are both residing in during their practice placements. Therefore, we split elements of the canvas into the two relevant contexts of the project, i.e. the university context and the practice placement context, to specify the problems that shall be addressed or the value that shall be created (value proposition) for both. For example, have a look at Figure 1 in the field called “Addressed Problem(s)” or “Value Proposition”.

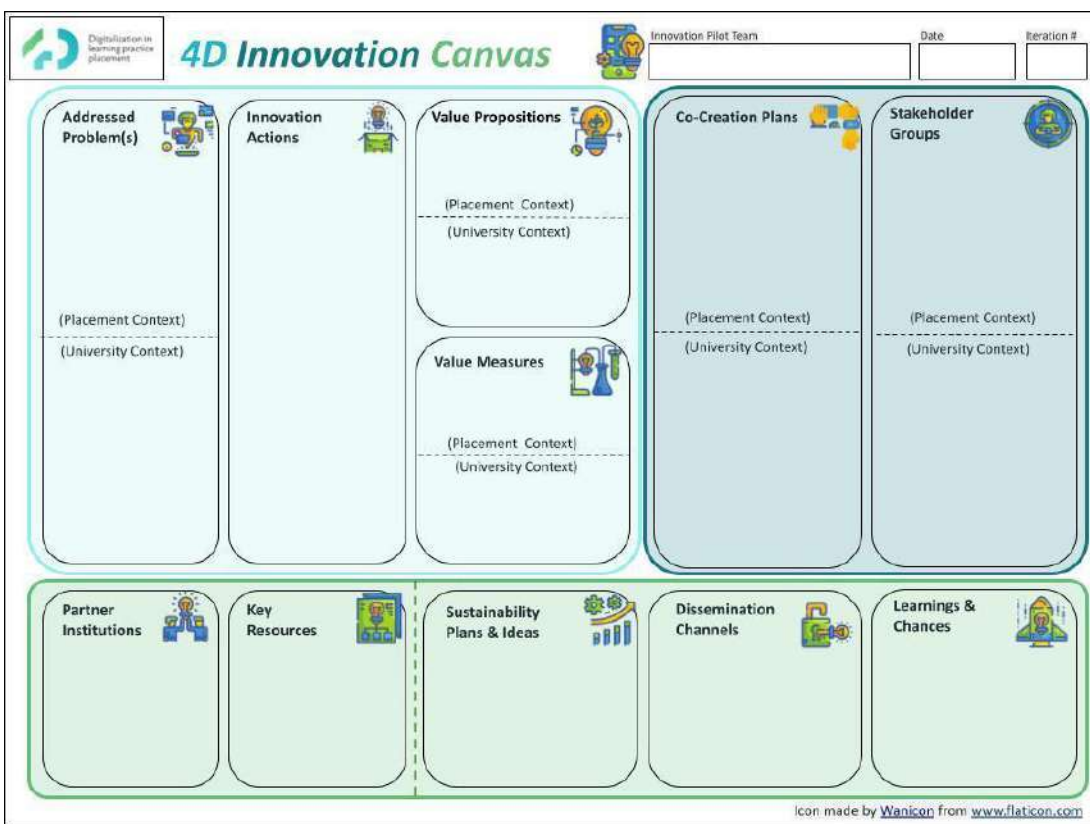


Figure 1: University Innovation Canvas

The UIC consists of eleven elements divided into three dimensions, the technology-enhanced learning concept (Value Creation), stakeholder relationships (Value Delivery), and foundation and scaling (Value Capture). The individual elements and dimensions of the canvas support possible stakeholders from the different contexts to sharpen their common focus and to reflect on important factors of the planned sustainable innovation regarding the improvement of the respective context.

The **Value Creation** dimension include the following five fields:

- ❖ **Addressed Problems:** One, two or three learning-related problem(s) that are addressed by the technologically enhanced didactic concept, should be mentioned.

- ❖ **Innovation Actions:** In order to be able to solve or improve the addressed problems with the TEL concept, a number of well thought out, clearly defined and definitive steps are necessary. These steps should be listed in the UIC.
- ❖ **Value Proposition:** Every TEL-innovation has a background or motivation, usually to solve a problem of students and/or teachers or to satisfy a particular wish or need. Every function of the innovation needs to (implicitly) contain this value proposition, e.g., to support motivation, interactivity, social relationships, efficiency or effectiveness, or improved usability. As a consequence of the innovative character of the learning/teaching scenario, more students and teachers can be addressed and motivated. Additionally, or as an alternative, the innovation could generate new data, information, and knowledge, or initiate new decisions or actions.
- ❖ **Value Measures:** Regular measuring and evaluating if an innovation meets its proposed value is beneficial for assessing the effectiveness of the innovation and taking necessary steps to adapt the process, should it be required. Choosing appropriate qualitative or quantitative methods and instruments to evaluate the innovation is essential for realising and fulfilling the proposed benefits.

The **Value Delivery** dimension include the following two fields:

- ❖ **Co-creation Plans:** Students and teachers will only use innovations that can actually generate benefits for them, e.g., regarding improvements in studying conditions. Thus, the stakeholders should not only be informed about the innovation, but actively integrated into the innovation process via co-creation formats. Co-creation also stays relevant in the implementation phase, to address upcoming problems, generate feedback, and find appropriate solutions.
- ❖ **Stakeholder Groups:** An innovation always strives to improve the learning and/or teaching process. Naturally, the central beneficiaries of the innovation are particular groups of students and/or teachers, e.g., the main body of students, niche groups, only students with particular seniority levels, skill sets, or disciplines. Furthermore, other stakeholders, e.g., the university administration, governance, or scientific body can be beneficiaries.

**Value Capture** ensembles the following five fields:

- ❖ **Partner Institutions:** For the realisation of the 4D project, it is essential to work closely together as a consortium with the company of the placement to be able to carry out the necessary steps. For example, partners' support might be helpful for measuring the value and effect of the innovation, making design-related decisions, and integrating the innovation into existing infrastructure at the place.
- ❖ **Key Resources:** Several types of resources are usually needed to design, develop, and implement innovation, e.g., expertise, finances, equipment, relationships, data, knowledge, etc.
- ❖ **Sustainability Plans & Ideas:** There are multiple ways of generating and sustaining value for the placement partners with an innovation. For example, innovations can be made accessible via implementation in the regular teaching infrastructure or by offering easily understandable guidelines, tutorials, and support for individual implementation in courses. Ensuring that an innovation is "Open Source", or at least that it is openly accessible at the placement partners after the end of the project are central steps for ensuring sustainability. If the innovation is centred around generating resources for teaching and/or learning, publishing those resources and materials as Open Educational Resources (OER, if possible, by copyright) can also greatly improve accessibility.
- ❖ **Dissemination Channels:** Students and teachers can only use what they know about, what they were recommended by colleagues or what is visibly available and accessible to them. For those reasons, stakeholders have to be informed about the innovation via different dissemination channels, where they can learn about the potentials and benefits of the innovation and how to use it. For the 4D Project, this means also to spread our innovation in corresponding conferences, journals, etc. to make the 4D project results visibly beyond the 4D consortium.



❖ **Learnings & Chances:** A collaborative innovation process between researchers, teachers and students can result in a multitude of conceptional, didactic and technological chances, e.g., identified barriers, new insights, and newly visible potentials. These chances can become relevant in the next iteration of the innovation and the 4D innovation canvas, after the project end, or after the implementation phase, and may even motivate a follow-up proposal. It is important to demonstrate these chances, in order to be able to take them at the right moment.

The categories and their respective key factors should be filled with content step by step, and reference to each other in a practical and coherent way. To achieve this, it can be helpful to follow these five steps in order:

- ❖ **Step 1:** From the addressed problems to the proposed benefits to the necessary steps of action:  
Addressed Problem(s) ► Value Propositions ► Innovation Actions.
- ❖ **Step 2:** From the proposed benefits to the validation with user groups during the innovation phase:  
Value Propositions ► Stakeholder Groups ► Co-Creation Plans.
- ❖ **Step 3:** From the addressed problems to the project partners and the necessary key resources for achieving the planned goals:  
Addressed Problem(s) ► Partner Institutions ► Key Resources ► Innovation Actions.
- ❖ **Step 4:** From the assessment of the proposed benefits to the validation with user groups during the implementation phase:  
Value Measures ► Stakeholder Groups ► Co-Creation Plans.
- ❖ **Step 5:** From plans and ideas for sustainability to dissemination strategies to further potentials:  
Sustainability Plans & Ideas ► Dissemination Channels ► Learnings & Chances.

### 3.1.3. Value Proposition Canvas

To specify the value proposition in a University Innovation Canvas and map it to possible technologies that are available for adoption, the value proposition canvas (VPC) (Osterwalder et al., 2015; Koole et al., 2018) is a viable means. It focuses on how to create value for all involved stakeholders (e.g., students, teachers, clinical mentors) and how the involved stakeholders can benefit from the expected learning intervention.

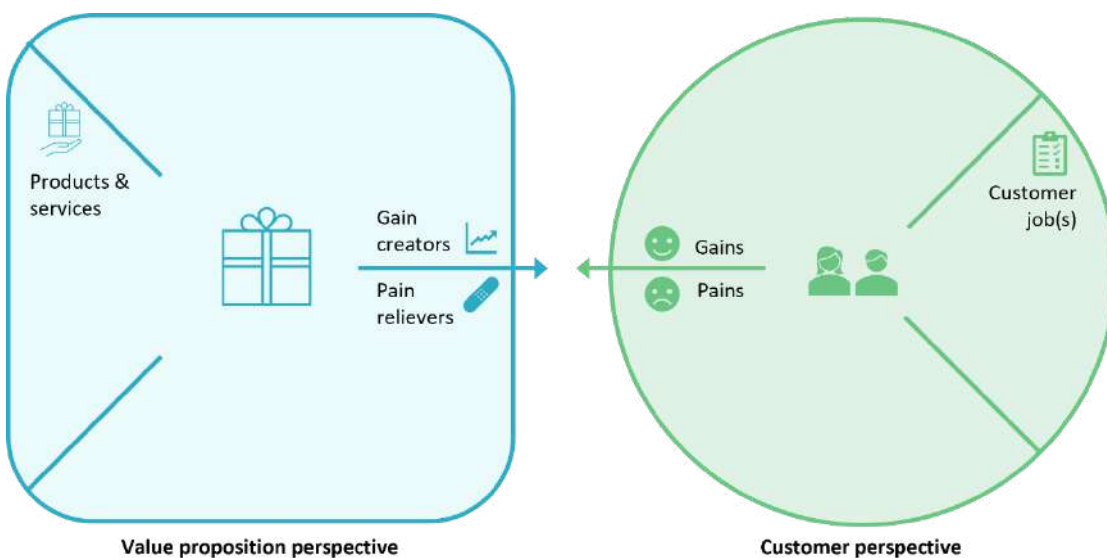


Figure 2: Value Proposition Canvas

Generally spoken, a value proposition describes the benefits a customer can expect from products and services. In 4D, a value proposition describes the benefits teachers, clinical mentors, or students

can expect from the learning intervention. The value proposition canvas shown in Figure 2 and the definitions below are based on Osterwalder et al. (2015).

The **customer** perspective (see Figure 2, right) consists of customer jobs, pains, and gains.

- ❖ **Customer Jobs:** They describe the things or tasks customers are trying to get done in their work or in their life. The questions to ask would be “What do our customers want when they use our product or service?” Relating the customer jobs to the target groups of the 4D project, we need to find which tasks could be supported – in relation to clinical nurses or students.
- ❖ **Pains:** While the customers perform their tasks, they face some difficulties, problems, or obstacles related to the tasks. The pain element deals with negative emotions that arise before / during or after the fulfilment of the customer jobs. These are problems, something that annoys the customer or where they get stuck. This can be anything from missing possibilities, complicated handling, high time expenditure, user unfriendliness or a flat learning curve because the product or service is too complicated. Besides these typical problems of usability, there can also be risk problems, such as trust. In relation to our setting, this could be the question of what happens with the data that is provided by the students or clinical mentors e.g., questions posed from student to clinical mentors, personal data.
- ❖ **Gains:** They describe the outcomes and benefits our customers would like to have. These are the things that make customers satisfied and happy. Thereby we differ between two levels of gains: Things our customers assume as a basic assumption which are those things the customers expects when they use our service. Then, those things they would love to have but maybe didn't expect. These can be things that make their jobs easier or eliminate annoying tasks and therefore makes the customers happy. In our example this could be information about the onboarding process in a new practice placement.

The **value proposition** perspective (see Figure 2, left) consists of products & services, gain creators and pain relievers.

- ❖ **Products & services:** They describe all products and services the value proposition is built around. In this segment all products or services are added that can be offered to the customers. For example, these could be some features that make it easier for study-beginners to orient themselves in the practice placement.
- ❖ **Pain relievers:** They describe how the products and services reduce/eliminate customer pains. These are all the things you do with the products or services to eliminate or reduce the customer pains identified before. For example, in our setting, if you design a localization app and the students are always annoyed that they can't find suitable places to study or don't know where and how to print things out, you offer them an app that combines outdoor and indoor localization. Then you've already reduced or eliminated this pain.
- ❖ **Gain creators:** They describe how the products and services create customer gains. These cover information where the product or service is strong. These gains help customers to fulfil the expectations previously described and where the app can even exceed the expectations of the users. In other words, a service that no one else has come up with before.

#### 3.1.4. Personas

Personas were introduced by Cooper (1999) as a goal-directed design tool. Personas represent a fictional individual or a group of users with similar behavioural characteristics (Adlin & Pruitt, John, 2010; Turner & Turner, 2011). Personas are often described in narrative form to make the person seem real and to provide needs of these individuals in the related context (Miaskiewicz & Kozar, 2011).

Personas are the purest representations of actual users. Personas are used in user experience (UX) design to focus on the reality of the target users and foster empathy with them. Personas should

never be created based on preconceived notions about your users; instead, they should always be developed from observations of actual users as well as with respective stakeholders.

**Advantages:** Personas allow the target user’s needs to be kept in mind throughout the whole design process. They serve as a tool to make quick decisions during the design process and constantly remind the designers or stakeholders that the result will be used by people.

**Disadvantage:** It is recommended to consequently update personas during the design process if important new information about the user and their needs is found.

For 4D, we developed a template (see Figure 3) that was used in the design workshops. To develop personas for each relevant target group, the following steps need to be taken.

- ❖ Step 1: Create a persona template (see Figure 3).
- ❖ Step 2: Collect information about the target-users that will be represented in the persona.
- ❖ Step 3: Identify behavioural patterns.
- ❖ Step 4: Create the persona together with all involved stakeholders.

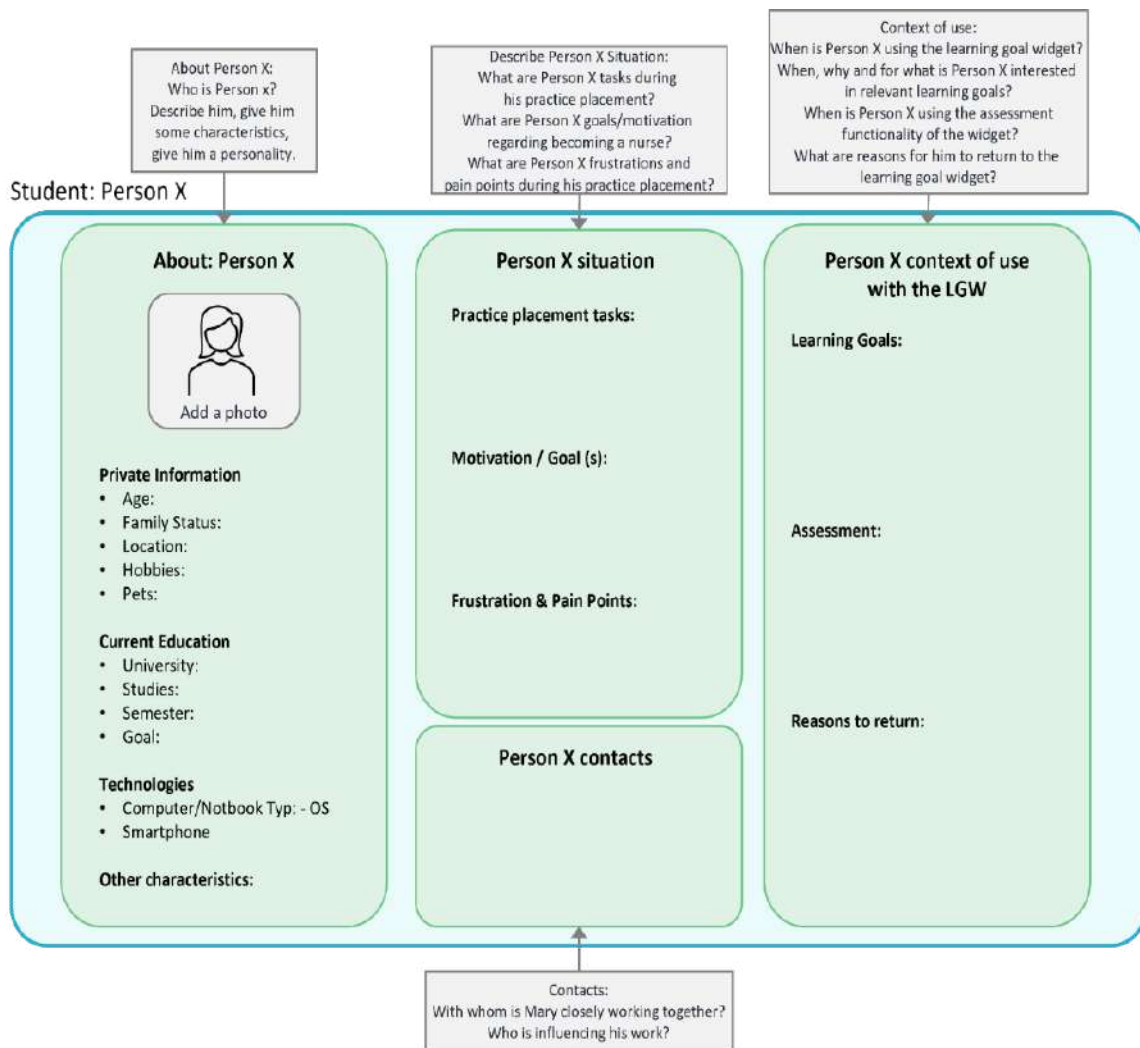


Figure 3: Template for developing a student persona in relation to the Learning Goal Widget.

### 3.1.5. Scenarios

Scenarios describe how an end-user will ideally use the developed technology or product in a narrative form (Cooper et al., 2014). Typically, scenarios are built upon personas and incorporate elements from the context of use where the interaction will occur. Cooper et al. (2014) distinguishes three types of scenarios: Context scenarios focus on how the system can respond to the user's needs. They are created before sketching a solution, so they give room for imagination. Key path scenarios are an evolution of the context scenarios and describe in detail the interaction between the user and the product. Validation scenarios propose different scenarios to test whether the product provides a solution to all needs or not.

**Advantages:** Scenarios allow the user's needs to be kept in mind throughout the design process. They help to better understand the user in their context. Additionally, they allow users to understand what users feel and contribute to how the product will be used.

**Disadvantages:** It is hardly possible to describe all the possibilities of interaction with the system. Additionally, it is recommended to update scenarios during the design process; if important new information about the user and their context is found.

Typically, scenarios closely related to previously developed personas. For example, Figure 4 presents a 'template' for a scenario referring to a previously developed persona and in context with the tool to be developed.

To develop scenarios for each relevant target group, the following steps need to be taken.

- ❖ Step 1: Understand the target user.
- ❖ Step 2: Put user details into context with all involved stakeholders.
- ❖ Step 3: Define the user's reasons for his/her activities, necessities, needs, etc.
- ❖ Step 4: Share and refine the scenario during the design process.
- ❖ Step 5: Compare / align the user scenario to the product.

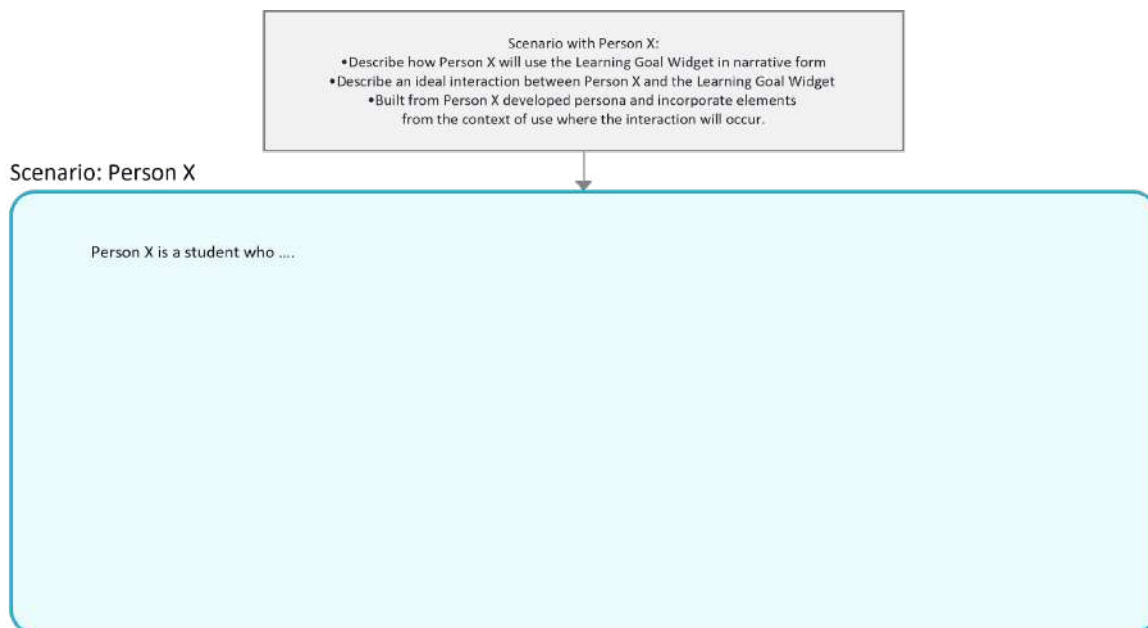


Figure 4: Template for developing a scenario.

### 3.1.6. User Journey

When having developed personas and scenarios, user journeys (Martin & Hanington, 2012) can be easily developed. User journeys show step by step the user’s interaction with the system and the emotions felt at each touchpoint. They show the interaction in a visual way and provide more details about the user’s emotions. Additionally, they help to determine which requirements the planned application or tool must have.

**Advantages:** User Journeys allow to empathise with the target users and their needs. They help to identify relevant elements and features of the interaction that are required by the new system or tool to be developed. Additionally, commonly developed user journeys contribute to all team members in that all involved actors have the same view on the context, interactions, and possibly tools.

**Disadvantage:** The development of a detailed user journey is time-consuming.

How a user journey template looks depends on the context and the information extracted in the personas and scenarios. For example, Figure 5 and 6 present both templates used for the development of the user journeys – one for the Learning Goal Widget (see Figure 5) and one for the Learning Toolbox (see Figure 6).

To develop scenarios for each relevant target group, the following steps need to be taken.

- ❖ Step 1: Create a template for the user journey.
- ❖ Step 2: Take the previous personas and scenarios into account.
- ❖ Step 3: Discuss possible interaction points of the target user with the newly developed system.
- ❖ Step 4: Create the user journey together with all involved stakeholders.

