Web-based Debriefing Dashboard

WP5 D2a. Design process for palliative care simulations

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Design of a debriefing dashboard

Content

Context

Part of the ACTIVATE project is to support the teaching of interprofessional collaboration in health professions education. Work package 3 will develop simulation-based scenarios involving students from several professions. Expansive learning from this multi-professional practice will mainly take place during the debriefing after the simulation. Work package 5 will design and develop a 'debriefing dashboard' to support this important debriefing and this document describes the design processes.

Preperatory work

Identification of Stakeholders:

a) Health Professions Education specialists: Prof. Samuel Edelbring (Mälardalen University), Dr. Bas de Leng (University of Münster)
b) Health Professions content experts

- for palliative care: Prof. Philipp Lenz, Florian Bernhardt (Central Palliative Care Centre of the Academic Medical Hospital Münster)
- for home care: Tiina Luukkanen, Erica Persson? (Academic nursing home Akvarellen)

c) Health Professions students

- for medicine: Linus Pinkernell (University of Münster)
- for nursing: Dr. Annica Kihlgren (Örebro University)
- for occupanional therapy\pharmacy Alexandra Björck (Örebro University)

Collecting stakeholder input

Workshops and brainstorming sessions.

Workshop during kickoff meeting 19.10.2024 Papendal, The Netherlands.

Participants:
Samuel Edelbring (ORU), Annica Kihlgren (ORU), Carola Liebe-Harkort (ORU), Florian Bernhardt (UM), Carola Peters (UM), Karina Sensen (UM), Johanna Schweizer (UM), Nele Woermann (UM), Bas de Leng (UM), Jochen Merker (UL), Andre Bester (UT).

Initially, it was assumed that the IP collaboration simulations for ACTIVATE would require a medical terminology vocabulary to populate a knowledge base that could automatically summarise the debriefing transcripts. However, stakeholders made it clear that the focus of the planned skills training was not so much on specific clinical skills or the performance of specific tasks, but rather on the application of more general knowledge and soft skills, and that the debriefings would pay more attention to 'problematising' and 'sensemaking' and to discussing tensions or contradictions in their collaboration. So it is not so much the medical terminology that is important, but the words used during debriefing or the specific terminology used in interprofessional collaboration. In addition, not only verbal expressions are of interest, but also non-verbal indicators such as facial expressions, gaze, gestures, tone or loudness of speech, etc. are interesting indicators to register.

Workshop HTWK team 15.11.2024 Leipzig, Germany.
Bas de Leng (UM), Friedrich Pawelka (UM), HTWK-coordinator: Oleg Krikotov; HTWK-supervisors: Jochen Merker, Thomas Riechert; HTWK-students: Clemens Berkenhoff, Tobias Gadau, Christin Göb, Kenn Kaubukowski, Felix Schmeißer.

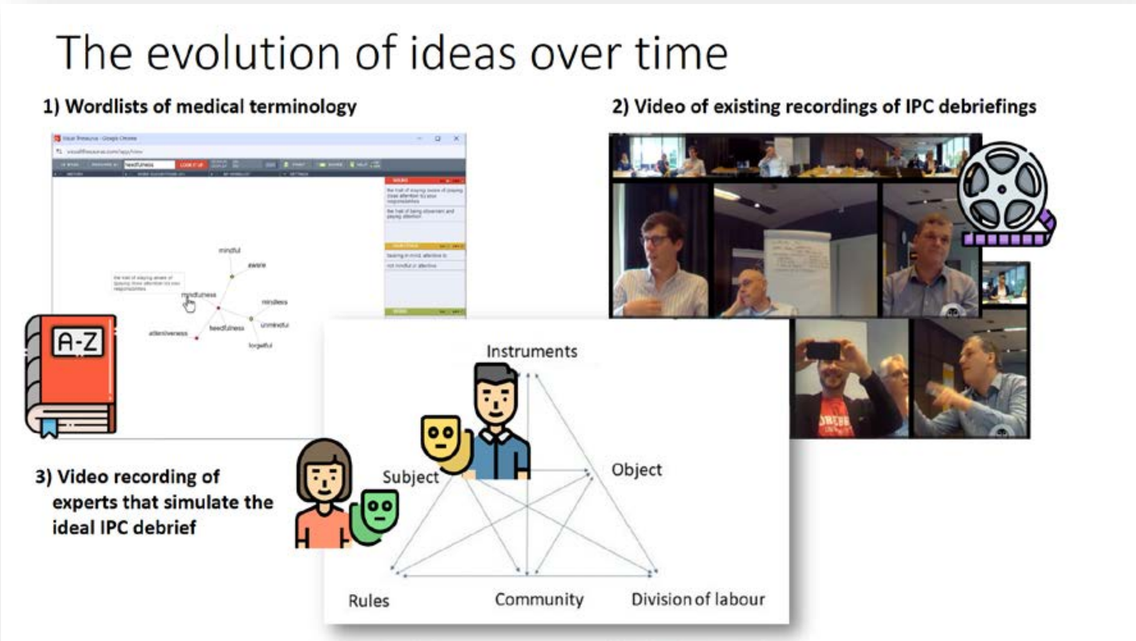


Fig.1 – The evolution of ideas over time.