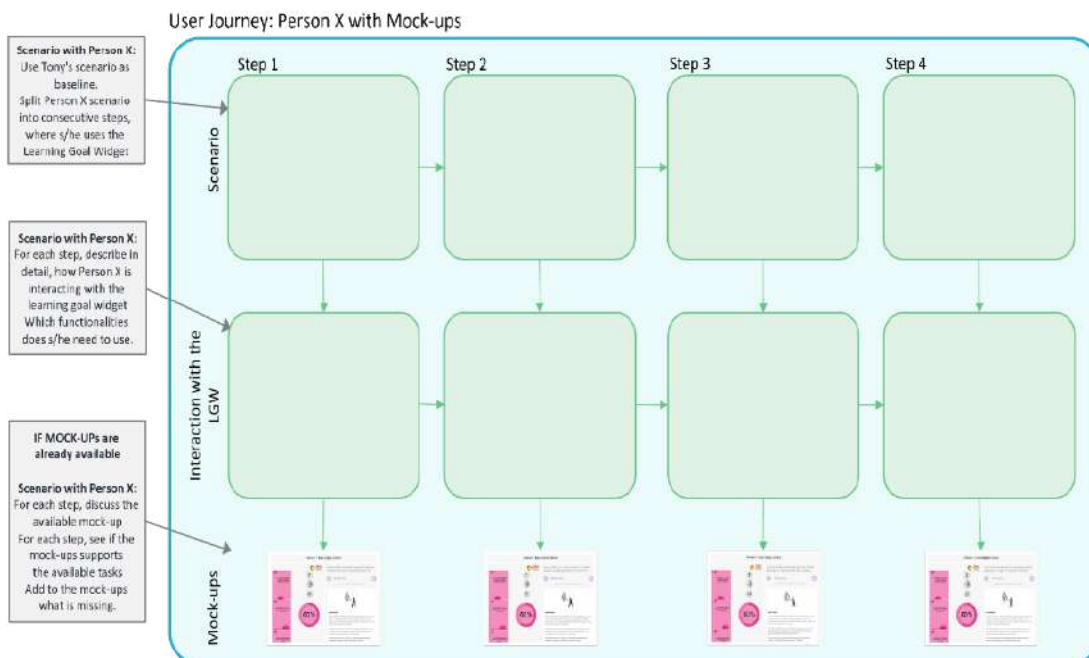


Figure 5: Template for developing the user journey for the learning goal widget.

User Journey: Person X with Mock-ups

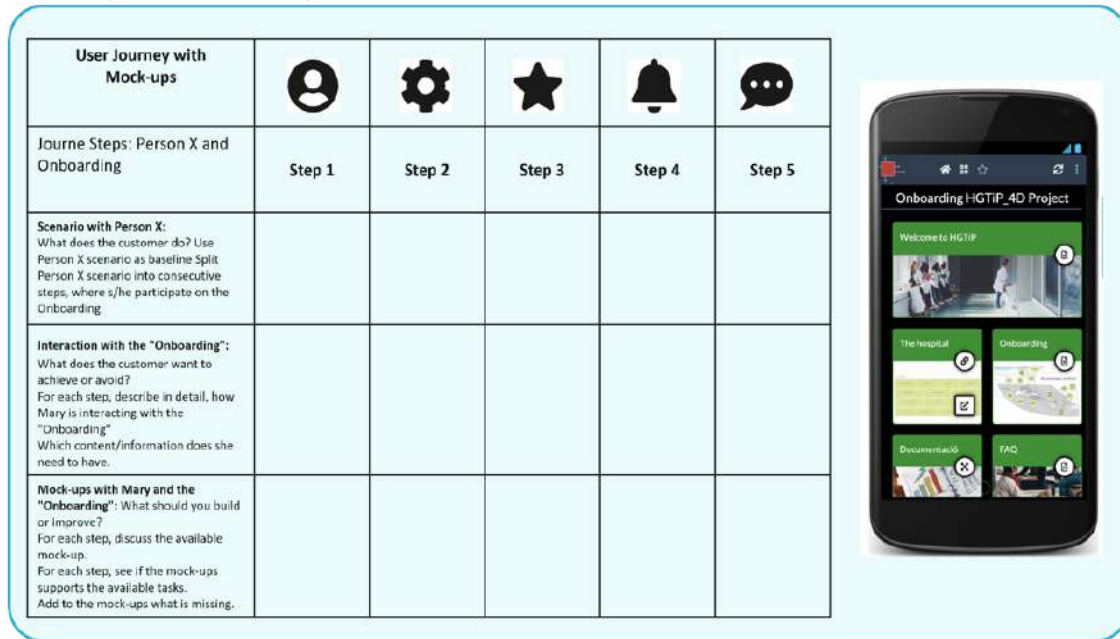


Figure 6: Template for developing the user journey for the learning toolbox.

### 3.1.7. Mock-ups

Mock-ups were used in industrial design, long before they were used in software design processes (Westerlund, 2009), and mid-1990s popular companies adopted paper prototyping in their product development process (Snyder, 2003). Already Floyd (1984) considered prototypes as a means of facilitating feedback and communication between software engineers and consumers while Ehn (1988) saw prototypes not only as a supportive tool for designers but also as a tool for allowing non-experts to participate in design processes. The purpose of cooperative prototyping (Bødker & Grønbaek, 1991) is to initiate a design process in which designers and users actively and creatively collaborate on a prototype and specifically provide users with the opportunity to try it out and play around with it. (Snyder 2003) confirmed that paper prototyping supports collaborative brainstorming, designing, and communication and (Pfister & Eppler, 2012) stated that sketching of prototypes supports knowledge creation and sharing.

There exists different types of prototypes or mock-ups, in our case we used paper-based mock-ups, meaning drawings created with PowerPoint showing how a possible mobile application could look like, as presented in Figure 7.

**Advantages:** Mock-ups could show on a high-level how a possible mobile application or software solution could look like. They typically show the main features and possible user interfaces of the main functionality. They help all stakeholders to get a common understanding of the tool.

**Disadvantages:** Not all in-depth functionalities could be shown in detail with paper-based mock-ups as this would be very time-consuming.

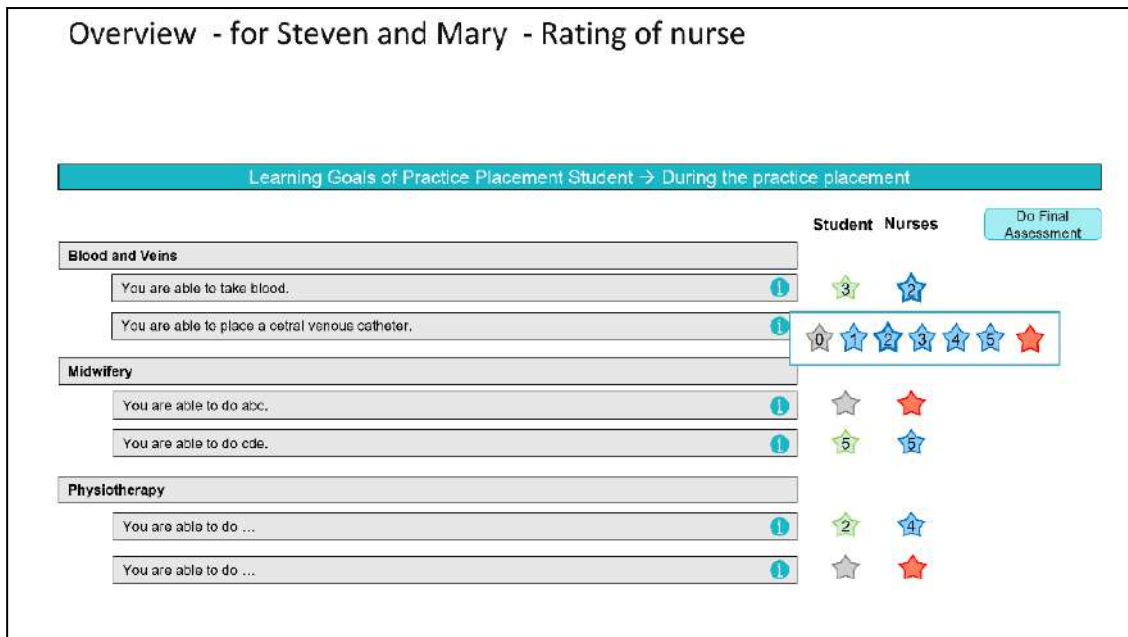


Figure 7: Mock-up presenting the Learning Goal Widget.

### 3.1.8. Glossary of Co-Design Terminology

This glossary (see Table 1) summarises relevant terms and definitions of co-design. We are aware that in literature there exists a plethora of definitions for most of the terms added to our glossary, however, we used those definitions of how we used, understand, and applied them in the context of the 4D project.

Table 1: Glossary

<b>Co-creation</b>	<p>“Co-creation is all about collaborative knowledge creation. It fosters both the rapid development and implementation of new ideas[.], but it also democratises the decision-making process.”</p>
	<p>(Treasure-Jones et al., 2020)</p>
<b>Co-design</b>	<p>Co-design is particularly referred to the design process that centres each design iteration on the users and their needs and stresses the importance of collaboration with all relevant stakeholders, to create and mature design ideas capable of impacting practice.</p>
	<p>(Durall Gazulla et al., 2020)</p>
<b>Co-design methods</b>	<p>“Co-design methods have a strong ethos of valuing and involving the experience, expertise, and creativity of all members [...] equally to those of the ‘formal’ product/content creators. [Their democratic approach fosters] creative thinking, while maintaining a view of real limitations.”</p>
	<p>(Treasure-Jones et al., 2020)</p>

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**Design-based research (DBR)**

DBR is characterised by bringing together (i) theoretical knowledge from science, (ii) the development of (technological) interventions, and (iii) stakeholder requirements and needs. This evidence-based, collaborative, and contextualised research methodology aims at addressing (educational) problems in practice.

*(DBRC, 2003; Dennerlein, Tomberg, et al., 2020; Fessler et al., 2020; Wang & Hannafin, 2005)*

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**Design iteration**

Design Iteration is one cycle of exploring (specifying requirements), designing (constructing the solution) and evaluating (analysing the performance of the design in practice) a technology enhanced learning solution.

*(McKenney & Reeves, 2018; Barab, 2014; Dennerlein et al., 2020)*

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**Design Workshop**

A design workshop is a meeting of two or more stakeholders who work together to create a design from scratch, to advance it, or to complete it. Typically, the workshop is guided by one or more facilitator(s), who suggests design methods and tools, who guide the discussions towards the intended workshop goal set at the beginning of the workshop.

*(4D Consortium)*

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**Mock-ups**

Mock-ups are representations of a (new) software, system, concept, or product that shows how the final result will look and feel. It is frequently used as a visual aid to describe the concept of the result from the perspective of the target-user.

*(4D Consortium)*

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**Participatory Design**

“Participatory design attempts to actively involve all stakeholders (e.g., employees, managers, partners, customers or end users) in the design process to ensure that the results meet the individual as well as organisational needs.”

*(Fessler et al., 2020)*

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**Personas**

“Personas consolidate archetypal descriptions of user behaviour patterns into representative profiles, to humanize design focus, test scenarios, and aid design communication.”

*(Cooper, 1999; Hanington & Martin, 2019)*

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**Prototypes**

A prototype is an early sample, model, or release of a product built to test and evaluate an idea, a concept, or a process within design teams and with target-users. Prototyping thereby helps to elicit concrete requirements and specifications for a real, working system.

*(4D Consortium)*

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**Scenario**

Scenarios are narratives that help design teams to better understand the context of application in a person's everyday life and that examines a product's potential use from the user's perspective.

*(4D Consortium)*

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**University  
Innovation  
Canvas**

The University Innovation Canvas is a strategic management template used for developing new innovations and documenting existing ones within an interdisciplinary project team. The goal of the canvas is to sharpen the common focus and reflect on important factors of sustainable innovation. The canvas offers a visual chart with elements describing an innovations' addressed problem, value proposition, infrastructure, stakeholder, and resources assisting all involved stakeholders to align their activities by illustrating potential trade-offs.

*(Osterwalder et al., 2010; Maurya, 2012).*

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**User journeys**

User journeys tell step-by-step stories about the user's (inter-) actions, feelings, and perceptions with a (new) software, system, or product in a visual way. At each touchpoint, they provide detailed information about the user's emotions. They help to determine which requirements a (new) software, system, or product must have.

*(4D Consortium)*

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**User stories**

User stories are an informal, generic explanation of a software feature written from the viewpoint of the target-user. The aim of a user story is to explain how a software feature will benefit the user.

*(4D Consortium)*

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**Value Proposition  
Canvas**

The Value Proposition Canvas is a business model tool that helps designers to make sure that a newly developed innovation is positioned around the needs and values of its target users.

*(Osterwalder et al., 2015)*

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## 3.2. Procedure

The present procedure is part of our long-term, design-based research initiative in the 4D project. It aims to develop socio-technological mobile learning applications for four practice placements in healthcare settings in three European countries, namely Spain, Germany, and Poland. According to the iterative nature of a design-based research process, this co-design process lasted from June 2022 to May 2023 and comprised seven design steps. In the following sections, we lay out the description of the study context, the design process (7 steps), the data collection, the participants, and analytical methods employed.

## 3.3. Study context

The study's context is three years lasting Erasmus+ research project that aims to introduce mobile technology in practice placements, creating a bridge between the different actors involved in the learning contexts to foster the best experience in practice-based learning in healthcare settings. For the design and development of the mobile application, co-creation and co-design methods were used for a successful adoption of mobile technology in practice-based learning reflecting the core values and needs of all involved stakeholders and actors.

The conducted co-design and co-creation process took place from June 2022 to May 2023. From each of the seven project partners at least one to three persons per partner participated in the co-creation and co-design activities. The participants' demographic backgrounds varied greatly in terms of their fields of study, work experience and age, including university teachers and researchers, physicians, nurses, and technology providers. The partners came from five different European countries including Spain, Netherlands, Germany, Poland, and Austria. Most of our participants had no previous experience with co-design and co-creation activities and related methods and tools.

### 3.4. Co-creation and co-design process

The co-creation and co-design process consisted of 7 different steps, followed by a final data collection with the help of questionnaires and interviews, to complete the whole design process (see section Data Collection). The overall co-creation and co-design process is presented in Figure 8, and shows the activities conducted for each step from the perspective of the project partners and the researchers.

In the context of the 4D project, the researchers played a central role in creating and accompanying the co-creation and co-design process. They helped to implement all the steps, analyse the results, and ensure that all decisions were taken democratically. In other contexts, and without the need to establish such a process from scratch, all participants can also conduct it collaboratively and share the moderating role.

All online meetings and workshops (Step 1, Step 3- Step 7) were conducted with video conferencing tools (e.g., MS Teams or WebEx), and collaborative whiteboards (e.g., MIRO) were used to present the 4D ICs, and to collect input and feedback in the respective project step. Only Step 2 was conducted in a face-to-face meeting using printouts of the VPC, flipcharts and post-its.

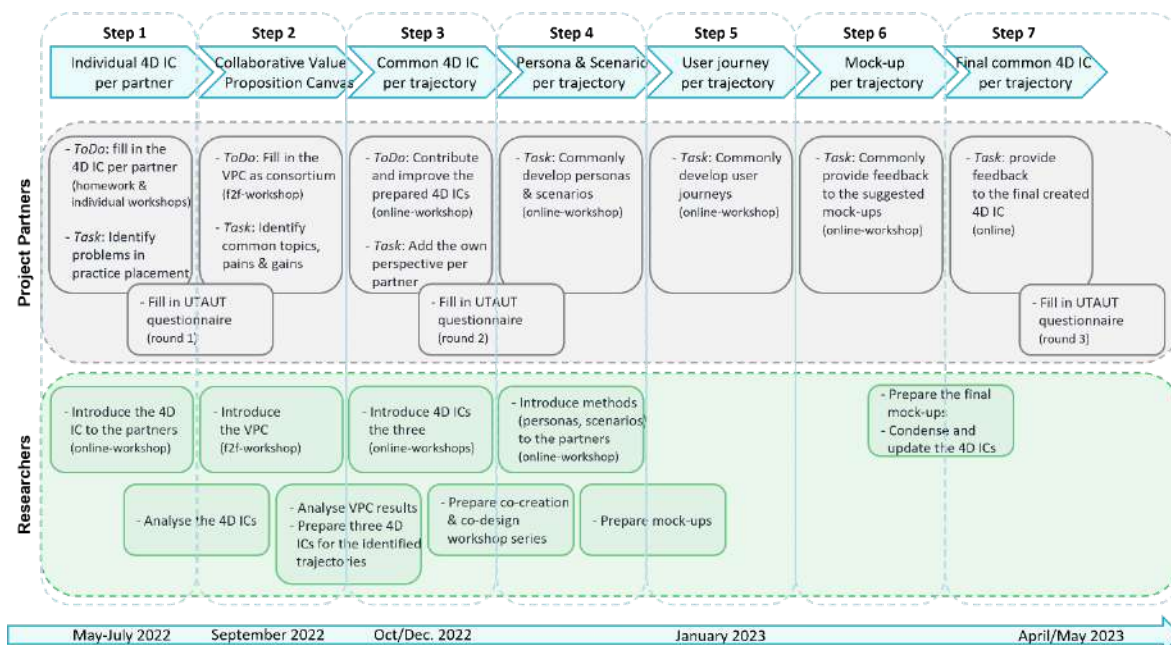


Figure 8: Overall 4D co-creation and co-design process.

**Step 1: Individual 4D IC per partner** - as an overarching tool that accompanied the whole co design process we used the 4D innovation canvas which explains the main factors promoting digital transformation and sustainable innovation. Thus, in a first online workshop, the researchers introduced the canvas to the project partners including a detailed description on how to fill in such a canvas. Afterwards the four practice placement partners were asked to fill in a canvas by themselves for 2-3 weeks and together with the researchers the canvas was iteratively improved until a stable version of the 4D IC per partner was achieved. Afterwards, the researchers sent out the questionnaire (round 1), to get first insights about the usage of the canvas.

**Step 2: Collaborative Value Proposition** - The researchers analysed all ICs and identified 5 types of addressed problems that were common for all four practice placements: 1) communication; 2) learning / learning goals / outcomes; 3) documentation; 4) reflection; 5) assessment and feedback. Using these five topics as a starting point, the researchers introduced in a face-to-face meeting the value proposition canvas (VPC) to discuss these five topics with the partners in-depth. During the discussions, the VPCs helped to concretise the topics resulting in three different trajectories that were pursued throughout the rest of the co-design process: Trajectory 1: Onboarding, communication, and documentation; Trajectory 2: Reflective Practice and Feedback; Trajectory 3: Assessment and Learning Goals.

**Step 3: Common 4D IC per trajectory** - The researchers used the results of the VPC and created a first version of a 4D IC canvas for each of the three derived trajectories. In another online workshop, the researchers presented the developed canvases to the project partners and asked them to provide input and feedback according to their practice placement's needs. After some iterations between the researchers and the project partners, a final common version of canvas was created that served as starting point for the next co-creation steps. Additionally, the same questionnaire (round 2) was sent out.

Step 4 - 6 were conducted in seven subsequent online workshops that took place in January 2023. In the first workshop, the researchers introduced the participants to a set of tools and methods and their application in practice that were used for the design and development of the mobile application. Subsequently, 2 workshops per trajectory were conducted.

**Step 4: Persona & Scenario per trajectory** - For this workshop, the researchers prepared a Miro board presenting templates for the development of personas and scenarios. In the first workshop of Trajectory 3, three personas were developed - one for a university teacher, one for a clinical mentor and one for a student - which were used in all three trajectories. Additionally, according to the trajectory, 1-2 scenarios were created.

**Step 5: User journey per trajectory & Step 6: Mock-ups per trajectory** - were conducted in the same workshop. First, based on the personas and scenarios a template for a user journey was provided by the researchers and they were filled in with the project partners for the corresponding trajectory. For the second part of the workshop, the researchers had prepared some prototypes in form of mock-ups (e.g., drawn images showing how the mobile application could look like); these mock-ups were discussed, enhanced, and improved by the project partners, so that a final set of mock-ups could be created by the researchers after the workshop series.

**Step 7: Common 4D IC per trajectory** - The researchers analysed all findings from the workshop series and used the previously developed 4D IC per trajectory to create a final version of the 4D ICs per trajectory. Again, all project partners were invited to provide their input and feedback and after compiling all of them, the final 4D ICs per trajectory emerged. Afterwards, the same questionnaire (round 3) was sent out to all project partners.

## 4. Results: Co-Design Activities

### 4.1. Trajectory 1: Onboarding, Communication, & Documentation


The first trajectory is dealing with “Onboarding” and arose from the discussions around the problems identified with communication and documentation related to clinical practice placements. This trajectory was chosen with the aim of providing a way of collecting and sharing comprehensive, up-to-date onboarding information with students that they could easily and reliably access before and during their clinical placements.

The discussions and activities during the design process identified a set of problems related to communication, documentation and general onboarding processes for students arriving at practice placements. During their training students attend various different practice placements and each placement has their own documentation, processes, orientation information, contact routes and requirements. Having easy access to this information before and during the placement can help the student to choose the most appropriate placement (where students are able to make that choice) and can help students to make the most of their educational experience during the placement since they feel prepared, confident and know where to go for help. However, at the moment gathering and sharing this information with the students is an arduous process involving the manager practicum (the university staff member responsible for overseeing the student placements and coordinating with the practice placement staff) and the practice organisations. Information tends to be gathered and shared by email, which can lead to loss of information, information not being easily retrievable when needed or out of date information being used. There is also no standard set or template of onboarding information, meaning that it is not clear if everything required has been gathered.

In the following sections, we firstly present the development of the “Onboarding” trajectory during the steps of the design process (see Table 2). Secondly, we present how the collections of onboarding content were developed/collected. Finally, we present how this was all implemented in the Learning Toolbox platform - allowing these collections to be created, shared, accessed, and maintained.

#### 4.1.1. Trajectory 1 Development along the Design Process

Table 2: Outcomes per step of the overarching design process for trajectory 1.

Steps in the Design Process	Summarised Outcomes for Trajectory 1
<p>Step 1</p>  <p>Individual 4D IC per partner</p>	<p>At the beginning, each practice placement partner filled in a 4D IC (see Figure 13, Figure 14, Figure 15, Figure 16). After analysing the four 4D ICs, 5 major addressed problems emerged. One of these was “Communication” and another one was “Documentation”.</p> <p>Addressed problems mentioned for “Communication” included:</p> <ul style="list-style-type: none"> <li>❖ Lack of communication with clinical teaching fellows and other clinical supervisors, leading to little consistency in the delivery of teaching and sub-optimal clinical experience.</li> <li>❖ Low student’s interaction with their academic institution, peers, and practice.</li> <li>❖ They have difficulties contacting the tutors (practice assessor and academic assessor).</li> <li>❖ Sometimes students feel lost and isolated when there is not the role of the link teacher. A consequence of ‘lack of communication’.</li> <li>❖ A desire to inform students about their practice placements and to welcome them. In this way, they don’t feel lost and isolated.</li> </ul>

Addressed problems mentioned for “Documentation” included:

- ❖ In clinical placements there are students from different universities and universities offer practice assignments in different institutions. So, there is a lot of information and documentation to exchange that is not easily accessible.
- ❖ Information overload on students: First day in clinical practice, evaluations, practice attendance sheets, vaccination card, contacts - clinical tutor, clinical supervisor, academic tutor, practice placement manager, ...
- ❖ A lot of information in paper.
- ❖ A desire to provide students with easy access to institutional information about the practice placement organisation before they arrive and whilst they are there.
- ❖ A desire to give students an application they can use for notetaking and to access clinical guides and other hospital protocols.



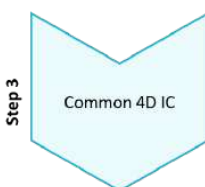
By discussing the results of the 4D ICs, three trajectories emerged, one called “Onboarding”. This trajectory focused on some of the issues identified under the Communication and Documentation problem areas. For each of the trajectories, the value proposition canvas was filled in (see Figure 17), resulting in the following insights regarding Onboarding.

From the target-users perspective:

- ❖ Pain: There are different onboarding processes and documents at each practice placement.
- ❖ Pain: Students are confused and do not know what to expect.
- ❖ Gain: Clinical mentors would have an easy and quick way of managing, updating, and sharing their onboarding information with students.
- ❖ Gain: Students feel better prepared, more confident, and less stressed when first starting at a new placement if they know what to expect.

From the value proposition perspective:

- ❖ Pain reliever: Reduce confusions and misunderstandings when a student arrives on placement.
- ❖ Pain reliever: organise/support the pathway of the students in clinical training.
- ❖ Gain creator: provide one core platform that allows different universities to create their own onboarding collection.
- ❖ Gain creator: Facilitate development of a shared onboarding guideline or template.



The results gained in the value proposition workshop were afterwards condensed and used to create a new 4D IC for the “Onboarding” trajectory (see Figure 21).

The following value propositions emerged:

For clinical mentors:

- ❖ Creation and delivery of context specific onboarding materials:
  - Guidelines, documentation, maps, legal, biological procedures.
  - Easily maintainable and adaptable.
  - Context specifications.
- ❖ Information about students in general will be provided.

For students:

- ❖ Easy access to context information and specific onboarding information:
  - BYOD (Bring Your Own Device).
  - All information, general as well as specific to placement or context.

We developed two different personas and two scenarios.

**Persona 1 “Manager Practicum - Laura”** (see Figure 27) describes Laura, a typical manager of the placements who has to decide on the placement for each student and manage the communication between the different universities/institutions.

- ❖ Motivation and Goal: support students getting the best educational experience in placement, ensure everyone has the information they require so they know what to expect, motivate and engage clinical mentors.
- ❖ Frustration and Pain Points: information gets lost, or people don’t read the onboarding information, missing or inaccessible info leads to confusion and complaints.
- ❖ LGW context of use: to work with the placements to create and maintain up-to-date onboarding information (stacks in LTB) for each placement and to share these with the relevant students.



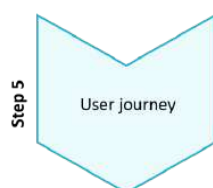
**Persona 2 “Student: Steven”** (see Figure 26) describes Steven. a typical student who joins a practice placement.

- ❖ Motivation and Goals: Improve his competences (knowledge, skills, and communication), get soft skills training, taste the 'real life' situation, and build his network.
- ❖ Frustration and Pain Points: Not having info about the healthcare setting (placement) before choosing to it, not understanding tasks & duties because of technical language, time pressures on learning, inadequate support/tutoring.
- ❖ LGW context of use: uses onboarding stacks in LTB to learn more about the placement setting before and during the placement, uses onboarding stack to access context specific guidelines and information

**Scenario 1 with manager practicum Laura** (see Figure 28) describes the work that Laura has to do to arrange and manage the practice placements, in particular the collation and sharing of onboarding information about those placements. The scenario describes how Laura is able to use the Learning Toolbox to manage this process prior to the practice placements starting and also during the placements. She works with the placements to build and keep the onboarding stacks up to date and makes sure the students have access to them.

**Scenario 2 with student Steven** (see Figure 29) describes how Steven uses the onboarding stacks in Learning Toolbox to find out about his placement setting before arriving and how he is able to use it to easily access documents specific to that placement and contact information whilst he is there.

We created two **User Journeys** (see Figure 30, Figure 31) - one for Laura and one for Steven, In Laura’s user journey we outline the 5 steps that she follows in order to create, share, and maintain the onboarding information.

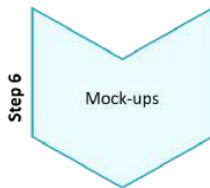


- ❖ Step 1. Laura receives some instruction on how to use LTB and is given an author account.
- ❖ Steps 2 - 3. Laura works with the practice placements to create/collect and put the onboarding information into the onboarding stacks in LTB.
- ❖ Step 4. Laura publishes the onboarding stacks and makes sure that the students have access to them and understand how to use them.
- ❖ Step 5. Laura continually keeps her onboarding stacks up to date.

In Steven’s user journey we outline the 4 steps that he follows to make effective use of the onboarding stacks.

- ❖ Step 1. Steven is given some guidance on how to access and use the LTB onboarding stacks.

- ❖ Step 2. Steven reviews the different placements' onboarding stacks to learn more about them and choose (if that is allowed) his placement.
- ❖ Step 3. Steven checks the placement's onboarding stack to learn more about how to get there and what is required when he arrives.
- ❖ Step 4. Steven uses the onboarding stack to access placement-specific guidelines, general information, and useful tools. He also uses it to access relevant contact details.



**Mock-ups:** The Learning Toolbox (LTB) platform already existed, and so no technical development was required to produce mock-ups of how an onboarding stack would appear. Instead, during the project meeting in Lublin in March 2023, the partners had a training in using the Learning Toolbox to create stacks and were shown examples of information sharing stacks used in other similar contexts. Partners started to design their own stacks during that Lublin meeting. It was then agreed that the partners would join monthly online meetings between April - July 2023 in which they would present and discuss their onboarding stack designs. This would provide all partners with an opportunity to get technical support from the technical partners, but importantly would also allow people to learn from each other's plans and designs and iteratively improve their own.



All partners were involved in the development of the **4D IC for trajectory 1**. The final version of this IC (see Figure 24) condenses all insights gained through all conducted design steps and shows a summary of the Onboarding trajectory.

#### 4.1.2. Development of Content and Implementation in LTB

For this trajectory it was clear that the onboarding content was highly context dependent. Each practice placement partner (Tecnocampus, IGPT<sup>1</sup>, DUE and MUL) would have their own set of onboarding materials, specific to their context (placement setting, student type and expectations of what could be done within that setting). However, whilst it was clear that the actual materials would be specific to a particular placement it was felt that it would be useful for partners to regularly meet to share with each other their ongoing work, so that they could potentially pick up new ideas from each other - both in terms of how best to arrange and display their content in LTB but also in terms of what type of content to include.

Therefore, the following meetings and activities took place between March 2023 and September 2023 to support the partner's development of their onboarding stacks in LTB.

##### Training session - March 2023

A training session took place during the project meeting in Lublin in March 2023 for partners who would be using LTB to author their onboarding (and reflection) stacks. This session included giving examples of how LTB had been used in a range of different scenarios, a hands-on demonstration of how to create and share a stack in LTB and time for the partners to start to create their own LTB stack with supervision and support available.

The session was run in a hybrid format, with most partners being present in Lublin but some joining through a video conference call.

All partners were provided with access to [online support materials](#) after the training session.

<sup>1</sup> Since TecnoCampus and IGPT already work together for their student placements then they also developed their onboarding stacks jointly.

### **LTB monthly support and sharing meetings - April 2023 - July 2023**

Regular LTB monthly support meetings were held from April to July 2023. These meetings were for all 4D LTB users (administrators and authors) who wanted to discuss their development of stacks in the Learning Toolbox. The aim was to give partners a chance to show what they have done so far, ask questions and share experiences.

These group meetings were held on every second Wednesday in the month and were held online so that all partners could participate. The meetings were recorded, and the recordings shared with all partners.

The key areas discussed in those meetings included:

- ❖ **Technical:** How to sign-in to Learning Toolbox, how to add new authors to your domain, the differences between the tile types, how to copy a stack
- ❖ **Sharing examples and progress:** Tours of existing and developing stacks made by 4D partners.
- ❖ **Sharing of advice from partners:** concentrating on structure first then style, using flat icons for coordinated images.
- ❖ **Discussions of different approaches:** Alternative ways to structure stacks - creating different stacks for different student groups or creating one stack and using colours to indicate which tiles are relevant to which student group.
- ❖ **Support beyond the calls:** How to get individual support between the monthly meetings - an email helpdesk was provided by Kubify to all partners.

### **Review & finalisation of onboarding stacks - September 2023**

At the project meeting in Essen in September 2023 each placement partner gave a demonstration and tour of their (nearly completed) onboarding stacks. This provided another opportunity for partners to both ask questions and to compare each placement's onboarding stacks. Figure 32 in the Appendix shows some screenshots from these onboarding stacks. Partners were offered the chance to restart the monthly LTB support meetings, but that was not felt to be necessary. All partners reported that their onboarding stacks were close to completion and would be finalised by November and ready for piloting in 2024. There has been little use of Kubify's email helpdesk, as partners reported finding LTB easy to use and the online support materials helpful. However, the Kubify email helpdesk providing support for partners (LTB authors and administrators) will continue to be available through to the end of the project.

## **4.2. Trajectory 2: Reflective Practice and Feedback**

The second trajectory in our educational journey is centred around the "reflective practitioner." This trajectory was undertaken with the aim of cultivating reflective practice skills among learners through the development of a comprehensive mini-guide on reflective practice and feedback.

Reflection is a fundamental element of professional growth, and it empowers practitioners to enhance their skills, make informed decisions, and continuously improve. In the realm of education, fostering reflective practitioners is of paramount importance as it not only equips learners with the ability to critically assess their experiences but also encourages them to seek out and receive constructive feedback for their personal and professional development.

During the conceptualization and design phase of this trajectory, we realised that the ability to reflect effectively and receive feedback is an essential skill for students, educators, and professionals across various disciplines. The mini-guide we developed serves as a valuable resource for anyone looking to harness the power of reflective practice and feedback in their learning journey.

In the subsequent sections, we will delve deeper into the development of "Trajectory 2: Reflective Practice and Feedback", outlining the key steps taken during its design. We will also provide insights into the content of the mini-guide, showcasing how it empowers learners to become reflective





practitioners who actively seek feedback for continuous growth. Additionally, we will discuss the practical implementation of these concepts, including the utilisation of Moodle as a valuable tool in this educational journey.

### 4.2.1. Trajectory 2 Development along the Design Process

In the following we present the development of trajectory 2 along the steps of the design process (see Table 3). For each step, we describe the outcomes achieved along the used design artefact.

Table 3: Outcomes per step of the overarching design process for trajectory 2

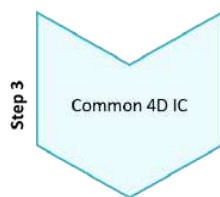
Steps in the Design Process	Summarised Outcomes for Trajectory 2
<p><b>Step 1</b></p>  <p>Individual 4D IC per partner</p>	<p>At the beginning, each practice placement partner filled in a 4D IC (see Figure 13, Figure 14, Figure 15, Figure 16). After analysing the four 4D ICs, 5 major addressed problems emerged. One of these was “Reflection” and another one was “Assessment and feedback”.</p> <p>Addressed problems mentioned for “Reflection and feedback” were:</p> <ul style="list-style-type: none"> <li>❖ By clinical tutors, academic assessors, and link teachers: <ul style="list-style-type: none"> <li>o Time required (many students) for reflection and feedback.</li> <li>o Make the reflection process attractive.</li> <li>o No guideline or scaffolding (no time) to conduct reflective sessions.</li> </ul> </li> <li>❖ By students <ul style="list-style-type: none"> <li>o Do not know how to achieve learning goals.</li> <li>o Have a lot of homework and exams → no time for reflection.</li> <li>o No scaffolding, guidance for reflection. No tools for reflection e.g., diary, e-portfolio.</li> <li>o Reflective practice is not integrated in their education neither at university nor at practice placement.</li> <li>o We need easy and fast access to content, goals and information.</li> </ul> </li> </ul>
<p><b>Step 2</b></p>  <p>Collaborative Value Proposition Canvas</p>	<p>By discussing the results of the 4D ICs, three trajectories emerged, one called “Reflective Practice and Feedback”. For each of the trajectories, the value proposition canvas was filled in (see Figure 18), resulting in the following insights:</p> <p>From the target-users perspective:</p> <ul style="list-style-type: none"> <li>❖ Pain: Students prioritise exams and theoretical subjects over reflective practice and feedback. They seek clarity on learning goals and practical application while managing their workload.</li> <li>❖ Pain: Clinical tutors, link teachers, and academic assessors face challenges defining reflection and managing time constraints without extra compensation, given their high student workload. They seek guidance on supporting specific content and methods to facilitate reflective practice and feedback.</li> <li>❖ Gain: Students express a desire for easy access to content and learning goals, a practical way to interact with real patients, and a user-friendly portfolio template with open-ended questions for facilitating reflective practice and feedback.</li> <li>❖ Gain: Clinical tutors, link teachers, and academic assessors emphasise the importance of easy and quick access to content and learning goals. They also express pride in their teaching and a sense of fulfilment in fostering their students' progress and professionalism, aiming to instil a strong sense of self-agency for responsible learning. Additionally, they stress the significance</li> </ul>

of the quality and content of their teaching and highlight students' self-reflection as a means to enhance progress.

From the value proposition perspective:

- ❖ Pain relievers: To offer an increased motivation and guidance for reflection.
- ❖ Gain creators: To provide a focused, flexible, and time-saving approach while enhanced clinical tutors, link teachers, and academic assessors' motivation and engagement.

The results gained in the value proposition workshop were afterwards condensed and used to create a new 4D IC for the "Reflection and feedback" trajectory (see Figure 20). The following value propositions emerged:



For clinical mentors, link teachers, and academic assessors:

- ❖ Improving teaching through reflection.
- ❖ Trigger reflection and receive feedback on their teaching approaches.
- ❖ Increase self-confidence as a teacher (pride and happy to be a good teacher).
- ❖ Increase teacher motivation.

For students:

- ❖ Easier transfer of theoretical knowledge into practice: (1) reflect and create lessons learnt and (2) learning from others.
- ❖ Benefit from their own and other's reflection to improve their learning and behaviour at the ward.
- ❖ Increase self-confidence.
- ❖ Benefit from different types of reflection: (1) Individual reflection (diary, portfolio and/or reflection tool), (2) collaborative reflection (in group with teacher) and (3) peer-to-peer reflection.

We developed two different personas and two scenarios.

**Persona 1 "Clinical Mentor: Mary"** (see Figure 34) describes Mary, a typical clinical mentor who teaches students during her shift on the ward.



- ❖ Motivation and Goals: Enhance the quality of care, earn the respect of students, prioritise patient safety, and cultivate responsible colleagues.
- ❖ Frustrations and Pain Points: Time constraints, limited space, insufficient management support, student disengagement, uncertainty regarding effective feedback delivery, and insufficient backing from peers and supervisors.
- ❖ LTB (Learning Toolbox) context of use: to define the learning goals in the beginning, looking up learning goals during the whole practice-placement, in the beginning, on daily bases and at the end for assessment.

**Persona 2 "Student: Steven"** (see Figure 33) describes Steven as a typical student who makes a practice placement.

- ❖ Motivation and Goals: Improve his competences (knowledge, skills and communication) and pass the assessment.
- ❖ Frustration & Pain Points: Not getting feedback, not knowing how to ask for it and not being able to reflect by himself without guidance.
- ❖ LTB (Learning Toolbox) context of use: Before start of placement: learn about/ review learning goals & competences, allows to understand own strengths and weaknesses. Alongside the placement: Understanding the available goals and progress on the Learning Goals and Understanding competencies, skills and activities related to goals, and is crucial to recognize the significance of

reflective practice and feedback in attaining our learning objectives in this particular context.

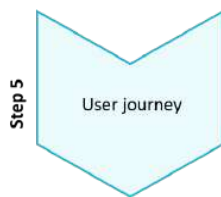
**Scenario 1 introduces “Clinical Mentor Mary”** (see Figure 36) and provides an overview of her typical workday, outlining her responsibilities and the arrival of a new student joining her ward for a practice placement. The scenario further illustrates two instances of Mary delivering feedback to her students in distinct clinical scenarios:

- ❖ In Case 1, Mary employs a feedback guide to address and rectify a student's mistake during catheterization, engaging the entire group in the correction process.
- ❖ In Case 2, Mary revisits instructions on measuring blood pressure at home after a student encounters difficulties in communicating with an elderly patient. She utilises her mini feedback guide to assist the student in improving their communication skills.

**Scenario 2 introduces Student Steven** (see Figure 35) and presents two cases illustrating Steven's experience in a clinical setting:

- ❖ In Case 1, Steven receives personalised feedback from a nurse via a widget and subsequently completes a feedback questionnaire.
- ❖ In Case 2, Steven engages in reflective practice, utilising a guide to reflect on his clinical experiences during a seminar with his peers and teacher, while also integrating the feedback he received.

In the **User Journey** (see Figure 37) we combined Mary's and Steven's personas and scenarios and developed four steps, where both of them access the Learning Toolbox App using the reflective practice and feedback mini guides:

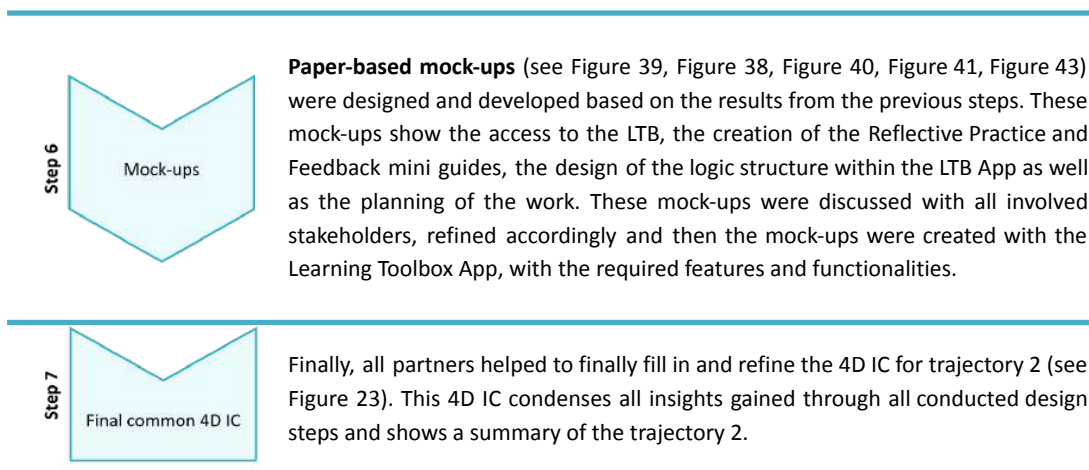


**Steps using the Reflective Practice Mini Guide:**

1. Access: They need concise information about LTB's purpose and website usage instructions.
2. Logic Structure: They review LTB materials for an organised structure to follow.
3. Content: In an online university seminar, the teacher starts with LTB's structured framework, incorporating case studies and "Reflective Practice" questions for student reflection.
4. Assessment: Learning goals are transparent, and student documentation is stored on the teacher's computer for assessment.

**Steps using the feedback Mini Guide:**

1. Feedback Mini Guide: They employ this guide to give and receive targeted feedback linked to each learning goal, creating examples that clarify the expected achievement (learning goal) and the feedback approach.
2. Content Review: They examine learning goals and related tasks, identifying key elements for inclusion in the feedback.
3. Feedback Method: They prepare the feedback to match the task and learning goal, referring to the feedback mini guide in the LTB, which offers various methods and resources like questions, tips, videos, and examples.
4. Feedback Preparation: They prepare feedback by accessing the description of the learning goal, which mirrors the information in the Learning Goal Widget (LGW).
5. Feedback Delivery: They provide/receive feedback and record notes for future reflection.



#### 4.2.2. Development of Content

To develop the content within the Learning Toolbox App for reflective practice and feedback in practice placement, the following steps are taken:

**Step 1. Understanding Reflective Practice and constructive Feedback:** In this step it was crucial to gain a comprehensive understanding of reflective practice and effective feedback techniques as the foundational knowledge for content development. In that sense:

- ❖ **Understanding Reflective Practice:** Reflective practice involves the deliberate examination of one's experiences, actions, and decisions. It encourages individuals to think deeply about their thoughts, feelings, and behaviours in different situations. The 4D Reflective Practice Mini Guide offers insights into the principles and techniques of reflective practice, helping learners become more self-aware and proficient in critical thinking (see Figure 41. Step 2. Create the Reflective Practice mini guide).
- ❖ **Understanding the art of constructive Feedback:** Feedback is a cornerstone of growth and improvement. The 4D Feedback Mini Guide provides guidance on giving and receiving feedback effectively. It explores the importance of constructive feedback, outlines strategies for providing it, and offers tips on how to receive and apply feedback for personal and professional advancement (See Figure 38. Step 2. Create the Feedback mini guide).

**Step 2. Utilise outcome-based knowledge:** In this step it was crucial to incorporate the content and insights derived from the outcomes of each step in the overarching design process for trajectory 2 (see Figure 43. Step 3. Design a logic structure in the LTB & Figure 40. Step 3. Design a logic structure in the LTB).

- ❖ Central to reflective practice is the process of setting personal learning goals. The mini-guide walks learners through the steps of self-assessment, helping them identify their strengths and areas for improvement. It then aids in the formulation of clear and achievable learning goals, aligning them with individual aspirations and career objectives.

**Step 3. Create Reflective Practice and Feedback Mini Guides:** In this step it was crucial to develop the content for the Reflective Practice and Feedback MiniGuides, crafting guidance and materials that support the reflective process and feedback delivery. The Reflective Practice and Feedback Mini Guides walks learners through the steps of self-assessment, helping them identify their strengths and areas for improvement. It then aids in the formulation of clear and achievable learning goals, aligning them with individual aspirations and career objectives (see Figure 43: Step 3. Design a logic structure in the LTB & Figure 40: Step 3. Design a logic structure in the LTB).

**Step 4. Design the Learning Toolbox App:** In this step it was crucial to design and structure the Learning Toolbox App, integrating the developed content and guides to facilitate seamless use by users engaged in reflective practice and feedback during their practice placements. In this step we considered:

- ❖ To ensure that the principles of reflective practice and feedback are an integral part of the learning experience. We discussed strategies for implementing these concepts in practice placement settings incorporating reflective assignments and seeking to maximise the benefits of feedback. Our mini guides provide practical suggestions for seamless integration.
- ❖ We explored how digital tools and platforms, such as Learning Toolbox, can be leveraged to facilitate reflective practice and feedback processes. Our Mini Guides describe and support these essential skills (Figure 42: Access to the corresponding LTBs).

#### 4.2.3. Implementation in LTB

Implementing content in the Learning Toolbox App, particularly for use in practice placements, involved a process to ensure a seamless and effective user experience. By following these steps, you can design, create, and implement an app for practice placements.

Below are the steps we followed to design and create a Learning Toolbox App in Reflective Practice and Feedback Mini Guides for practice placements that enhance the learning experience, foster reflective practice, and facilitate constructive feedback:

##### Step 1: Needs Assessment and Planning

- ❖ Identify Objectives: We determined the specific learning objectives and goals the app should address, such as facilitating reflective practice and feedback in practice placements.
- ❖ User Needs: We understood the needs and preferences of our target users (students, clinical mentors, link teachers, and academic assessors).
- ❖ Content Scope: We defined the scope of content to be included in the app, encompassing topics and resources.

##### Step 2: Content Development

- ❖ Content Creation: We developed relevant content that aligns with the identified objectives. This involved creating text-based materials and examples in reflective practice and feedback.
- ❖ Structured Framework: We organised the content in a structured framework that was easy to navigate and aligned with the learning objectives.

##### Step 3: Design and User Interface

- ❖ User-Centred Design: We created a user-centred design that focused on user experience and accessibility. We ensured the app's interface was intuitive and user-friendly.
- ❖ Visual Design: We developed a visually appealing design that aligns with the app's purpose.
- ❖ Responsive Design: We ensured the app is responsive, meaning it functions well on various devices and screen sizes, including smartphones, tablets, and desktops.

##### Step 4: User Testing and Feedback

- ❖ Beta Testing: We conducted beta testing with a select group of users to gather feedback on usability, content relevance, and any technical issues.
- ❖ Feedback Utilisation: We used this feedback to make necessary improvements.

### 4.3. Trajectory 3: Assessment and Learning Goals

The third trajectory is dealing with “Assessment and Learning Goals”. This trajectory was pursued to design a mobile application for practice placements that presents well-formulated learning goals related to the corresponding curriculum.

During the design process, it was uncovered that learning goals and a fair and unbiased assessment play a crucial role in clinical practice placements. Learning goals describe what a learner should be able to do after a specific learning activity, they should include learning activities and should be measurable. In that sense, learning goals are equally important for clinical mentors, nurses, and physicians who teach students in the practice placement as well as for students who are doing their practice placement. Learning goals give clinical mentors, nurses, and physicians an exact overview of what to teach, including which skills and competences a student should have at the end of the practice placement. At the same time, well formulated learning goals serve students as focal points and give them an overview of what they will be taught in their current practice placement.


Accordingly, when formulating learning goals in a clear and understandable way and defining learning goals along several categories including a detailed definition of a learning goal, related competencies, and skills to acquire, specific learning activities as well as assessment criteria, learning goals help to better structure the education in practice placements. Especially, the formulation of assessment criteria helps mentors, nurses, and physicians to fairly assess the performance of their students, while the students exactly know what is expected from them.

In the following sections, we will first shortly present the development of the “Assessment and Learning Goals” trajectory along the steps of the design process. Secondly, we will present how the learning goals were formulated and how the learning goal content was developed. Finally, we present its implementation as a software or tool in Moodle.

#### 4.3.1. Trajectory 3: Development along the Design Process

In the following we present the development of trajectory 3 along the steps of the design process (see Table 4). For each step, we describe the outcomes achieved along the used design artefact.

Table 4: Outcomes per step of the overarching design process for trajectory 3.