Ideas to collect everyday language:
1) Experts in palliative care to come up with word variants that relate to topics they find important in IP collaboration. Problem: to conceptual for practioners. Alternative: devising vignettes for the most common problems in IP collaboration based on the elements of an Cultural-Historical Activity Theory CHAT activity system: instruments (e.g. patient record, lab form, telephon), object (e.g. patient

cure\care, relatives, hospital services), division of labour (e.g. hierarchy, triage, workschedules), rules (e.g. guidelines, limits competency).

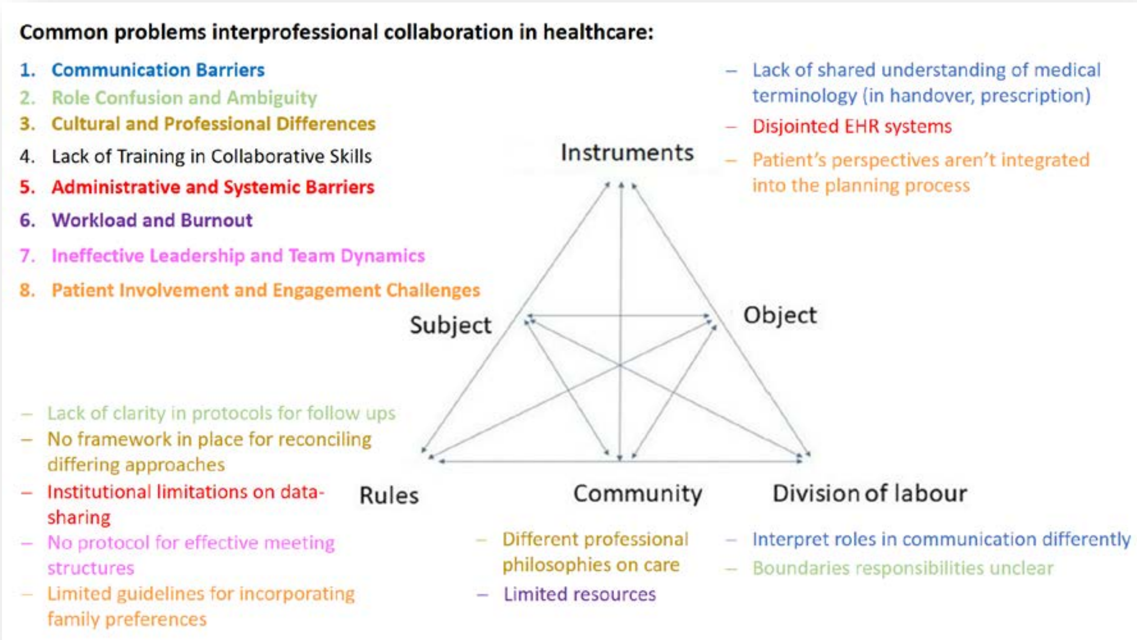


Fig.2 – Common problems of interprofessional collaboration in healthcare.

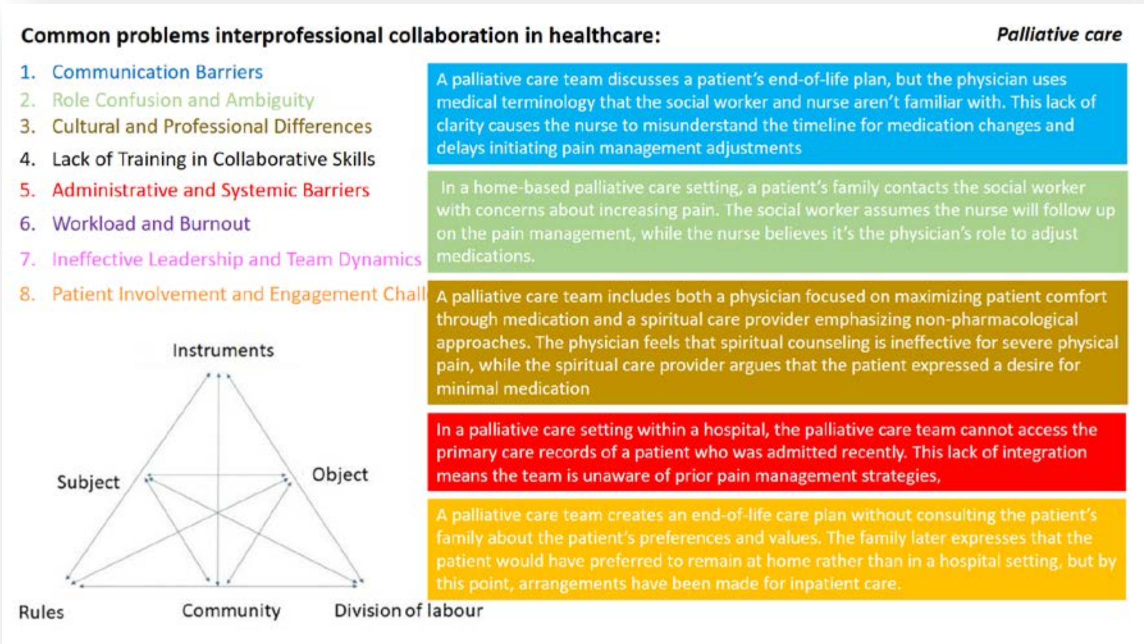


Fig.3 – Common problems of interprofessional collaboration in healthcare: Palliative care.