Steps in the Design Process	Summarised Outcomes for Trajectory 3
<p><b>Step 1</b></p>  <p>Individual 4D IC per partner</p>	<p>At the beginning, each practice placement partner filled in a 4D IC (see Figure 13, Figure 14, Figure 15, Figure 16). After analysing the four 4D ICs, 5 major addressed problems emerged. One of these was “Learning/Learning Goals/Outcome” and another one was “Assessment / Feedback”.</p> <p>Addressed problems mentioned for “Learning/Learning Goals/Outcome” were:</p> <ul style="list-style-type: none"> <li>❖ Some teaching methods don't involve students in effective learning.</li> <li>❖ suboptimal learning environments, providing inconsistent students experience of active learning, coaching, feedback, and supervision.</li> <li>❖ Students and educators: learning and teaching is not structured.</li> <li>❖ Educators: uncertainty in teaching and mentoring</li> <li>❖ Nurses need to have the clinical practice program, learning objectives and outcomes, clinical practice regulations, evaluation, etc. available and easily accessible.</li> <li>❖ Addressed problems mentioned for “assessment” were, for example:</li> </ul>

- ❖ Allowing to give feedback on competencies assessments.
- ❖ 360° assessment. Tool should allow assessment of students with the traffic light / smiley system.
- ❖ Clinical tutors or nurses should be able to easily assess students.



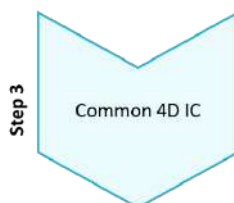
By discussing the results of the 4D ICs, three trajectories emerged, one called “Assessment and Learning Goals”. For each of the trajectories, the value proposition canvas was filled in (see Figure 19), resulting in the following insights.

From the target-users perspective:

- ❖ Pain: There are no clearly defined learning goals – neither for clinical mentors nor for students
- ❖ Pain: There are no clear and uniform assessment criteria
- ❖ Gain: Clinical mentors would become more self-confident in teaching and can provide better/easier support to the students.
- ❖ Gain: Better outcomes for students as they know what to learn, students will be more satisfied with their learning and less stressed.

From the value proposition perspective:

- ❖ Pain relievers: provision of clear learning goals and assessment criteria
- ❖ Gain creators: clear learning and teaching goals.
- ❖ Gain creators: continuous, reliable monitoring of students learning progress and better understanding and cooperation of all involved stakeholders.



The results gained in the value proposition workshop were afterwards condensed and used to create a new 4D IC for the “Assessment and Learning Goal” trajectory (see Figure 22).

The following value propositions emerged:

For clinical mentors:

- ❖ Clearly formulated learning goals: make clear what to teach, increase the self-confidence of teachers and increase efficiency (time, cost, resources).
- ❖ Clear assessment criteria along learning goals (how to assess students)
- ❖ Identify learning deficits of students.

For students:

- ❖ Clearly formulated learning goals: increase the efficiency and result in better learning outcomes, increase the students' self-confidence with learning and lead to higher satisfaction with learning and reduce stress.



We developed two different personas and two scenarios:

**Persona 1 “Clinical Mentor: Mary”** (see Figure 45) describes Mary, a typical clinical mentor who teaches students during her shift on the ward.

- ❖ Motivation and Goal: taking care of ill patients, to convey the skills and knowledge, create “good” nurses/doctors by supporting their education, share their experience and knowledge.
- ❖ Frustration and Pain Points: don't have time, don't have the skills to teach skills well, don't have the skill how to assess.
- ❖ LGW context of use: to define the learning goals in the beginning; looking up learning goals during the whole practice-placement, in the beginning, on daily bases, and at the end for assessment.

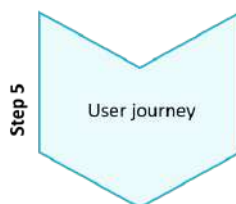
**Persona 2 “Student: Steven”** (see Figure 44) describes Steven as a typical student who makes a practice placement.

- ❖ Motivation and Goals: Learn in practice about the learning goals, and bridge the gap between theory and practice, learn how to autonomously perform tasks (learn competences and skills).
- ❖ Frustration and Pain Points: Understanding tasks, competences, and skills (activities) in practice placement in relation to goals of university, feeling of being alone and lost, clinical mentors (due to rotation/ schedule) with varying expectations/ interests, tools/ methods, and motivation to supervise & teaching, communication, and coordination style.
- ❖ LGW context of use: Before start of placement, learn about/ review learning goals & competences; alongside the placement, understanding the available goals, competencies, skills, and activities; Discussion with clinical mentor about the achievement of the learning goals (relation self and nurse assessment?)

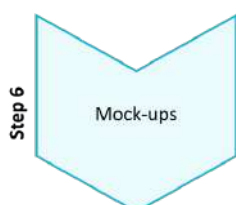
**Scenario 1 with clinical mentor Mary** (see Figure 46) describes a typical working day of Mary including her tasks during the day and the arrival of a new student, who will do a practice placement at Mary's ward. Additionally, the scenario describes when Mary would use the learning goal widget and what for. In Mary's case, she uses the LGW to find out which learning goals and related learning activities and tasks the new student has to learn as well as to keep track and assess the student's learning progress.

**Scenario 2 with student Steven** (see Figure 47) describes one of the tasks the student has to learn and how he conducts this task in front of the clinical tutor. Additionally, the scenario describes when Steve would use the learning goal widget and what for. In Stevens's case, he uses the LGW to find out which learning goals he has to achieve until the end of the practice placement as well as to keep track and assess the own learning progress.

In the **User Journey** (see Figure 48) we combined Mary's and Steven's personas and scenarios and developed four steps, where both of them access the learning goal widget.



- ❖ Step 1. At the beginning of the practice placement: Mary opens the LGW to find out what she has to teach the student when he arrives at the ward. Steven opens the LGW to find out which learning goals he has to acquire.
- ❖ Step 2 - 3. During the practice placement: Mary uses the LGW to review the tasks she has to teach Steven and enters the assessment of tasks Steven has done in front of her. Steven uses the LGW to review the learning goal content, to assess his own learning progress and to see Mary's assessments.
- ❖ Step 4. At the end of the practice placement: Mary and Steven meet and enter the final assessments in the LGW together, before sending the results to the university teacher.



**Paper-based mock-ups** (see Figure 49, Figure 50, Figure 51) were designed and developed based on the results from the previous steps. These mock-ups show the learning goals, how to access the learning goals content, how to do the assessment for learning goals as well as how to prepare the final assessment. These mock-ups were discussed with all involved stakeholders, refined accordingly and then the mock-ups were handed over to the software developer, who implements the LGW with the required features and functionalities.



Finally, all partners helped to finally fill in and refine the **4D IC for trajectory 3** (see Figure 25). This 4D IC condenses all insights gained through all conducted design steps and shows a summary of the LGW trajectory.



### 4.3.2. Development of Learning Goals

From literature we know that learning goals describe what a learner should be able to do after a specific learning experience (e.g., a university course) (Bloom, 1956; Krathwohl & Anderson, 2010; Mager, 1962). Learning is about what students do, not about what the teachers do. And for developing learning goals, teachers need to think about what exactly is learned by the student. Keeping this in mind, learning goals need to be specified in a way that it is clear for students what is expected from them. A good way to formulate well-defined learning goals is to use a learning taxonomy - in our case we follow Bloom’s revised taxonomy (Bloom, 1956; Krathwohl & Anderson, 2010) that we adapted to our needs and from which we developed a systematics on how to formulate learning goals. Bloom’s revised taxonomy distinguishes between six levels of performance - Remember, Understand, Apply, Analyse, Evaluate, Create (Fessler et al., 2021). To simplify the systematics, we combine certain levels of performance resulting in three types of learning goals i) knowledge/comprehension-oriented learning goals that address the levels Remember and Understand; ii) application/competence-oriented learning goals that target the levels Apply, Analyse, Evaluate and Create; iii) transfer-oriented learning goals which describe the demonstration of an application/competence oriented learning goal in a specific context or for a specific use case (ibid).

Based on this systematics, we used a tool called “The Learning Goal Tool” - an interactive Google spreadsheet - that supports the systematic formulation of learning goals (see Figure 9) based upon previous work in the EU project BUS Leagues (Dennerlein and Endedijk, 2023). This tool was introduced to the consortium to support the formulation of well-defined learning goals. After an initial tool training in an online meeting, all practice partners implemented the learning goals in a self-regulated but supervised manner with regular coordination meetings. The Learning Goals Tool was improved alongside this process to account for the specificities of the 4D project and the needs of the partners.

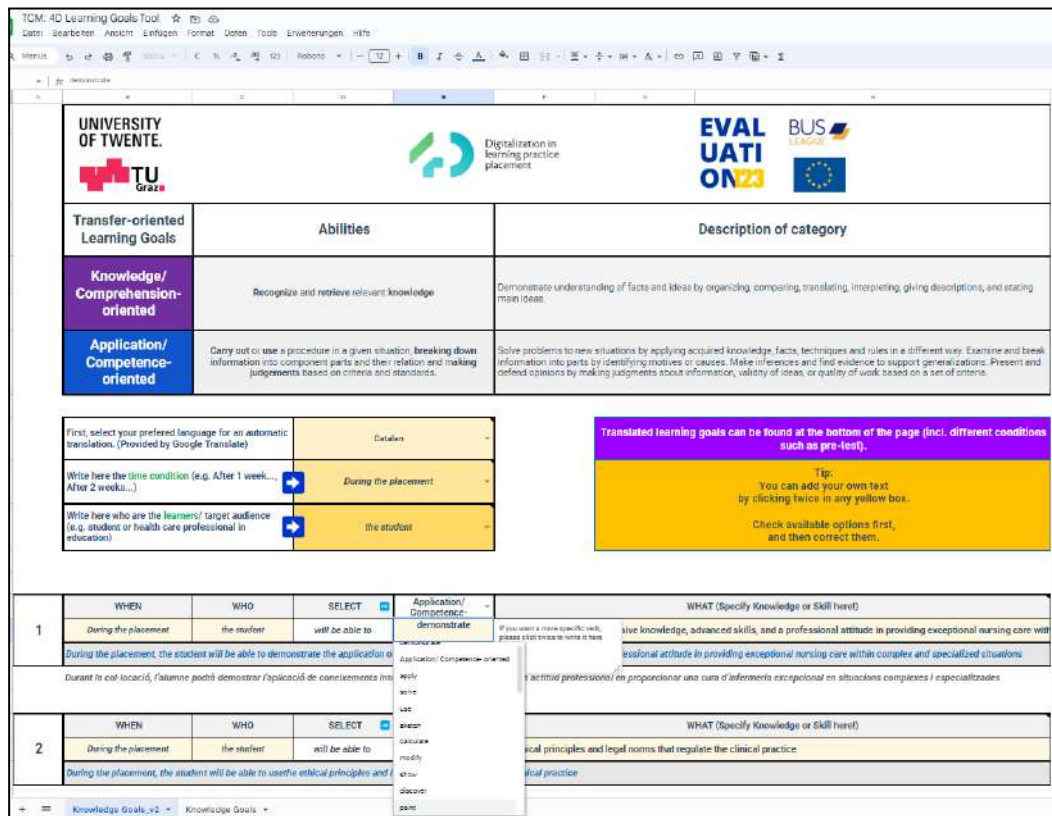


Figure 9: Learning Goal Tool - Interactive Google spreadsheet to formulate learning goals.

After the formulation of the learning goals, we developed a blueprint (see Figure 52 in the Appendix) for elaborating the content of the learning goals. This blueprint consisted of the following categories: The Learning Goal, the definition of the learning goal, related knowledge, and skills, learning activities, assessment criteria, and additional material. All partners elaborated the content of their developed learning goals and filled in the blueprint accordingly. Again, this process was supervised and supported by the researcher in parallel regular coordination meetings. A fully elaborated learning goal can be seen in Figure 10.

<b>Learning Goal</b>
<b>Professionalism and Ethics in Nursing: The student will be able to develop attitudes of self-analysis and self-assessment in the context of the activities carried out in practice placements</b>
<b>Definition of the learning goal:</b>
This learning goal focuses on the student's ability to reflect on their own actions, attitudes, and behaviors during their practical training, and use this reflection to identify areas for improvement and growth. It involves being aware of one's own limitations and biases, and being open to constructive feedback from others.
<b>Related Knowledge &amp; Skills:</b>
<ol style="list-style-type: none"> <li>1. Understanding the importance of self-reflection and self-assessment in personal and professional growth</li> <li>2. Knowledge of effective self-assessment strategies, such as setting goals, monitoring progress, and seeking feedback from others</li> <li>3. Developing the ability to identify personal strengths and weaknesses, and using this information to set goals and make improvements</li> <li>4. Developing the ability to recognize personal biases and prejudices, and work towards addressing them</li> <li>5. Demonstrating openness to constructive feedback and a willingness to learn from mistakes.</li> </ol>
<b>Learning Activities:</b>
The following clinical preceptorship experiences could provide students the opportunities to develop attitudes of self-analysis and self-assessment in the context of the activities carried out in practice placements:
<ol style="list-style-type: none"> <li>Step 1. To show the attitudes needed to be a good co-worker in the future.</li> <li>Step 2. To organize, plan and prioritize daily tasks.</li> <li>Step 3. To use the digital tools of the institution.</li> <li>Step 4. To participate in activities of prevention, promotion, and/or health education.</li> <li>Step 5. To participate in tasks of clinical management and/or improvement of the quality of care.</li> </ol>
<b>Assessment Criteria:</b>
<ol style="list-style-type: none"> <li>1. <b>Reflection on personal experiences:</b> Demonstrating the ability to reflect on personal experiences and actions in a thoughtful and meaningful way</li> <li>2. <b>Effective self-assessment:</b> Demonstrating an understanding of effective self-assessment strategies and techniques</li> <li>3. <b>Incorporating feedback:</b> Demonstrating a willingness to seek out and incorporate feedback from others</li> <li>4. <b>Weakness or challenge:</b> Demonstrating growth and improvement in identified areas of weakness or challenge</li> <li>5. <b>Personal and professional growth:</b> Demonstrating openness to new ideas and a commitment to ongoing personal and professional growth.</li> <li>6. <b>Self-reflection:</b> The student can demonstrate the ability to self-reflect and identify personal strengths and weaknesses, and set goals for improvement.</li> <li>7. <b>Feedback:</b> The student actively seeks feedback from peers and supervisors, and uses this feedback to guide their professional development.</li> <li>8. <b>Learning from mistakes:</b> The student demonstrates a willingness to learn from mistakes and take steps to address areas of weakness.</li> </ol>
<b>Additional Material</b>
<ol style="list-style-type: none"> <li>1. 4D Feedback Mini Guide. WP3 – Design and digitalisation (Trajectory 2: Feedback and Reflective Practice): <a href="https://4d.tecnocampus.cat/">https://4d.tecnocampus.cat/</a></li> <li>2. 4D Reflective Practice Mini Guide. WP3 – Design and digitalisation (Trajectory 2: Feedback and Reflective Practice): <a href="https://4d.tecnocampus.cat/">https://4d.tecnocampus.cat/</a></li> </ol>

Figure 10: Example of an elaborated learning goal for TCM / IGTP

Overall, the practice placement partners formulated 44 learning goals as follows:

- ❖ TCM (Tecnocampus University Center) and IGTP (Germans Trias i Pujol Research Institute):
  - 4 topics and 11 learning goals.
  - All learning goals were developed in Spanish and in Catalan.
- ❖ MUL (Medical University of Lublin):
  - 4 topics and 16 learning goals.
  - All learning goals were developed in Polish.
- ❖ DUE (University of Duisburg-Essen):
  - 5 topics and 17 learning goals.
  - All learning goals were developed in German.

### 4.3.3. Implementation of Learning Goal Widget (LGW)

The Learning Goal Widget (LGW) was developed based upon the mock-ups that we have developed during the co-design process. It covers all suggested functionalities and was implemented using the look & feel of the corporate design of the 4D project.

The starting point for the development and implementation were the results of a previously conducted research project, [the DIGIVID Erasmus+ Project](#) and the [TEL Marketplace project](#) (which was conducted exclusively in German), as well as an internal project at TU Graz (Graz University of Technology). In both projects we have used different versions of the Learning Goal Widget, thus, we were able to start with an existing codebase that we adapted to the needs and enhanced with new features of the 4D project partners' needs.

Generally, the LGW in the 4D project is implemented as a prototype (TRL 3-4) and is developed as a standalone Moodle activity for the Moodle version 4.2. Typically, each Learning Goal Widget is added to a moodle course as an activity available on a course. For the 4D project this means that we will have implemented three different courses, one for each practice placement:

1. TCM (Tecnocampus University Center) and IGTP (Germans Trias i Pujol Research Institute).
2. MUL (Medical University of Lublin).
3. DUE (University of Duisburg-Essen).

And in each course, a Learning Goal Widget is added presenting the respective topics and learning goals per practice placement. In the following, we will briefly describe the features of the Learning Goal Widget.

- ❖ **Topics and Learning Goals:** For each practice placement, a moodle course was created and the Learning Goal Widget was added. Thereby, the LGW consists of two views, one for nurses and one for students. For both roles, the overview about the topics and learning goals is presented in the same way as depicted in Figure 12. On the top-level, all available topics are shown. When clicking on a topic, the learning goals are presented. When clicking on a learning goal, the respective learning goal description (as described in the section above) is opened as a .pdf document, providing all relevant information about the current learning goal. Additionally, we have added for each learning goal a folder in Moodle, where educators/nurses can add additional relevant learning goal related material. The link to the folder is also added to the learning goal description.

- ❖ **Student's Self-assessment:** For each learning goal, students can assess their own learning progress towards a learning goal in a self-regulated way (see Figure 11). To do so, students need to click on the left star (green) next to a learning goal. A small pop-up appears that allows users to select the rating from 5 stars (best) to 1 (lowest) to assess their own progress. The green start on the right side gives students additionally the possibility to state that the learning goal and related activity was not taught or that they did not have the possibility to practice it.

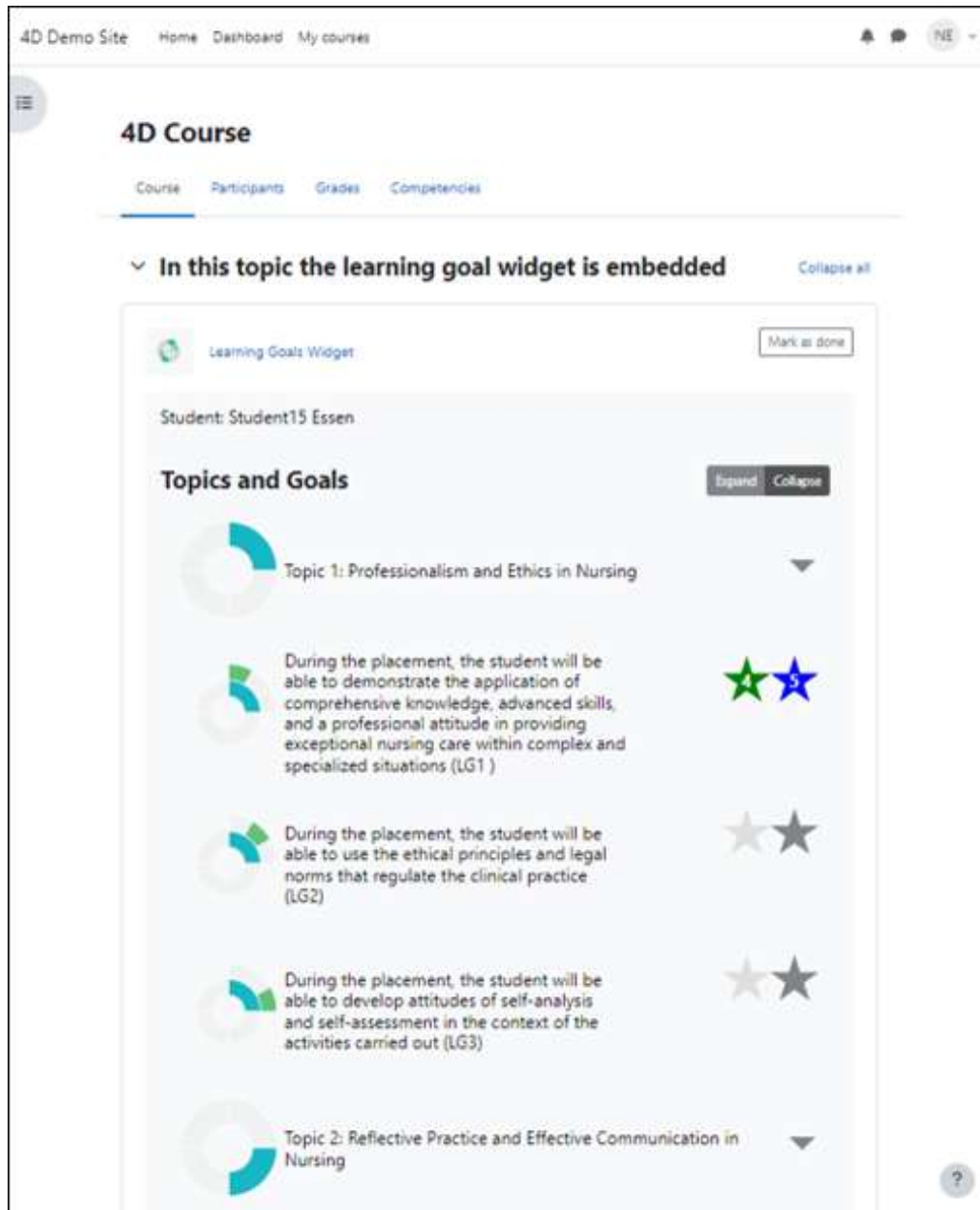


Figure 11: Topics and Learning Goals in the Widget

- ❖ **Nurses' assessment of students:** Before nurses enter a course, they need to select the student which they would like to assess. Thus, a list of all students enrolled in the course is presented to the nurses when entering the course. After selecting a student, they can assess the students by rating their performance from 5 - 1 star(s). Additionally, they can also select a specific star if a learning goal was not taught during the practice placement.

- ❖ **Nurses' final assessment of students:** In addition to the individual ratings of the students' progress towards the learning goals, the nurses have the feature to create the final assessment (see Figure 12.) at the end of a practice placement. They have below the topics and learning goals the possibility to add overall feedback in a free text field and then to save the whole assessment as PDF. This final report then consists of all ratings given to the individual learning goals and the final overall feedback.

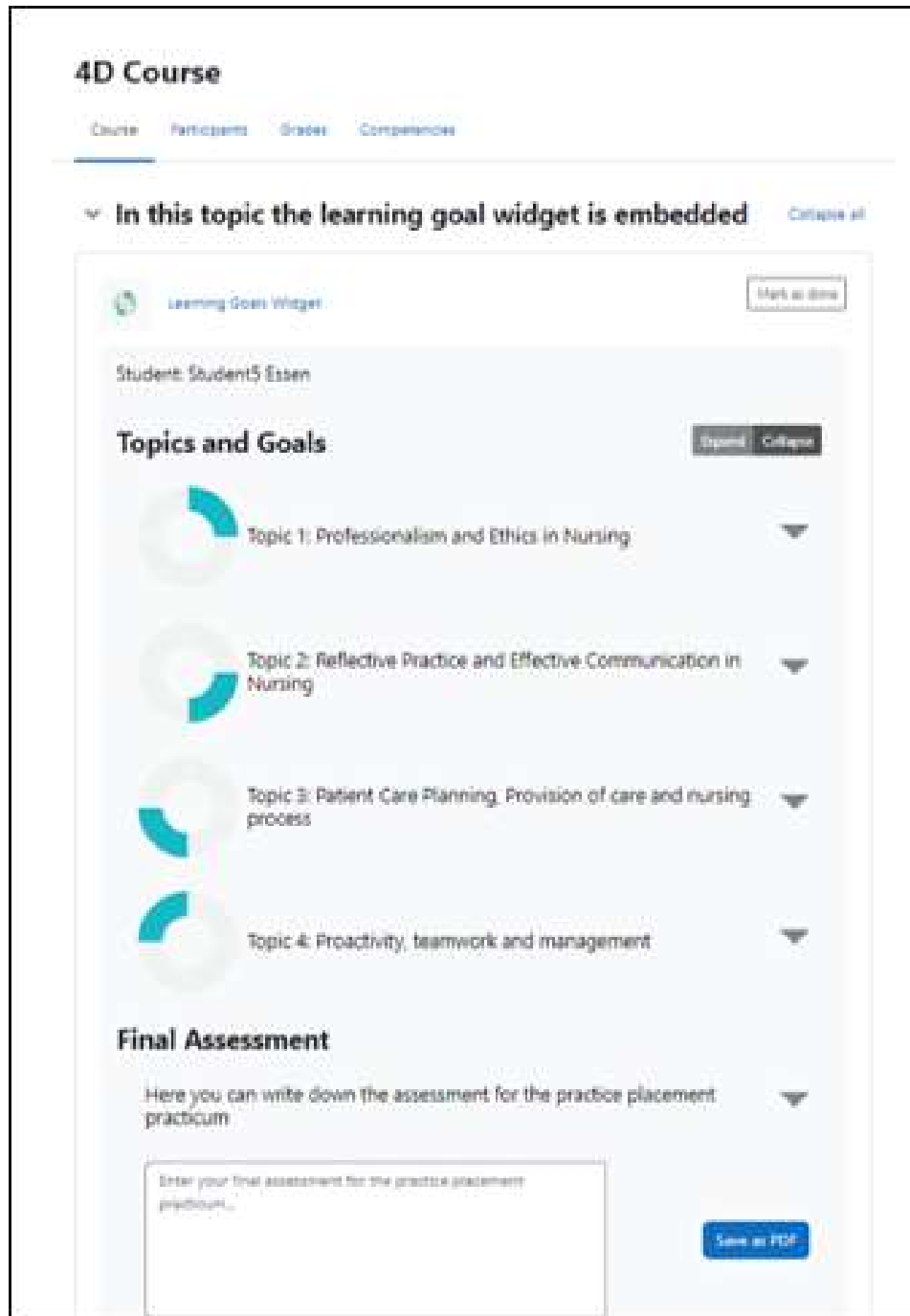

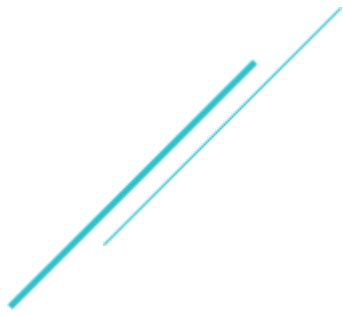


Figure 12: Nurses view: Final overall assessment that can be saved as PDF.



*A co-creation and co-design process can be used to share and capture insights into teaching and learning practices in complex practice placements settings. Including a wide range of stakeholders with different methods and tools helped everyone to express, explore and reflect on the insights, ideas and challenges that were identified resulting in mobile applications tailored to the users' needs.*



## 5. Conclusion

This report sets out the key work conducted in WP3. The research background and justification for the overall co-design process is first explained in Section 2. Then the actual methods and tools used in this process are explained in more detail in Section 3. This information is shared both in this report and in the accompanying toolkit so that others can pick up and use these methods in their own work, particularly when designing and planning the introduction of mobile technology to support placement learning. But also, the methods can be used more widely, beyond this specific context, to help shape and plan projects in the area of technology adoption. Section 4 provides more detail on how the design steps were followed and content development and implementation were achieved in each of the three chosen trajectories (onboarding, reflection, assessment and learning goals).

The report shows how such a design-based research process can be used to share and capture insights into teaching and learning practices in complex settings such as these. A wide range of stakeholders were involved in all stages of the process and the tools used helped everyone to express, explore and reflect on the insights, ideas and challenges that were identified. Using tools such as the University Innovation Canvas means that we have structured records of the thinking at all stages of the process. Practical considerations (time, resources etc.) mean that not all ideas generated can be immediately taken up into the next design steps or realised in the final implementations. However, the rich records and artefacts produced by following such a design-based research process means that these ideas can be returned to later and developed further in future work by the partners or by others.

The objectives of WP3 were to define and conduct co-creation and co-design activities to determine with all Project partners key components and features in the design of possible mobile application(s). In that sense, if you are interested in introducing mobile applications in practice placements you should/could take the following lessons learned into account:

- ❖ **Active involvement of all relevant stakeholders:** Promote active participation with the introduction of the co-design and co-creation as a method to ensure ongoing and active participation of all stakeholders in the whole design process of mobile technology. This approach recognises the importance of all contributions (e.g., values, needs, opinions) from all actors involved in the design process of mobile technologies in practice placements. The different actors include students, clinical tutors, link teachers, academic assessors, hospital managers and directors, university teachers and deans.
- ❖ **Select appropriate methods and tools:** Select appropriate tools and methods that could be applied in the co-creation and co-design process. Prepare and conduct introduction sessions or workshops, so that all involved stakeholders know upfront, what the goals of co-design activities are, which co-creation and co-design methods or tools will be used and how they work; and clearly state what the expected outcome of the activities is.
- ❖ **Usability:** Try to enhance usability with a special focus on user-centred methods and scenario-based design processes. By doing so, you will increase the usability of the designs within the context of learning in practice placement. This emphasis on usability aims to make the technology more accessible and effective for both students and educators.
- ❖ **Values, needs, and benefits:** Address core values and needs of the students and mentors, and all other involved stakeholders. The user-centric approach will help you to ensure that the designed and developed technology aligns with the preferences and requirements of those using it and brings them a clear benefit, thereby promoting its successful adoption.
- ❖ **Goals:** Beside designing and developing a technology or mobile application, make clear what the goal of the intervention should be (e.g., practice placement integrated learning), including which

(domain) knowledge or information should be conveyed to the learners, the role of educators (e.g. nurses, clinical mentors) and which content needs to be prepared. need. For instance, in our case, guidelines and instructions regarding the mini guides for supporting reflective practice and providing feedback were prepared. Content wise, well-formulated learning goals were defined, and the respective learning content has been prepared.

- ❖ **Share and disseminate insights and lessons learned:** Share your knowledge with other interested parties, for instance, using and preparing a toolkit. Such a toolkit could present information of the methods and tools used, why they have been selected, how they were applied in practice, and the gained insights and results. Additionally, it could show the overall development of a tool, starting with the development of first ideas until the concrete implementation of the mobile technology. This toolkit could be useful to introduce mobile technology in various scenarios across higher education institutions in EU countries.



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## 7. Appendix A: 4D Innovation Canvas Development

This appendix shows the development of the 4D Innovation Canvases developed over time. 4D IC Round 1

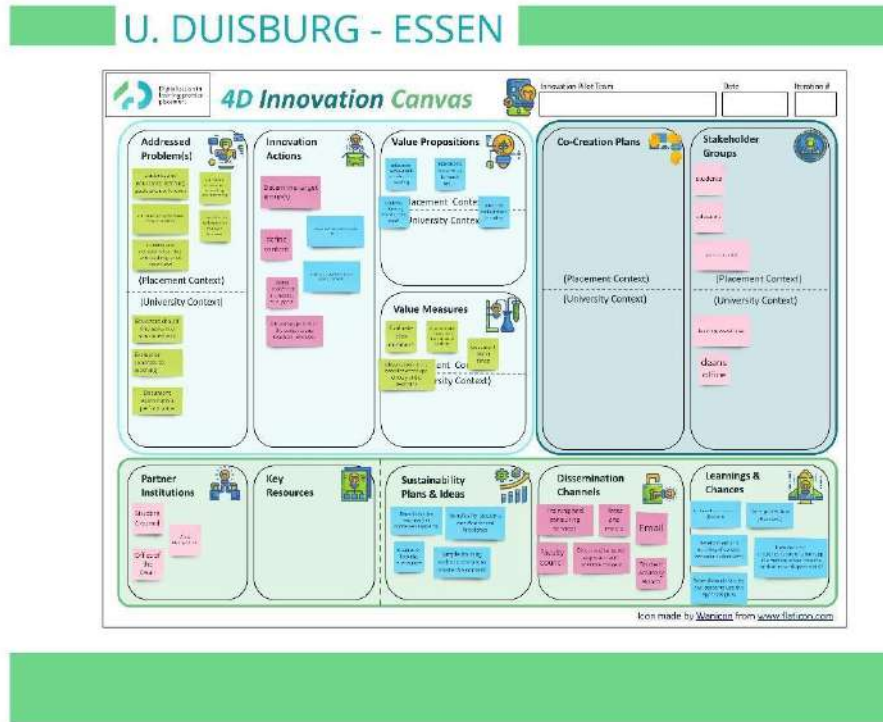


Figure 13: 4DIC – Round 1 – Canvas filled in by partners Duisburg-Essen

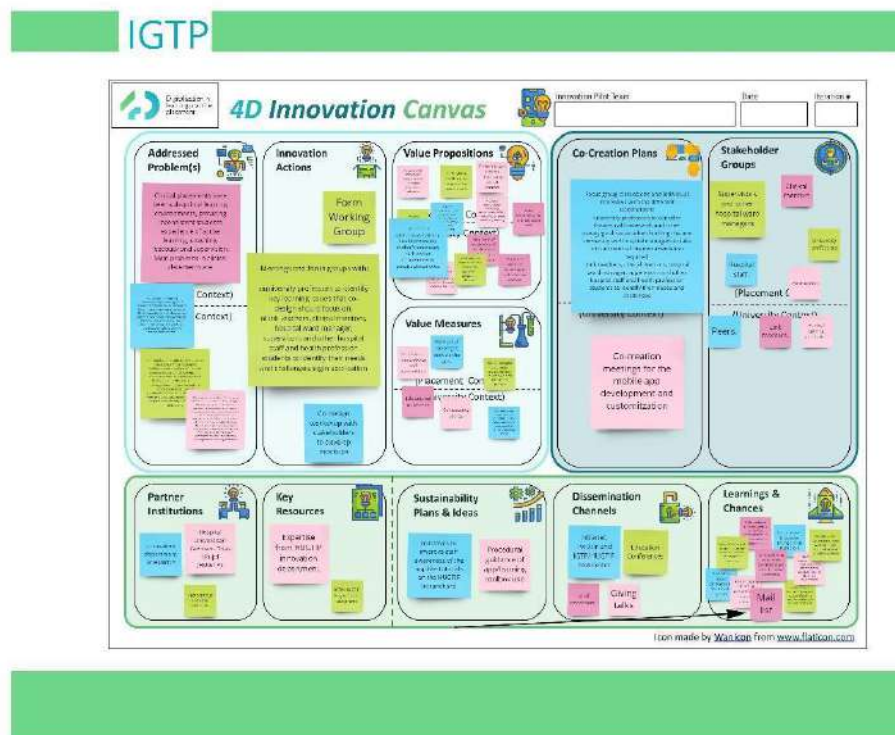


Figure 14: 4DIC – Round 1 – Canvas filled in by partners IGTP.

## TECNOCAMPUS

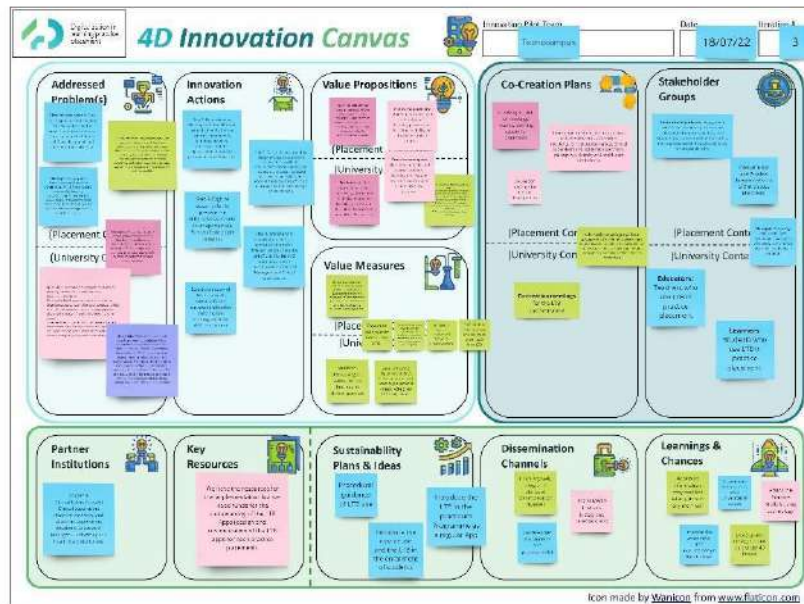


Figure 15: 4DIC – Round 1 – Canvas filled in by partners Tecnocampus.

## Medical University of Lublin

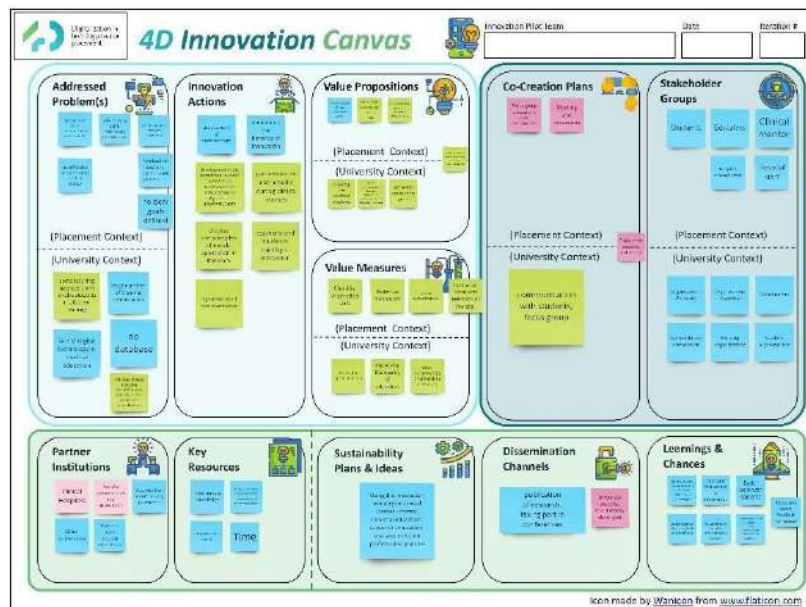


Figure 16: 4DIC – Round 1 – Canvas filled in by partners MUL.

### 7.1. Value Proposition Canvas

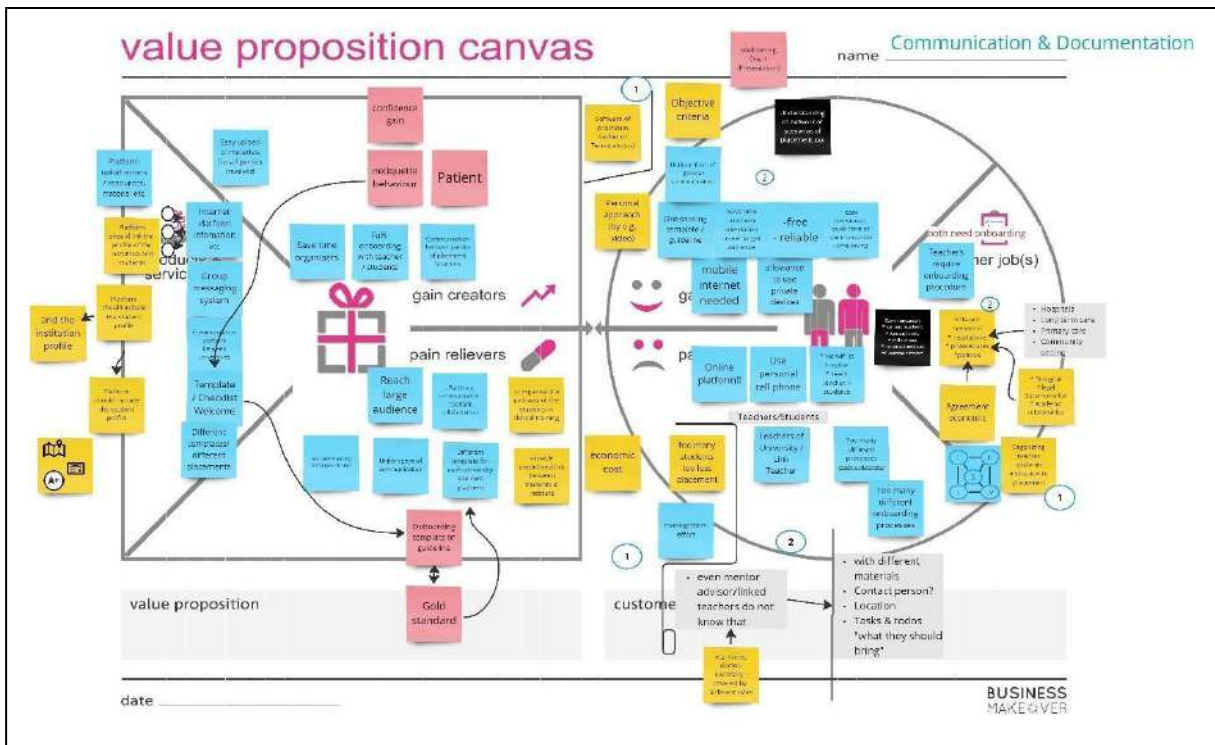


Figure 17: Value Proposition Canvas developed for Trajectory 1

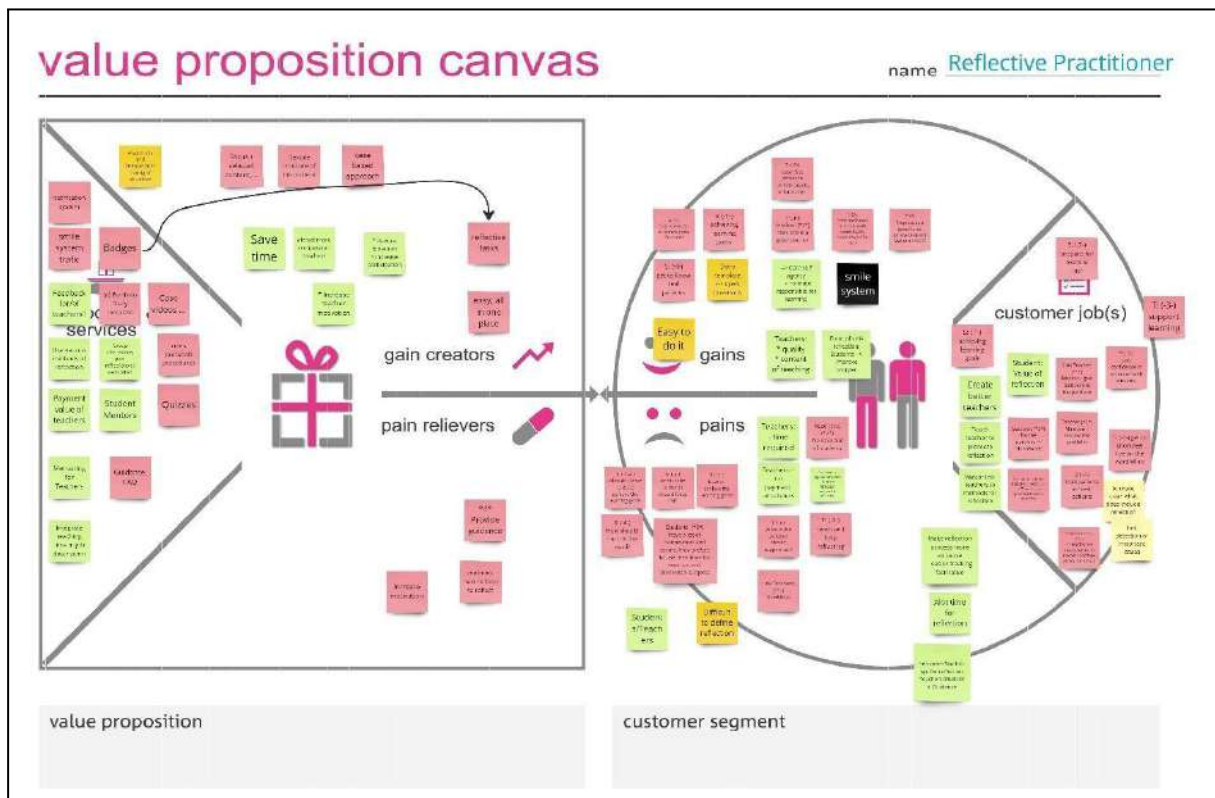


Figure 18: Value Proposition Canvas developed for Trajectory 2

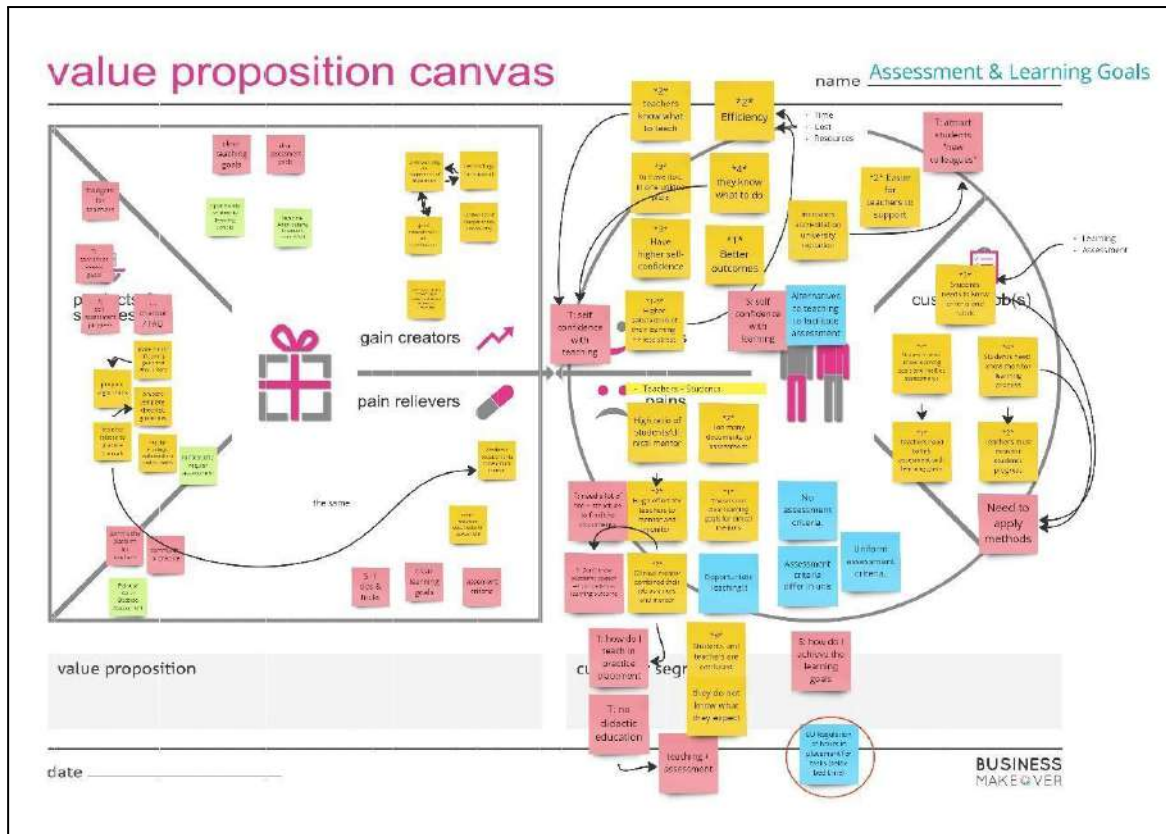


Figure 19: Value Proposition Canvas developed for Trajectory 3

### 7.2. 4D IC Round 2

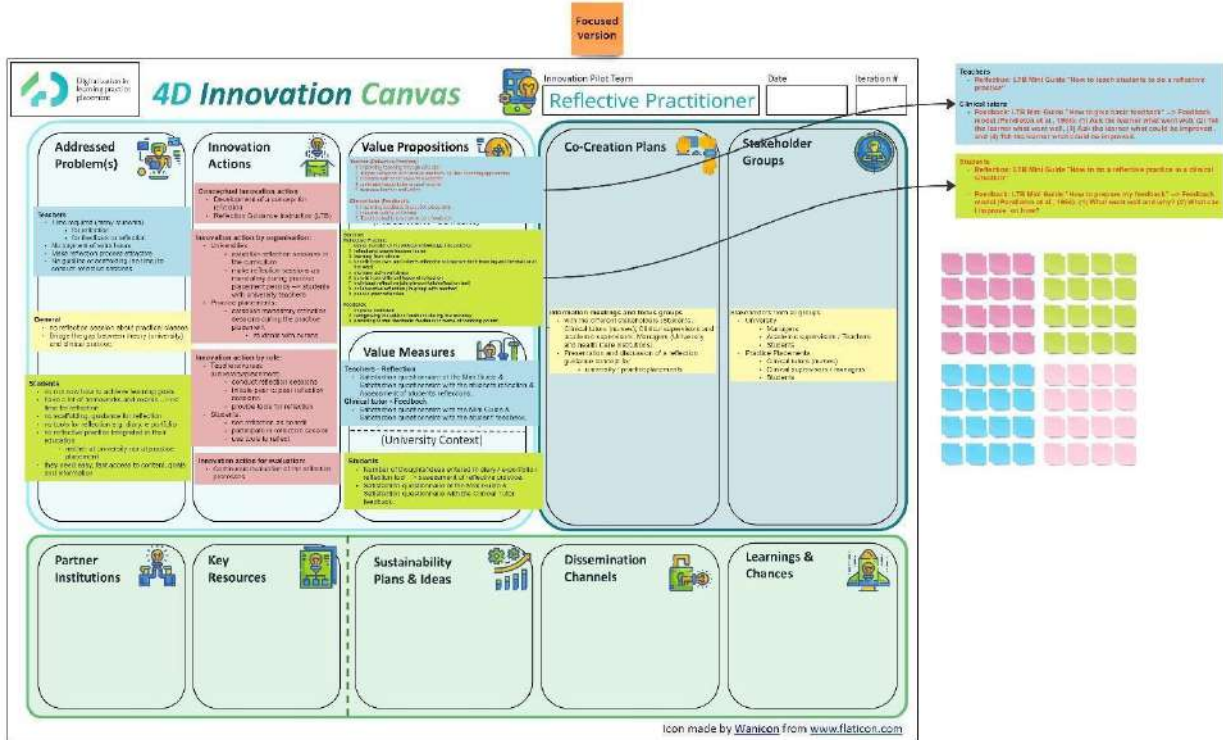


Figure 20: 4DIC – Round 2 – Trajectory 2

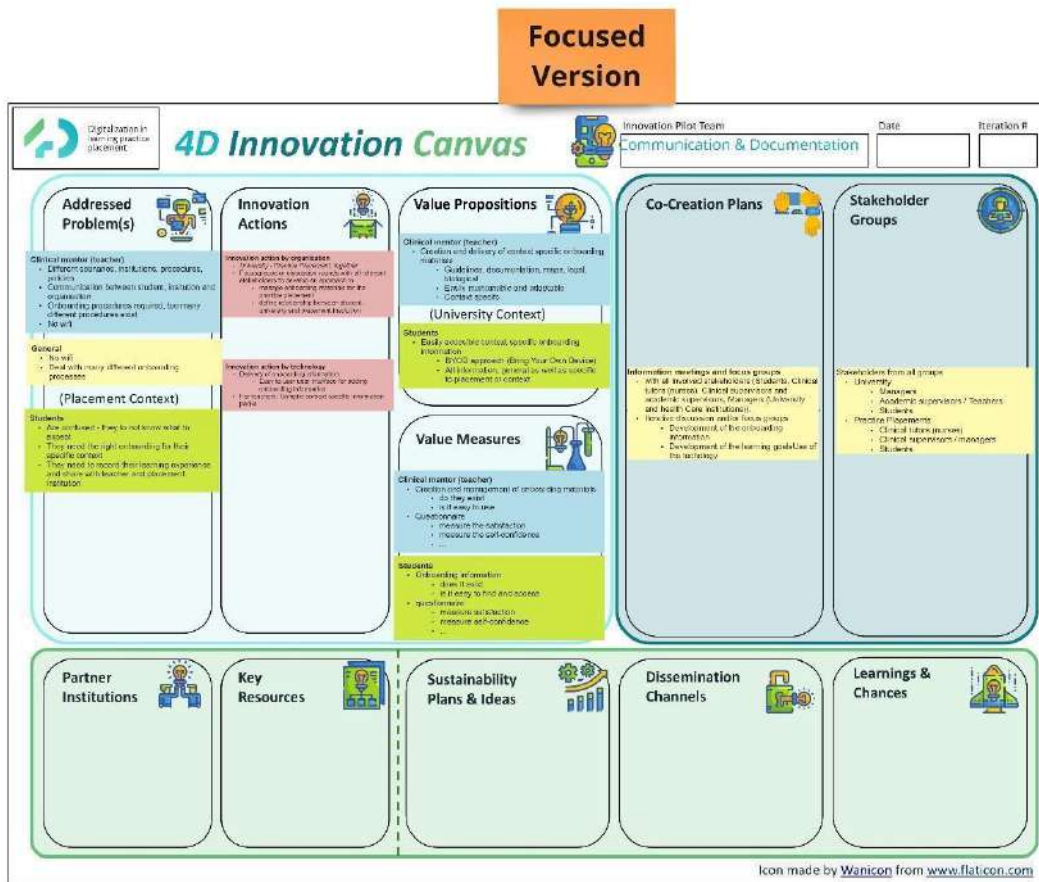


Figure 21: 4DIC – Round 2 – Trajectory 1



**Focused Version**

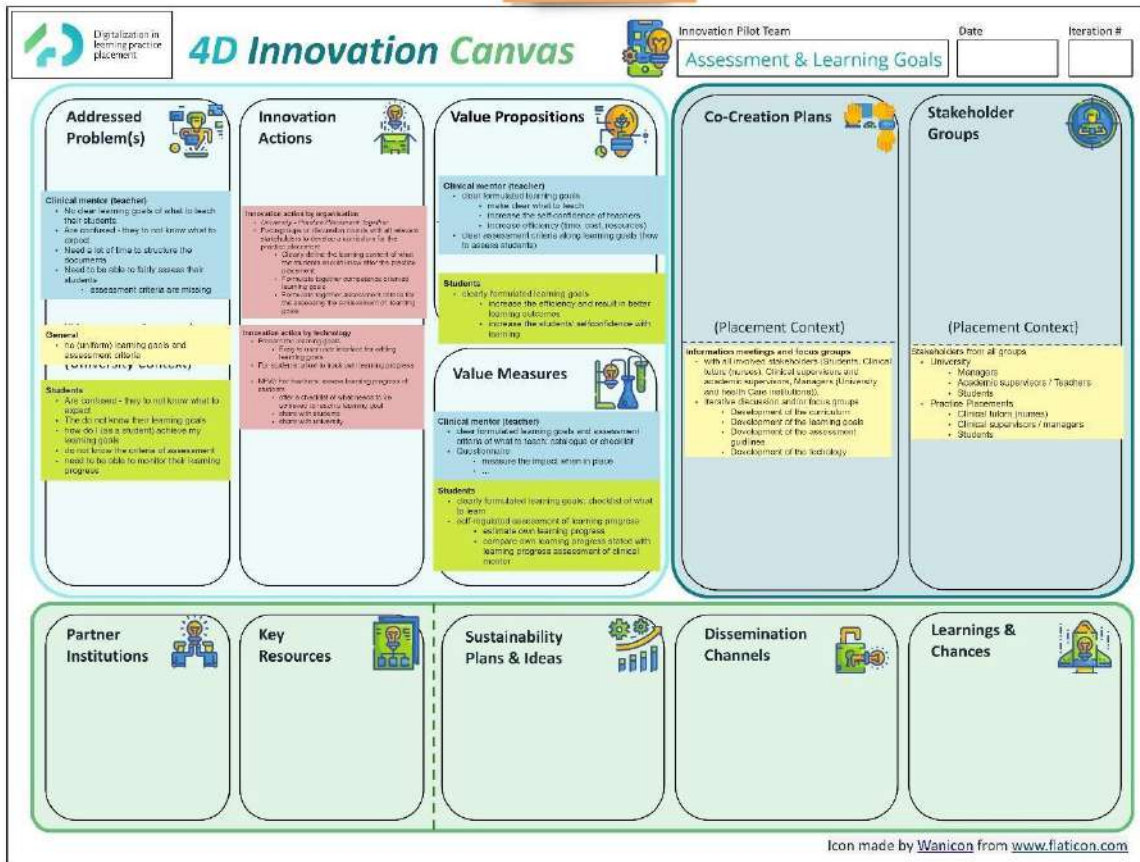


Figure 22: 4DIC – Round 2 – Trajectory 3

### 7.3. Final 4D Innovation Canvases

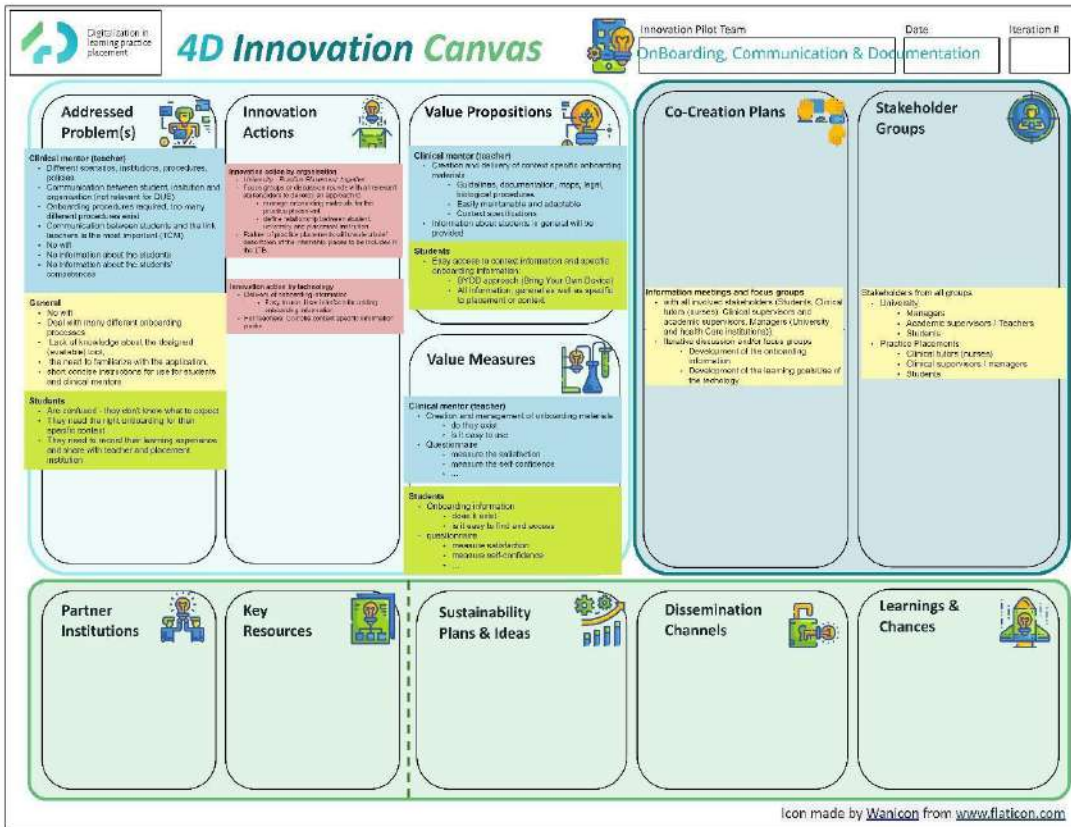


Figure 24: 4DIC – Round 3 – Trajectory 1

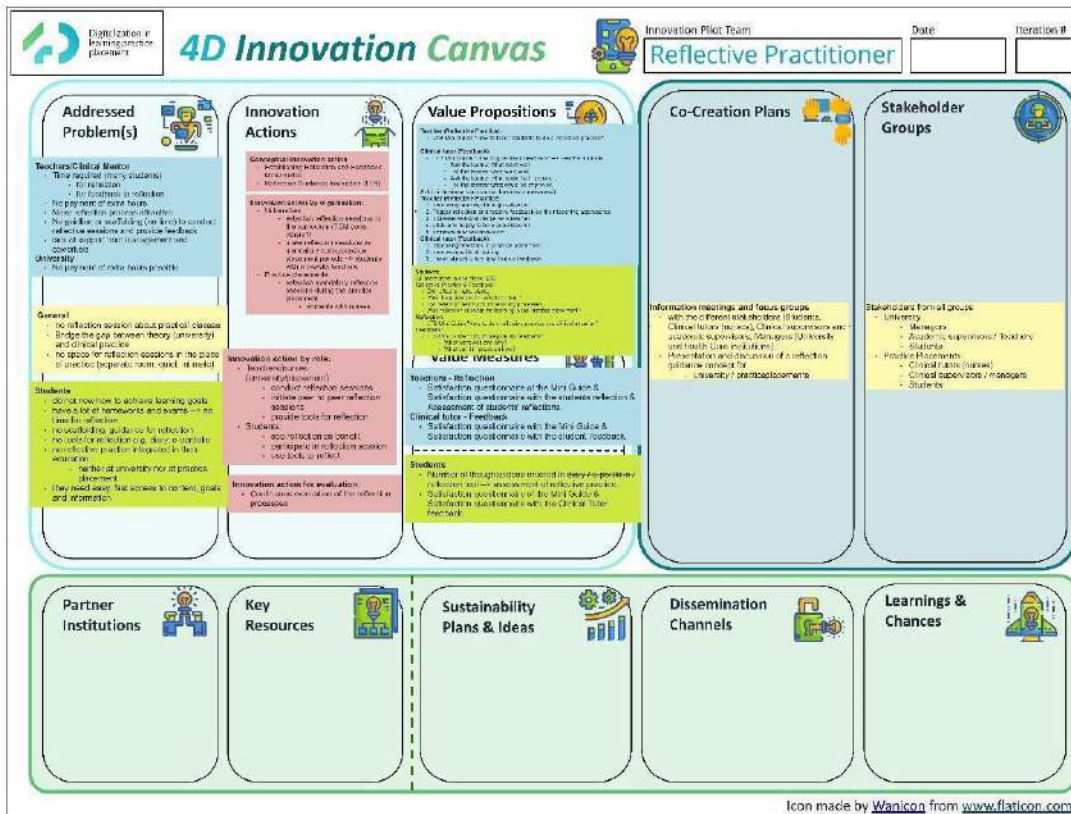


Figure 23: 4DIC – Round 3 – Trajectory 2

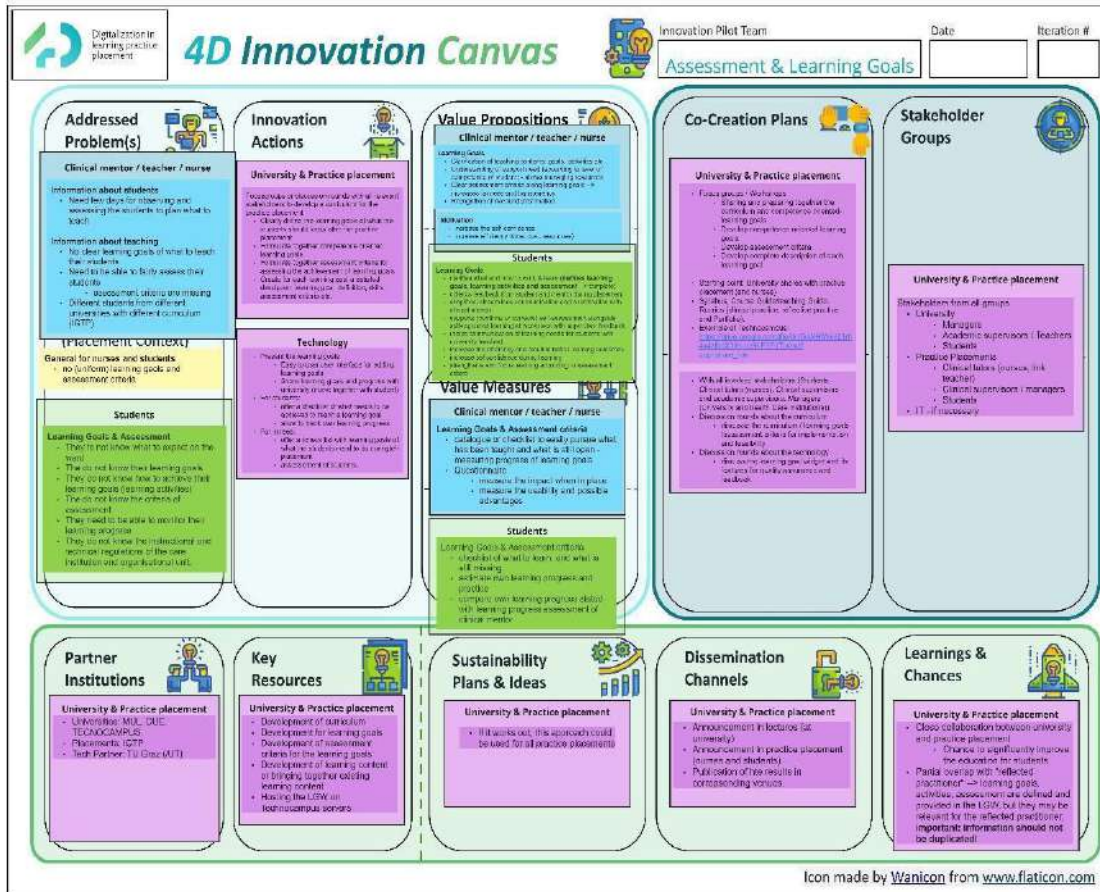


Figure 25: 4DIC – Round 3 – Trajectory 3

## 8. Appendix B – Trajectory 1

### 8.1. Trajectory 1: Personas

#### Persona: Manager Practicum: Laura

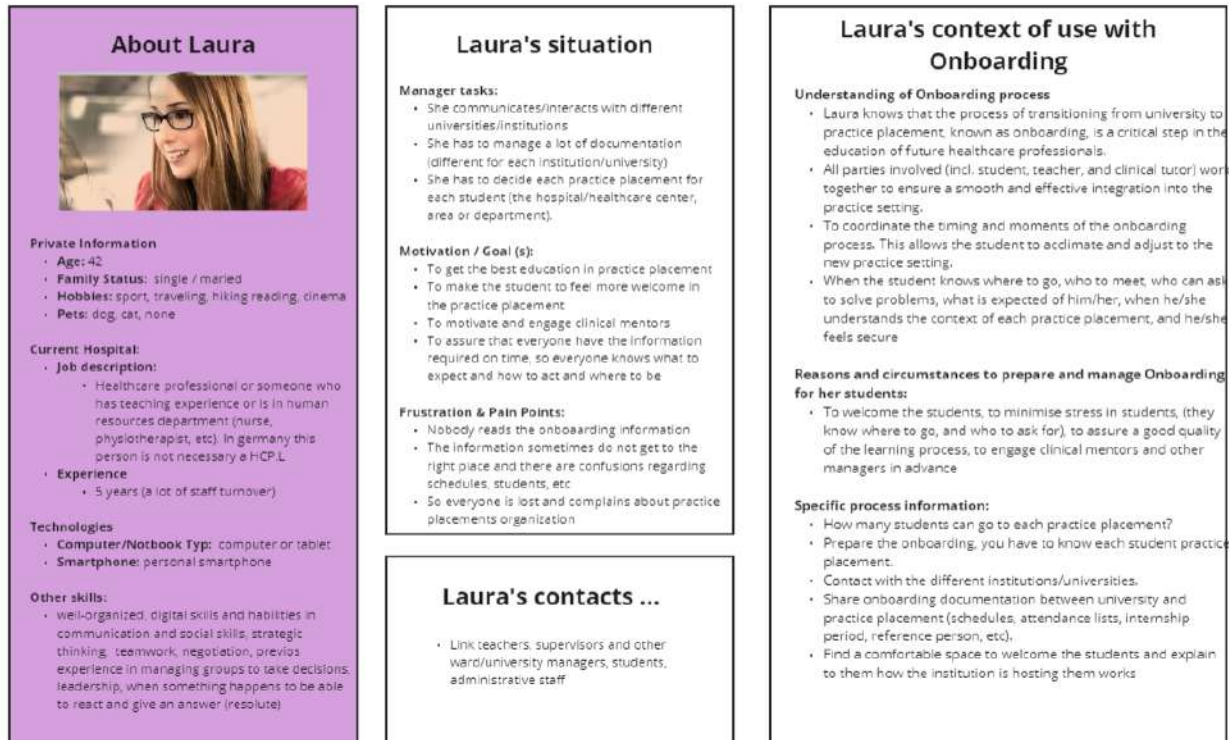


Figure 27: Persona: Manager Practicum Laura – Trajectory 1

#### Persona: Student: Steven

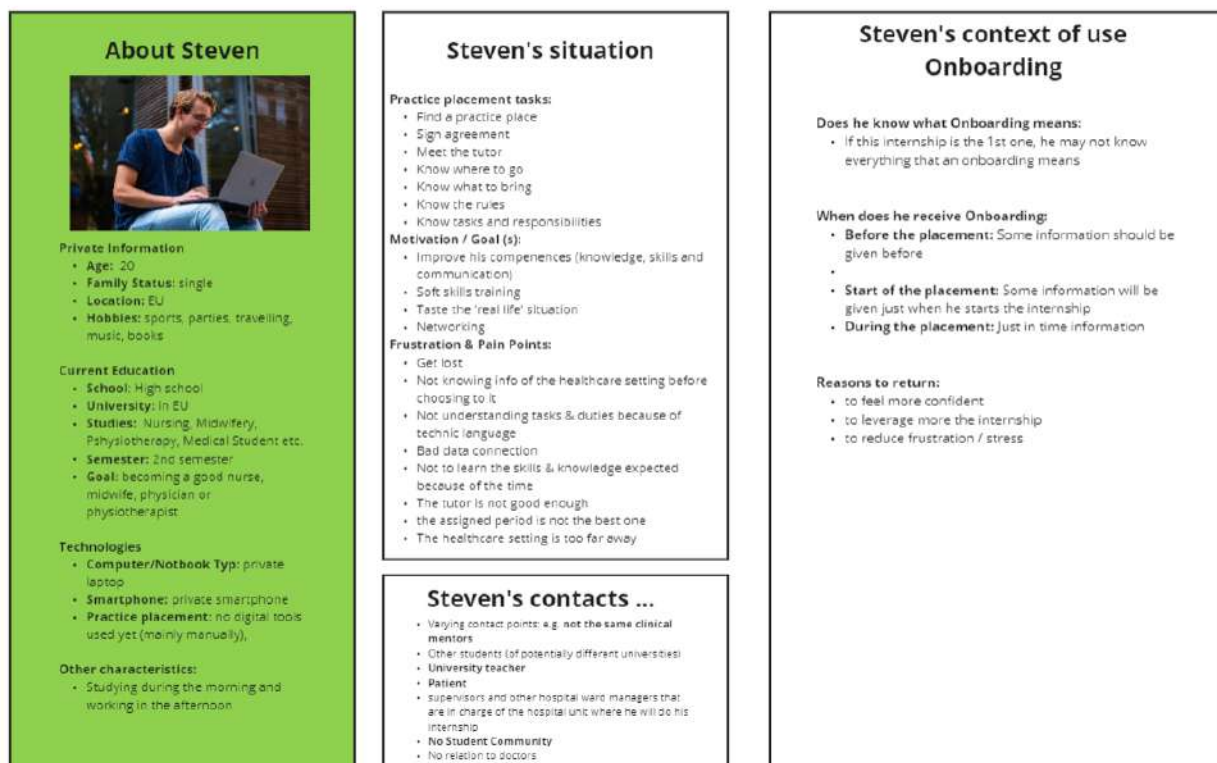


Figure 26: Persona: Student Steven – Trajectory 1

## 8.2. Trajectory 1: Scenarios

### Scenario with Manager Practicum Laura

The academic year is about to start and Laura has to manage all student's practice placements. She has previously contacted with different institutions/universities to know how many students can go to each practice placement. After a hard negotiation with different institutions, she gets the offer and students are distributed in different practice placements. Laura has to contact all the institutions again in order to know all the onboarding details, so lots of emails are sent and Laura gets lost in the middle of all those emails, so she gets stressed. Lots of changes are made in the middle of the process so she has to reorganise all the time. But Laura suddenly remembers that she can use LTB, where all the institutions can upload all this onboarding documentation and information. If all the institutions can access to the LTB, all this processes are easier for everybody

Figure 28: Scenario with Manager Practicum Laura – Trajectory 1

### Scenario with Student Steven

Steven signs in to the app, to be able to access all the necessary information

Steven needs to pick a practice place and looks at the given information about each available hospital to learn what skills he will be able to train at each particular place

He needs to choose a place

When Steven is assigned to a practice place, before his first day he familiarises himself with the rules, layout, location etc. of his practice place. He makes sure he knows who his tutor is and how to find/contact them.

Steven has to sign some legal papers

During the practice placement Steven has a need to learn more about his particular duties and tasks. He needs to be able to read up or find the right person to help him further

Steven writes up a short report on what he has done and how he gets on with his learning goals. This could be in the form of a document maybe. He sends this report back to the university

Figure 29: Scenario with Student Steven – Trajectory 1

### 8.3. Trajectory 1: User Journey

#### User journey for Manager Practicum Laura

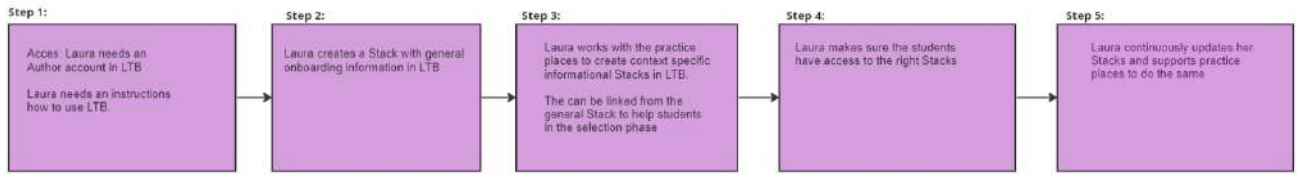


Figure 30: User journey for Manager Practicum Laura – Trajectory 1

#### User journey for Student Steven

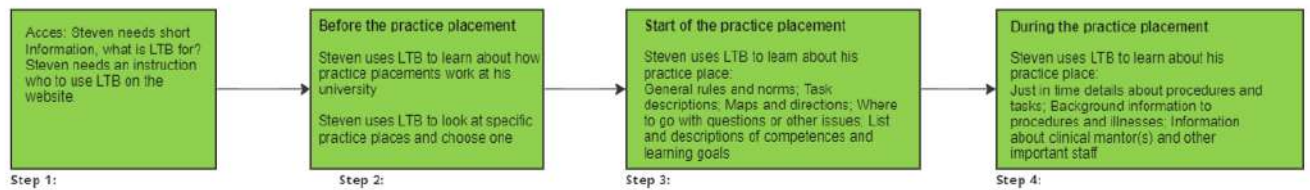


Figure 31: User journey for Student Steven – Trajectory 1

### 8.4. Trajectory 1: Mock-ups

Screenshots from the onboarding stacks created by the placement partners in LTB.

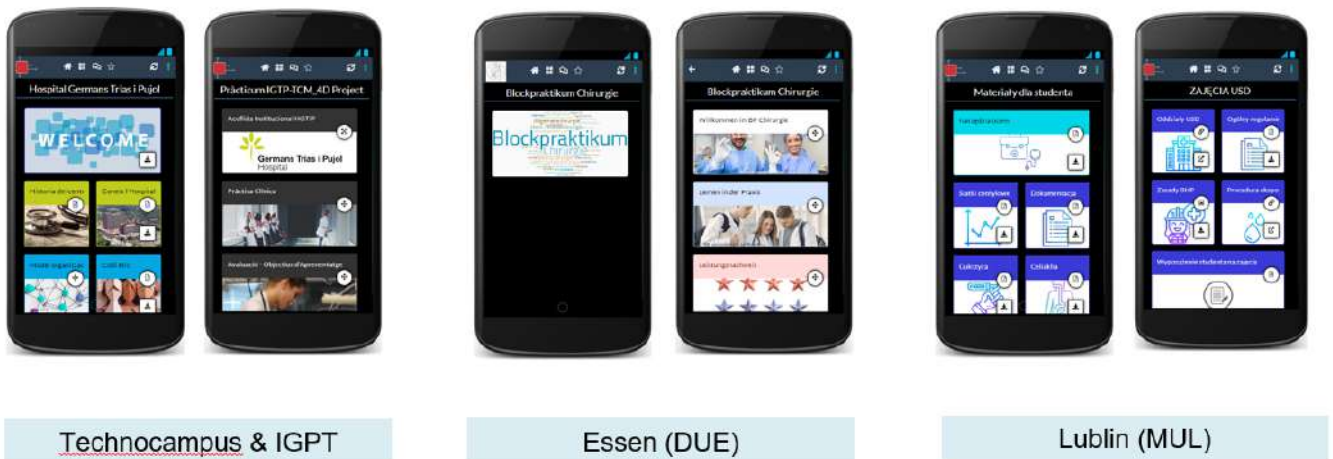


Figure 32: Screenshots from the onboarding stacks created by the placement partners in LTB – Trajectory 1

## 9. Appendix C – Trajectory 2

### 9.1. Trajectory 2: Personas

#### Persona: Clinical Mentor: Mary

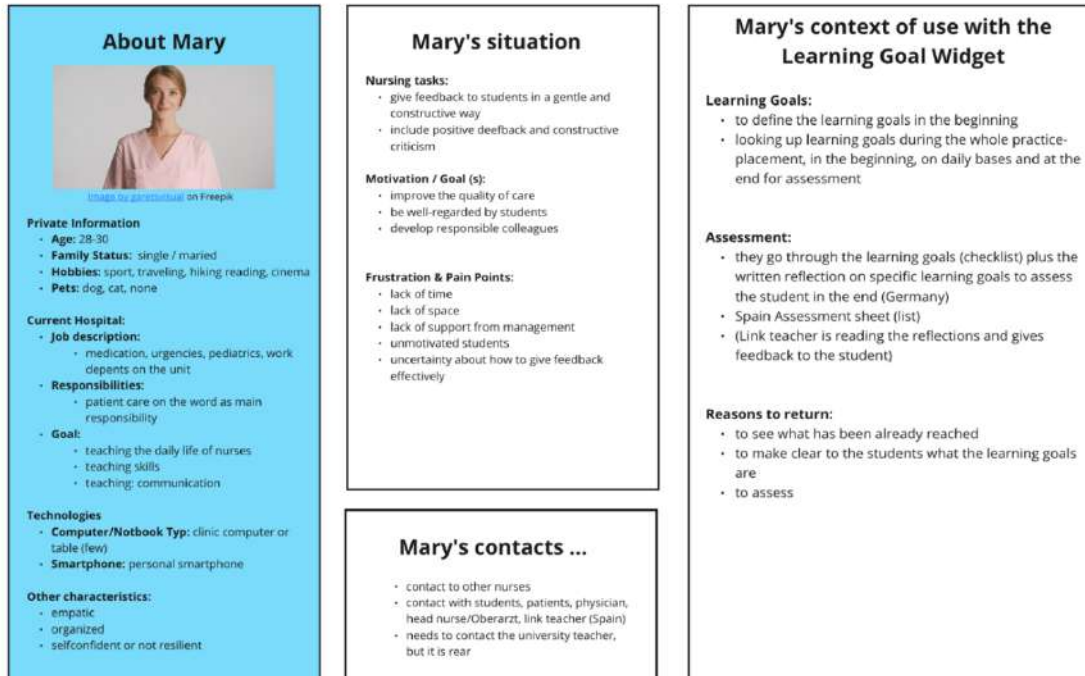


Figure 34: Persona: Mentor Mary – Trajectory 2

#### Persona: Student: Steven

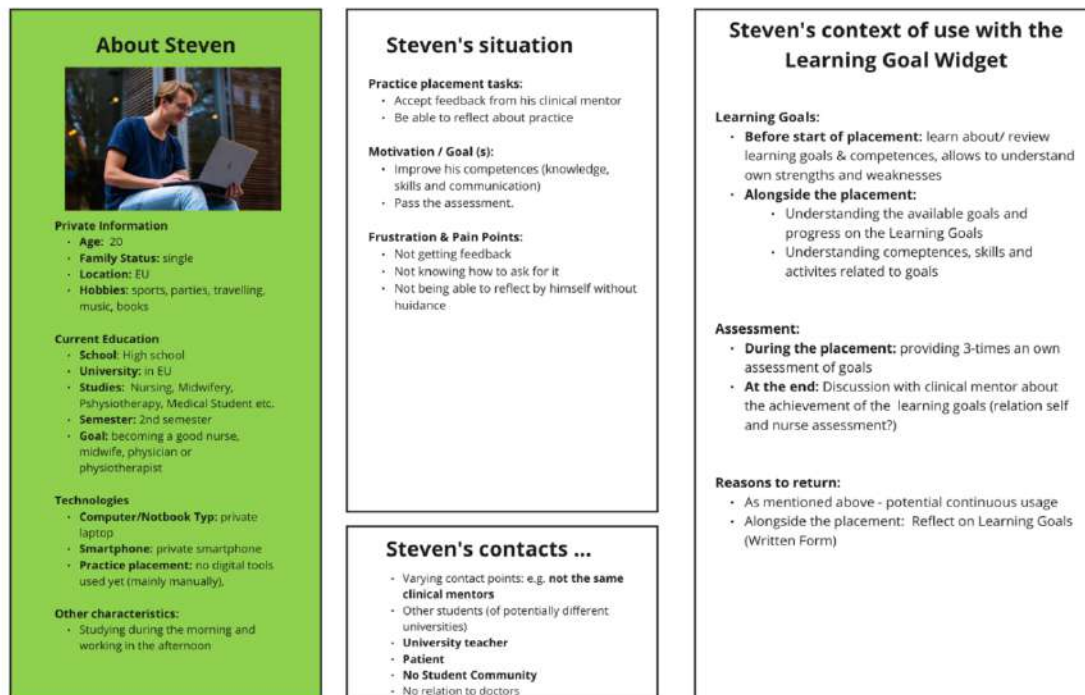


Figure 33: Persona: Student Steven – Trajectory 2

## 9.2. Trajectory 2: Scenarios

### Scenario with Clinical Mentor: Mary

Two cases of Mary given feedback to her students in different clinical situations:

Case 1: Mary uses a feedback guide to correct a mistake by a student in catheterization and involves the whole group in the process.

Case 2: Mary repeats the information on how to measure blood pressure at home after a student fails to communicate well with an elderly patient and uses her mini feedback guide to help the student.

Figure 36: Scenario: Clinical Mentor Mary – Trajectory 2

### Scenario with Student Steven

Two cases of Steven, a student who receives feedback and reflects on his practice in a clinical setting.

Case 1. Feedback: Steven gets personal feedback from a nurse through a widget and answers a questionnaire about it.

Case 2. Reflective practice: Steven uses a guide to reflect on his practice with his peers and teacher in a seminar and connects it with the feedback he received.

Figure 35: Scenario: Student Steven – Trajectory 2



### 9.3. Trajectory 2: User Journey

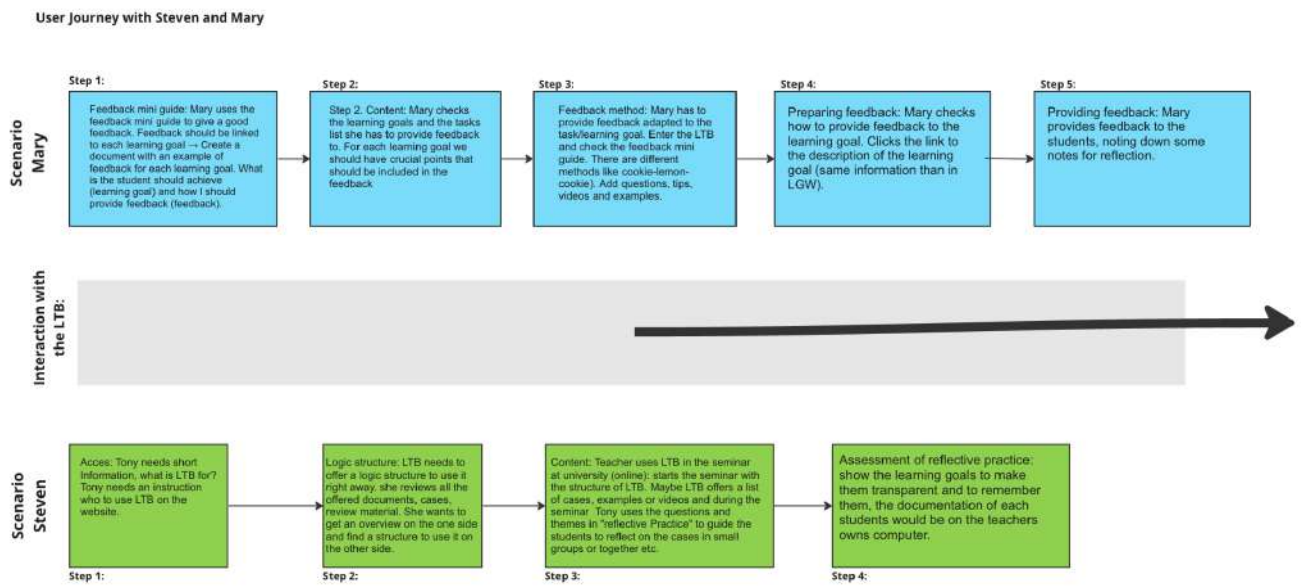


Figure 37: User Journey: Clinical Mentor Mary and Student Steven – Trajectory 2

## 9.4. Trajectory 2: Mock-ups

### Step 1: Access to the LTB

**How to start using the Learning Toolbox?**

**Step 1. Download the Learning Toolbox App.** Search for 'Learning Toolbox' in Google Play or App Store and download the App.

**Step 2. Create your account**

- Open the Learning Toolbox App on your mobile or tablet
- Create an account. You can use your tecno-campus account or an account such as facebook, google, etc.

**Step 3. Scan the QR code of the Feedback or Reflective Practice App. Select the Learning Toolbox scanner and scan the QR code of the LTB (Reflective Practice or Feedback)**

**Step 4. Other devices and computers.** You can check the App from your computer. Open the Feedback App URL (<https://api.ltb.io/show/ABSAI>) or the Reflective Practice App URL (<https://api.ltb.io/show/ABSVD>) in a web browser to access the web version.

Figure 39: Mockup: Access to LTB – Trajectory 2

**Step 2. Create the Feedback mini guide**

**4D Feedback Mini Guide**  
WP3 – Design and digitalisation  
Trajectory 2: Reflective Practice

**What is Feedback?**

Telling a fellow student that they are doing a good job usually comes from talking to them. However, it takes a lot more time and effort to provide feedback for creating your own performance. Giving constructive feedback in a constructive manner will be all professionals who study with us in our program. For feedback to be good feedback we want to make sure we...

**Universität Düsseldorf: What is Feedback?**

Telling a fellow student that they are doing a good job is usually easier than criticizing them. However, criticism in a constructive form is indispensable for improving one's own performance. Giving constructive feedback is an important communication t...

Figure 38: Mockup: Create the Feedback mini guide – Trajectory 2

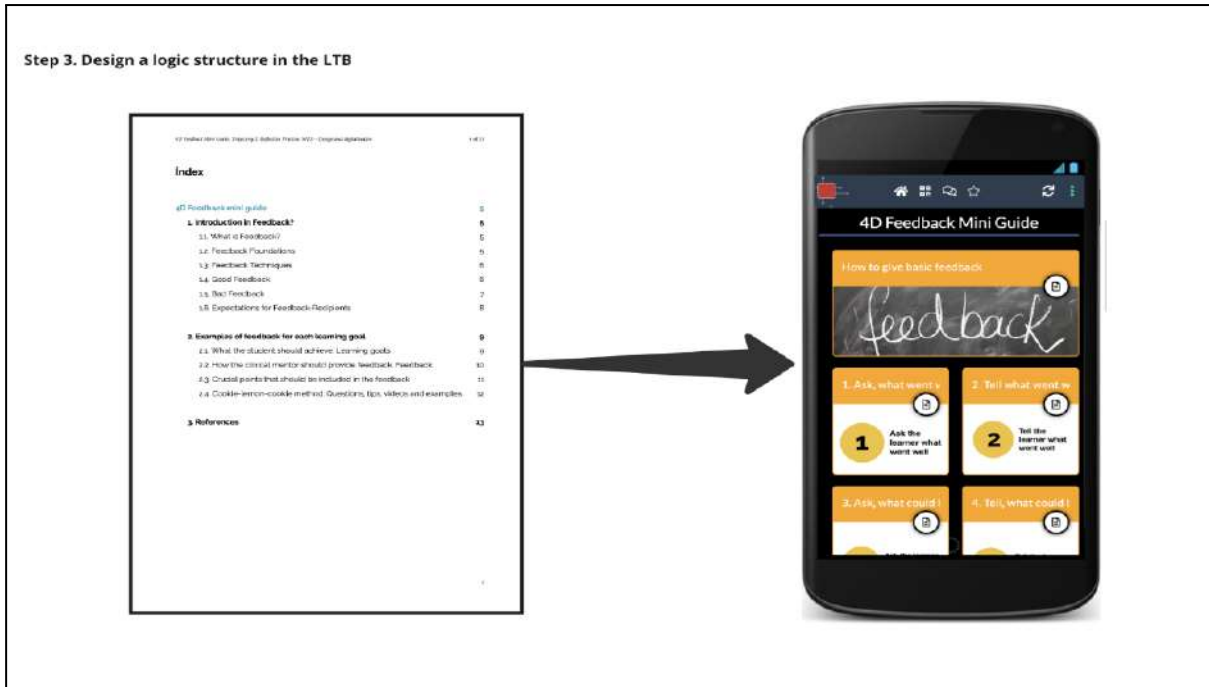


Figure 40: Mockup: Design a logic structure in the LTB – Trajectory 2

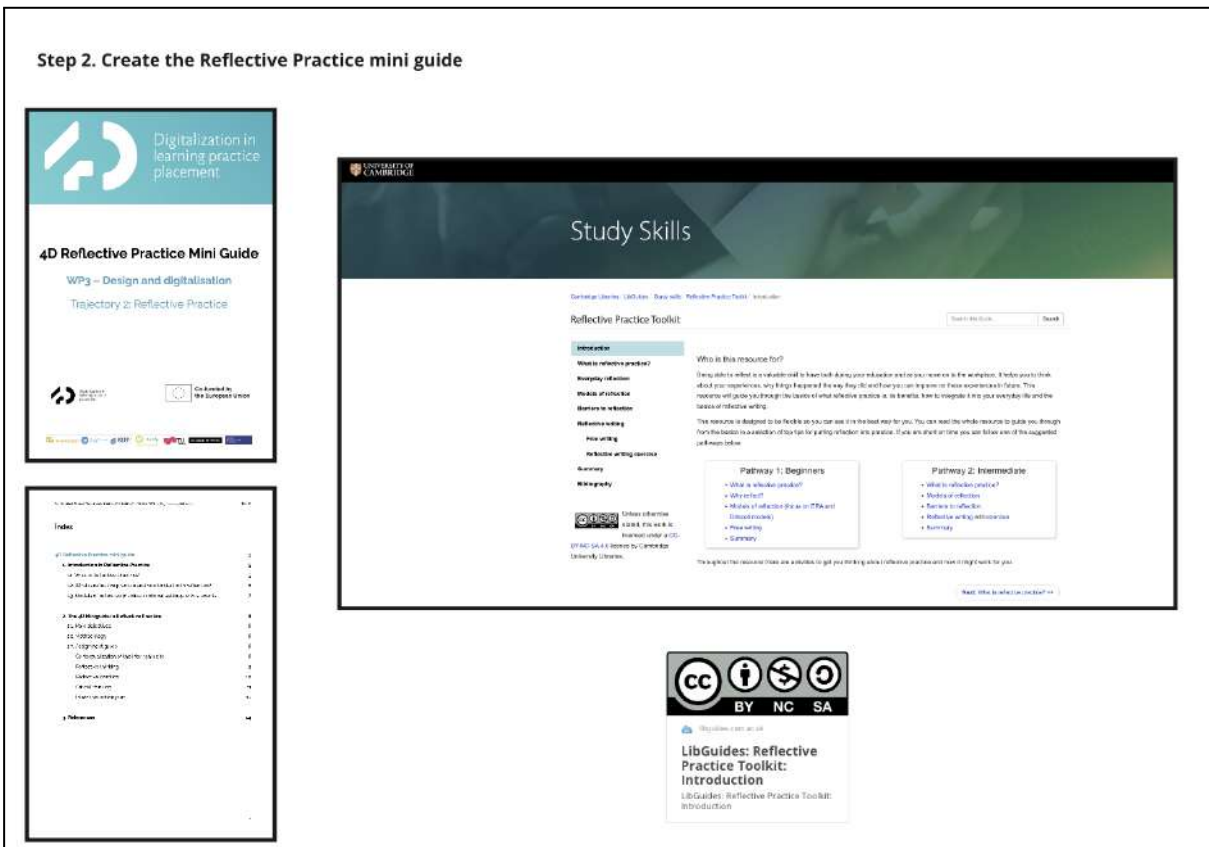


Figure 41: Mockup: Create the Reflective Practice mini guide – Trajectory 2

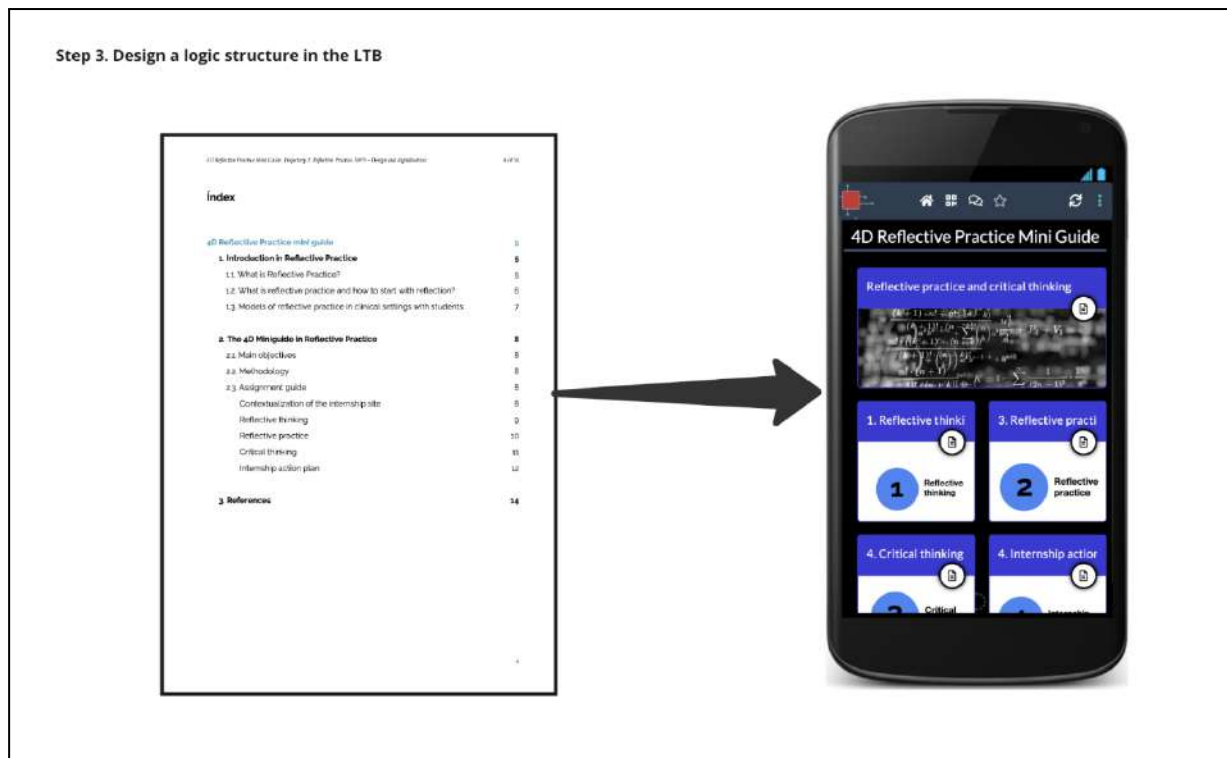


Figure 43: Mockup: Design a logic structure in the LTB – Trajectory 2



Figure 42: Access to the corresponding LTBs

## 10. Appendix D – Trajectory 3

### 10.1. Trajectory 3: Personas

#### Persona: Clinical Mentor: Mary


<p style="text-align: center;"><b>About Mary</b></p>  <p style="text-align: center; font-size: small;">Photo by pixabay.com/FreePress</p> <p><b>Private Information</b></p> <ul style="list-style-type: none"> <li>Age: 28-30</li> <li>Family Status: single / married</li> <li>Hobbies: sport, traveling, hiking, reading, cinema</li> <li>Pets: dog, cat</li> </ul> <p><b>Current Hospital:</b></p> <ul style="list-style-type: none"> <li><b>Job description:</b> <ul style="list-style-type: none"> <li>medication (urgencies, pediatrics, work depends on the unit)</li> </ul> </li> <li><b>Responsibilities:</b> <ul style="list-style-type: none"> <li>patient care on the ward as main responsibility</li> </ul> </li> <li><b>Goal:</b> <ul style="list-style-type: none"> <li>teaching the daily life of nurses</li> <li>teaching skills</li> <li>teaching communication</li> </ul> </li> </ul> <p><b>Technologies</b></p> <ul style="list-style-type: none"> <li><b>Computer/Notebook Type:</b> clinic computer or table (fixed)</li> <li><b>Smartphone:</b> personal smartphone</li> </ul> <p><b>Other characteristics:</b></p> <ul style="list-style-type: none"> <li>empathic</li> <li>organized</li> <li>adaptable and fast learner</li> </ul>	<p style="text-align: center;"><b>Mary's situation</b></p> <p><b>Clinical tutor tasks:</b></p> <ul style="list-style-type: none"> <li>taking care of patients</li> <li>medication, prescription</li> <li>practical skills</li> <li>communication &amp; administration</li> <li>supporting and working with doctors</li> </ul> <p><b>Motivation / Goal (s):</b></p> <ul style="list-style-type: none"> <li>taking care of all patients</li> <li>to convey the skills and knowledge</li> <li>create "good" nurses/doctors by supporting their education</li> <li>share their experience and knowledge</li> </ul> <p><b>Frustration &amp; Pain Points:</b></p> <ul style="list-style-type: none"> <li>don't have time</li> <li>don't have the skills to teach skills well</li> <li>don't have the skill how to assess</li> <li>need more information to teach the right stuff</li> <li>they do not get paid</li> <li>no kind of recognition</li> </ul>	<p style="text-align: center;"><b>Mary's context of use with the Learning Goal Widget</b></p> <p><b>Learning Goals:</b></p> <ul style="list-style-type: none"> <li>to define the learning goals in the beginning</li> <li>looking up learning goals during the whole practice placement, in the beginning, on daily bases and at the end for assessment</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>they go through the learning goals (checklists) plus the written reflection on specific learning goals to assess the students in the end (Germany)</li> <li>Soain Assessment sheet (list)</li> <li>Link teacher (acts as liaison between the educational institution and the clinical practice placement) is reading the reflections and gives feedback to the student</li> </ul> <p><b>Reasons to return:</b></p> <ul style="list-style-type: none"> <li>to see what has been already reached</li> <li>to make clear to the students what the learning goals are</li> <li>to assess</li> </ul>
<p style="text-align: center;"><b>Mary's contacts ...</b></p> <ul style="list-style-type: none"> <li>contact to other nurses</li> <li>contact with students, patients, physician, head nurse/obstetric link teacher (Spain)</li> <li>needs to contact the university teacher, but it is rare!</li> </ul>		

Figure 45: Persona: Mentor Mary – Trajectory 3

#### Persona: Student: Steven


<p style="text-align: center;"><b>About Steven</b></p>  <p><b>Private Information</b></p> <ul style="list-style-type: none"> <li>Age: 20</li> <li>Family Status: single</li> <li>Location: EU</li> <li>Hobbies: sport, parties, travelling, music, books</li> </ul> <p><b>Current Education</b></p> <ul style="list-style-type: none"> <li>School: High school</li> <li>University: in EU</li> <li>Studies: Nursing, Midwifery, Physiotherapy, Medical Student etc.</li> <li>Semester: 2nd semester</li> <li>Goal: becoming a good nurse, midwife, physician or physiotherapist</li> </ul> <p><b>Technologies</b></p> <ul style="list-style-type: none"> <li><b>Computer/Notebook Type:</b> or tablet laptop</li> <li><b>Smartphone:</b> owns a smartphone</li> <li><b>Practice placement:</b> no digital tools used yet (mainly manually)</li> </ul> <p><b>Other characteristics:</b></p> <ul style="list-style-type: none"> <li>studying during the morning and working in the afternoon</li> </ul>	<p style="text-align: center;"><b>Steven's situation</b></p> <p><b>Practice placement tasks:</b></p> <ul style="list-style-type: none"> <li>Current situation: Following clinical mentor/ nurse and learning from observing/ copying</li> <li>Ideal situation: Learn and implement tasks in relation to the learning goals of the course</li> </ul> <p><b>Motivation / Goal (s):</b></p> <ul style="list-style-type: none"> <li>To learn in practice about the learning goals and bridge the gap between theory and practice</li> <li>After practice placement, Steven wants to autonomously perform tasks (learn competences and skills)</li> </ul> <p><b>Frustration &amp; Pain Points:</b></p> <ul style="list-style-type: none"> <li>Understanding cases, comparisons and skills (activities in practice placement) in relation to goals of university</li> <li>Feeling of being alone and lost</li> <li>Clinical mentors (due to rotation) schedule with varying expectations/ interests, tools/ methods and motivation to supervise &amp; teach, communication and coordination skills</li> </ul>	<p style="text-align: center;"><b>Steven's context of use with the Learning Goal Widget</b></p> <p><b>Learning Goals:</b></p> <ul style="list-style-type: none"> <li><b>Before start of placement:</b> learn about/ review learning goals &amp; competences, allows to understand own strengths and weaknesses</li> <li><b>Alongside the placement:</b> <ul style="list-style-type: none"> <li>Understanding the available goals and progress on the Learning Goals</li> <li>Understanding competences, skills and activities related to goals</li> <li>Follow up learning activities for their learning goals</li> </ul> </li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li><b>During the placement:</b> providing 3-times an own assessment of goals</li> <li><b>At the end:</b> Discussion with clinical mentor about the achievement of the learning goals (relativ self and nurse assessment)</li> </ul> <p><b>Reasons to return:</b></p> <ul style="list-style-type: none"> <li>As mentioned above - potential continuous usage</li> <li>Alongside the placement: Reflection Learning Goals (Written Form)</li> </ul>
<p style="text-align: center;"><b>Steven's contacts ...</b></p> <ul style="list-style-type: none"> <li>Varying contact, politics e.g. <b>not the same clinical mentor for the whole practice placement</b></li> <li>Other students (of potentially different universities)</li> <li><b>University teacher</b></li> <li><b>Patients</b></li> <li><b>No Student Community</b></li> <li>No relation to doctors</li> </ul>		

Figure 44: Persona: Student Steven – Trajectory 3

## 10.2. Trajectory 3: Scenarios

### Scenario with Clinical Mentor: Mary

Today is a normal day; Mary (clinical mentor) is busy preparing medication, visiting patients, and more. Suddenly, a student named Steven arrives (late) and Mary has no prior knowledge of him, his learning goals, or the subjects he is studying. She is in a bad mood and the student feels rejected. Steven introduces himself and expresses his desire to have Mary check his learning goals.

Feeling overwhelmed, Mary is about to give up when an "Angel" comes to her rescue. The supervisor shows Mary how to use the Learning Goal Widget, a tool that allows her to keep track of Steven's progress and plan for the next day or week. Mary and Steven work together, using the Learning Goal Widget, to review and set learning goals, and to plan and track progress.

As the internship progresses, Mary and Steven regularly check the list of learning goals and work to achieve them. They also use the widget to provide feedback and comments, and at the end of the internship, Mary uses the widget to give Steven a final assessment, including a digital signature.

Thanks to the Learning Goal Widget, Mary feels more relaxed and confident in her role as a clinical mentor, and Steven benefits from her guidance and support. At the end of the story, Mary is happy with the results and feels more relaxed and confident using the Learning Goal Widget.

Figure 46: Scenario: Clinical Mentor Mary – Trajectory 3

### Scenario with Student Steven

1. Steven goes to the working place; today his learning goal (skill) is to learn taking blood.
2. Steven watches how the nurse does the blood taking and he was allowed to practice this procedure with several patients. Finally he got the ok to do it by his own.
3. During the practice placement, he assesses his skills of blood taking three times during the practice placement on his own. This requires coordination with Mary to get the chance to train this skill as part of the assigned tasks, which can be challenging.
4. When Steven feels secure about conducting the blood taking process, he tells the clinical tutor that he is ready to perform the task (can also be the other way around: Mary knows the student has to do the assessment and tells student to do it).
5. So when a new patient arrives and blood needs to be taken, the nurse asked Steven to do the task.
6. Mary assesses the performance of the task and the progress of the student regarding learning goal using the widget. While using the widget she is also sees the student's self assessment.
7. At the end of the practice placement, Steve together with his nurse go through all learning goals and assessments together and reflect about Steven's progress. Together they discuss what was good and what was bad and do the final assessment.

Note: at some point in time, when Steven asked a nurse to assess another task, Student feels rather nervous and was not able to conduct the task thoroughly. As the nurse knows that Steven is a good nurse, she gave him a second chance on another day and Steven repeated the task, without any mistakes. Both reflected together of what has happened and used the learning goals widget to assess the learning goal.

Figure 47: Scenario: Student Steven – Trajectory 3

### 10.3. Trajectory 3: User Journey

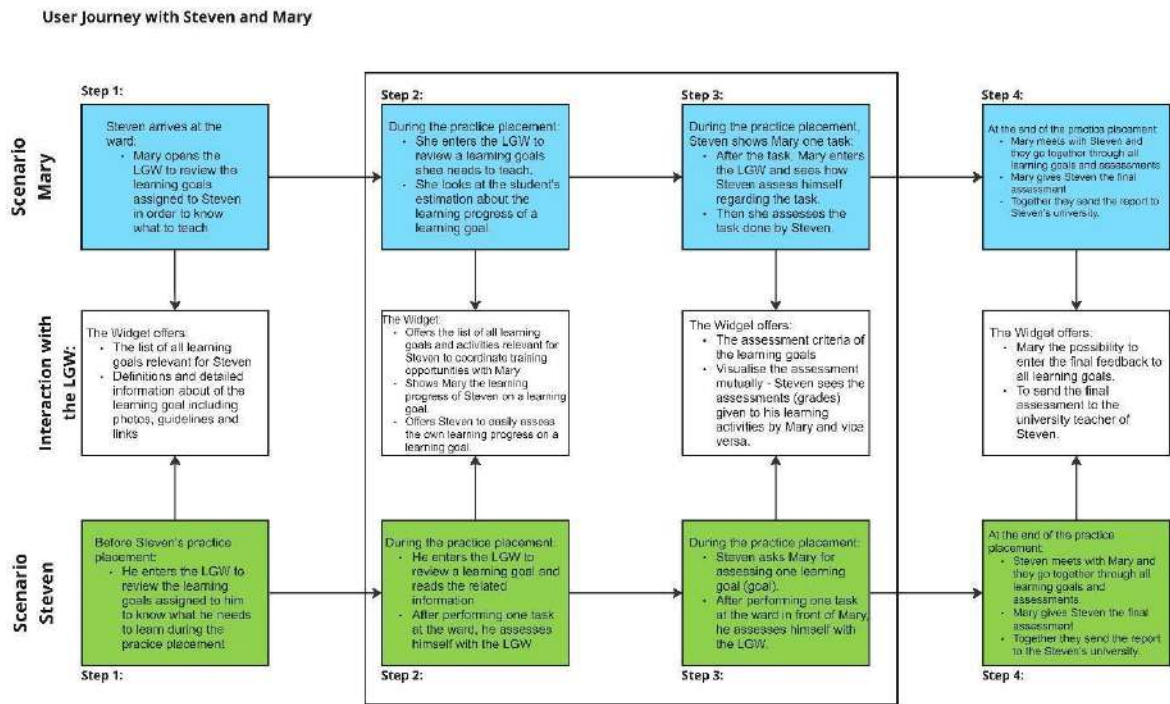


Figure 48: User Journey - Clinical Mentor Mary and Student Steven – Trajectory 3

### 10.4. Trajectory 3: Mock-ups

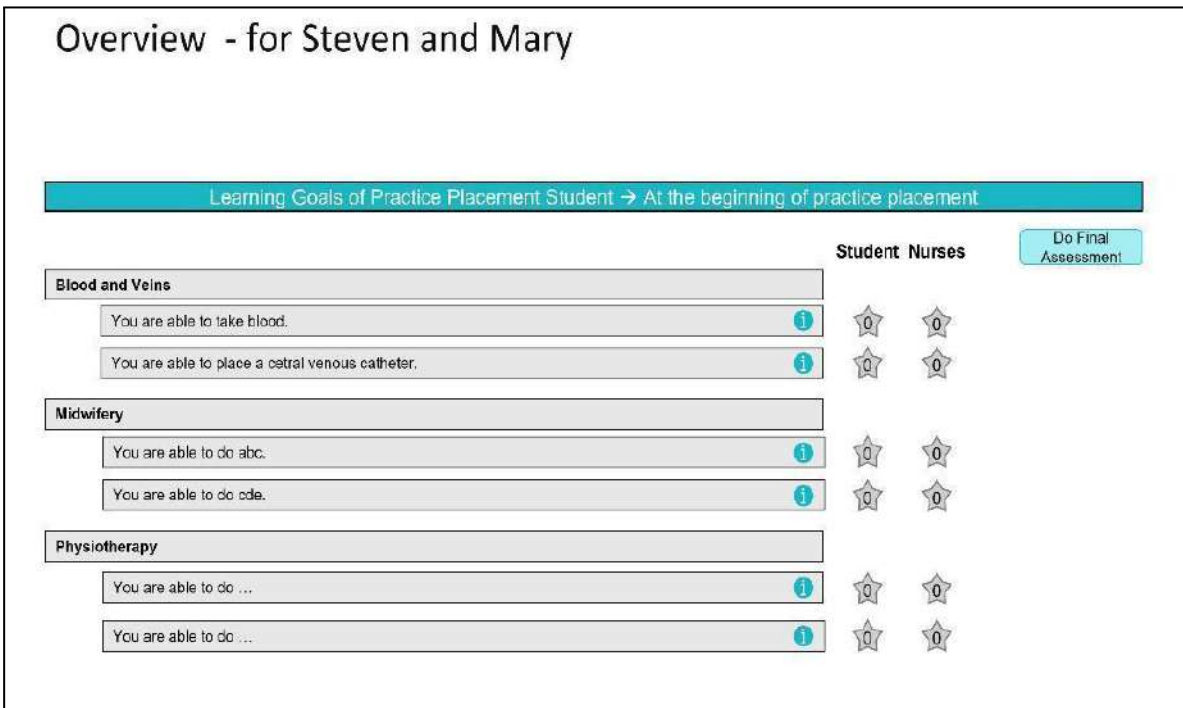


Figure 50: Mock-up: Learning Goal Overview – Trajectory 3

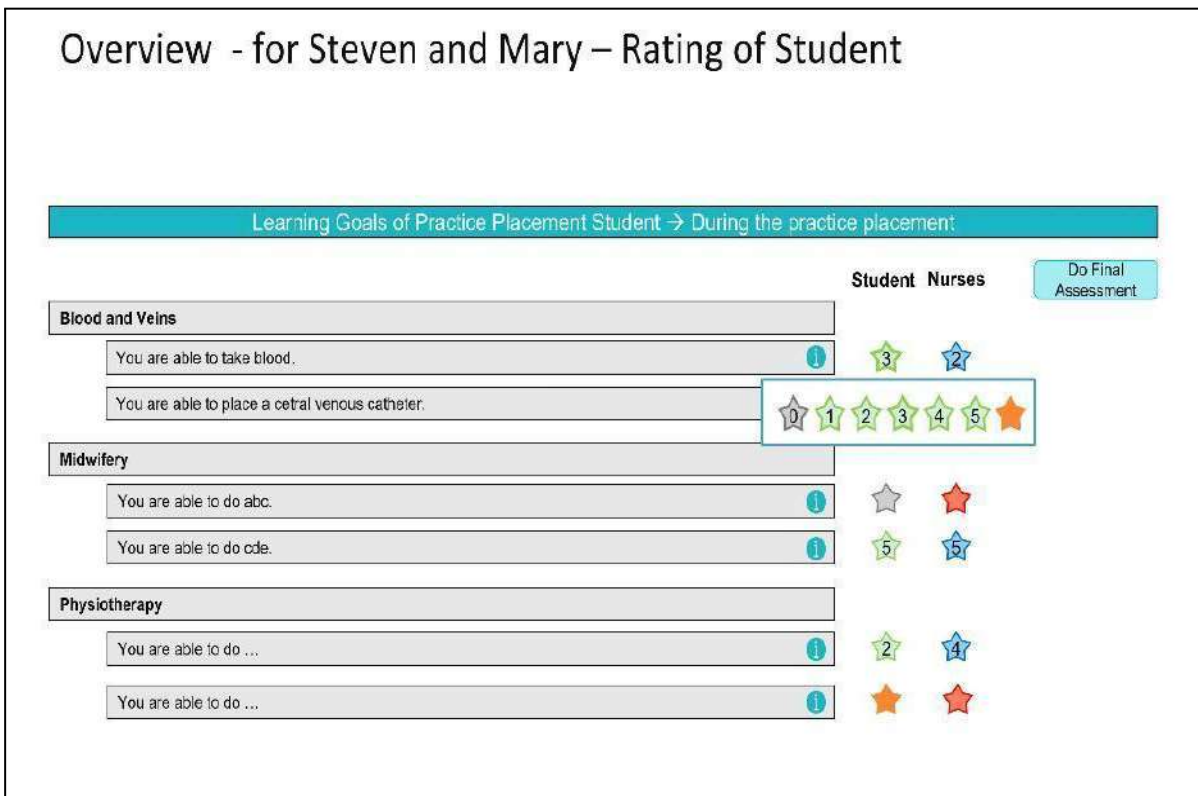


Figure 49: Mock-up: Learning Goal Overview with star assessment – Trajectory 3



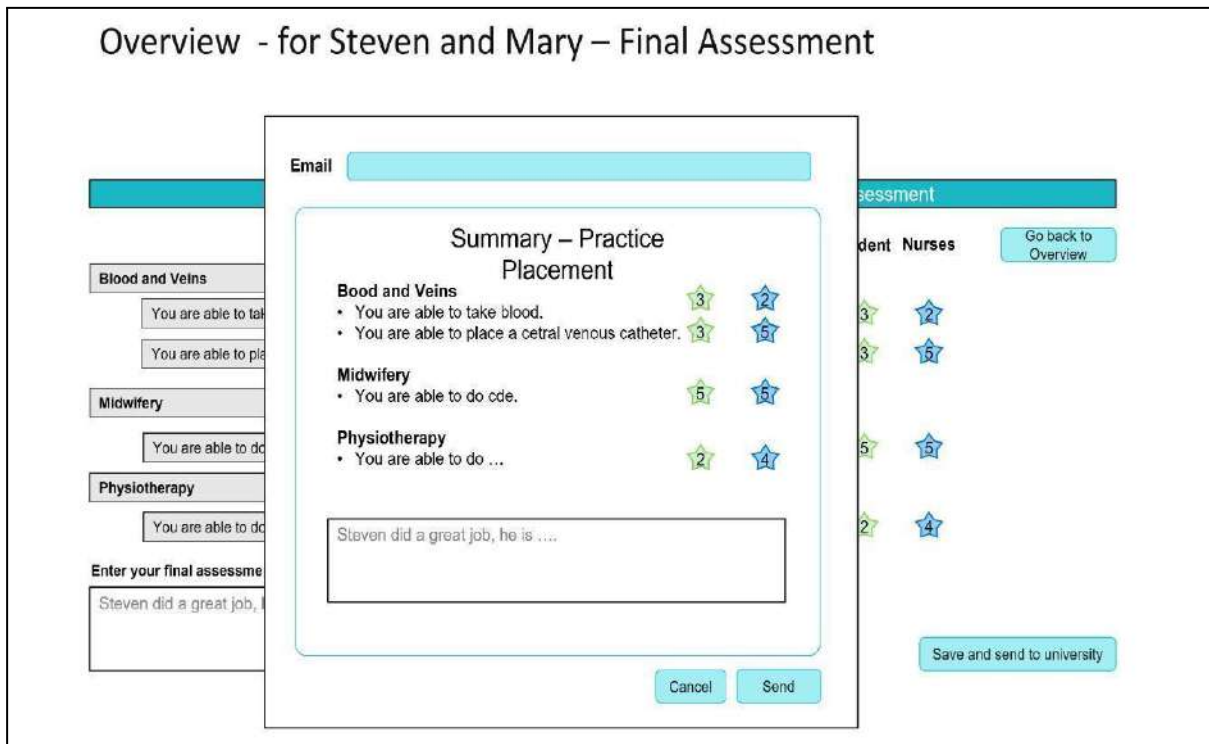
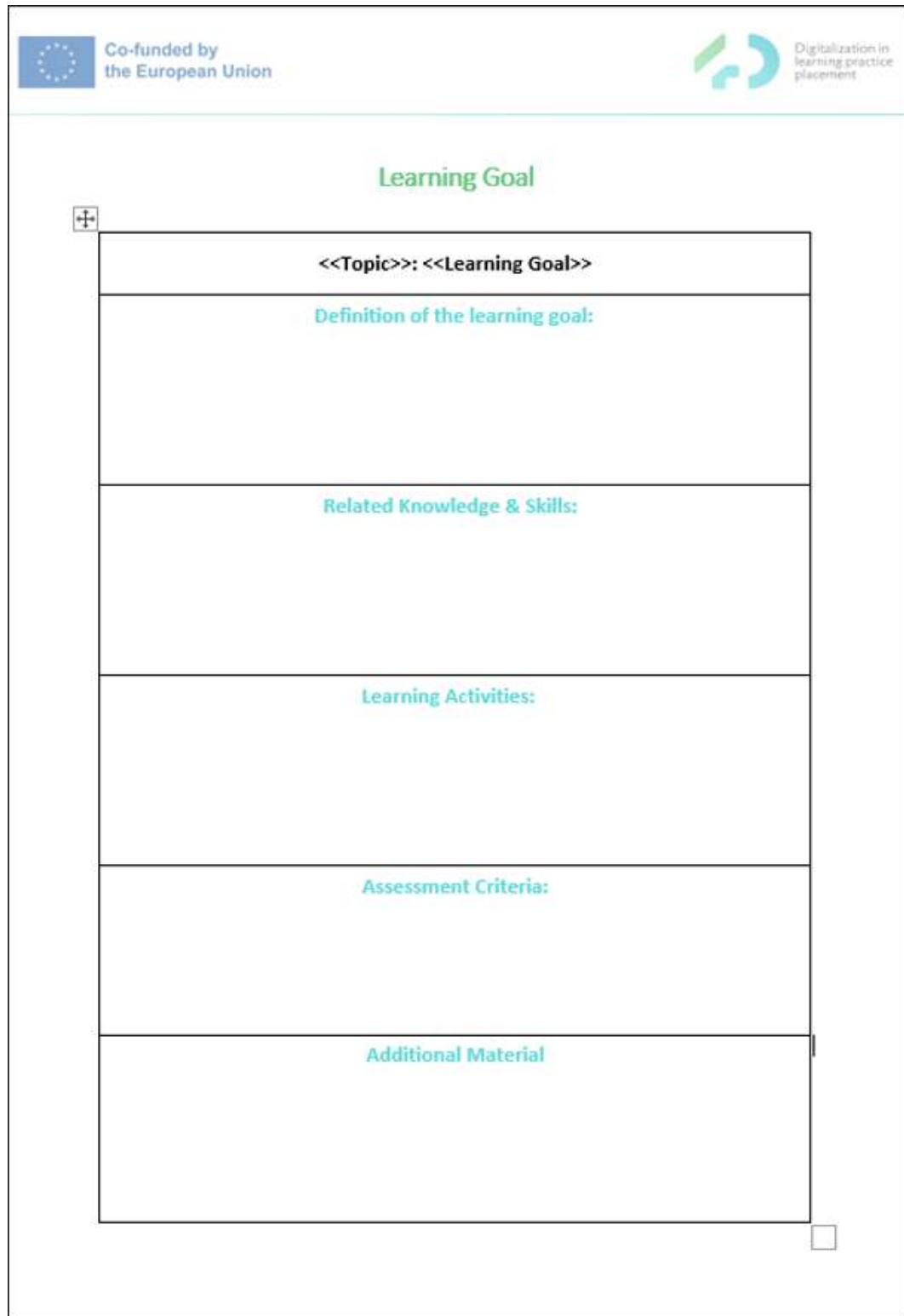


Figure 51: Mock-up: Learning Goal Widget Final Assessment - Trajectory 3

## 11. Appendix E

### 11.1. Learning Goal Blueprint



The figure shows a form template for a Learning Goal Blueprint. At the top left is the European Union flag and the text "Co-funded by the European Union". At the top right is a logo with two interlocking shapes and the text "Digitalization in learning practice placement". The main title "Learning Goal" is centered in green. Below it is a small icon of a plus sign in a square. The form consists of a large rectangular box with a black border, divided into six horizontal sections by thin black lines. The sections are labeled in blue text: "<<Topic>>: <<Learning Goal>>", "Definition of the learning goal:", "Related Knowledge & Skills:", "Learning Activities:", "Assessment Criteria:", and "Additional Material". A small square icon is located at the bottom right corner of the form box.

Co-funded by the European Union

Digitalization in learning practice placement

### Learning Goal

+

<<Topic>>: <<Learning Goal>>

Definition of the learning goal:

Related Knowledge & Skills:

Learning Activities:

Assessment Criteria:

Additional Material

Figure 52: Learning Goal Blueprint