2) Existing videorecordings of IP collaboration debriefings. Problem: very sparsely available and if present then no informed consent sought.

3) Experts in palliative care to simulate interprofessional collaboration and debrief it in what appears to be an ideal way (perspective taking, context clarification, solution focus, heedfulness, emotional reactions etc.). Problem: not feasible.
4) Scientific articles that transcribed conversations from debriefings in interprofessional palliative care or simulation. Sixteen articles from 2013 to 2023 are used for the preparation of sample data sets for the knowledge base and for the design of the debriefing dashboard..
5) Critical incidents (i.e. examples of particularly strong or weak performance) from healthcare practice can provide valuable content for authentic scenarios for interprofessional skills training.

- The University of Münster will use critical incidents to develop its two IPC scenarios for the simulation-based palliative care training of students in the skillslab. The first step will be to use the very limited number of cases on palliative care in the Critical Incident Reporting System (CIRSmedical.de), an initiative of the German Medical Association (BÄK) to report safety-relevant incidents in medicine. At a later stage, palliative care professionals will be invited through a survey to provide information on identified risks, errors and critical or preventable events that they have experienced in their practice.
- Örebro and Mälardalen University will use healthcare professionals in an academic nursing home (Akvarellen) to inform the development of four IPC scenarios, two for professionals in the workplace and two for students in the Skillslab.

Technical development

HTWK team

Supervisors: Prof. Jochen Merker, Prof. Thomas Riechert; HTWK-coordinator Dr. Oleg Krikotov; Students: Clemens Berkenhoff, Tobias Gadau, Christin Göb, Kenn Kaubukowski, Felix Schmeißer.

Working schedule.

HTWK scheduled 90-minutes offline meetings every 2 weeks, the first meeting has been conducted on 05.11.2024. In November, December 2024 and January 2025 in total 5 working meetings (overall 10 hours) were held. Each meeting is moderated by Prof. Jochen Merker. He announces the project updates, he also receives feedback every 2 weeks in online meetings with the Thematic Core Team 'Interprofessional Learning'. Together with Prof. Thomas Riechert and Dr. Oleg Krikotov a work plan for the Technical Development Team is determined, and tasks are given to each student in the Technical Development Team. Afterwards, each team member one after another reports on the work performed and answers the questions.

Fig.4, Fig.5 – Technical Development Team at HTWK Leipzig at 2 weekly meetings.

Task and input

In WP5 'Digital technologies for interprofessional learning' HTWK Leipzig will develop a shared dashboard for debriefing of interprofessional team trainings to support the acquisition of competencies for team-oriented patient care. WP3 'Interprofessional learning for chronic and palliative care' provided us with a framework based on Cultural-Historical Activity Theory (CHAT) from their educational science perspective on which the debriefing dashboard should be developed. This enables the analysis of students' interprofessional collaboration in simulations. It considers six elements: the 'subject' (individual or groups of individuals) acting on an 'object' (task or goal of the subject) mediated by 'tools' (non-human objects or artefacts) and as part of a 'community' mediated by 'rules' (explicit or implicit) and 'division of labour' (division of tasks within the social group).

The dashboard should represent an activity system to support students in sharing and discussing their experiences of the preceding simulation. On the one hand, it should serve as a fixed basis for a structured discussion and, on the other hand, it should be editable so that students can mark and comment on elements and tensions they have identified.

Work approach

The HTWK uses the structured approach to software development, starting with the project requirements analysis, then design, coding, testing, deployment, service and support As WP5 is a dynamic endeavour where requirements can change frequently and our development team needs rapid delivery and regular feedback, an agile project management framework was chosen. For software development, the agile framework Scrum was used, because it is well suited to software development, emphasising iterative progress, collaboration and adaptability.

SCRUM\SPRINT

For WP5 a SCRUM model was adapted with two SCRUM phases running in parallel, the development of a knowledge database and of a webbased debriefing dashboard. The schematic description of the SCRUM\SPRINT model applied is presented in Fig. 6. The core of SCRUM is a group of people called a scrum team. It consists of one SCRUM Master (Thomas Riechert, HTWK Leipzig, supported by Tobias Gadau), two Product Owners (Bas de Leng, University Münster and Samuel Edelbring, Mälardalen University) and 5 Developers (HTWK students from the Technical Development team). HTWK students are trained to use the SCRUM methodology for project development and possess the necessary competencies. Development is carried out in sprints. A sprint at the HTWK is min 1 - max 4 weeks long, during which the students' team performs a task, given on the HTWK meeting. The HTWK Team has a product backlog/ the sprint backlog - an organized and constantly updated list of features – containing everything that is planned to be done to build and improve the product/ current sprint. It is a good source of work archive information for the HTWK Team.

The intermediate software results of the sprints are tested by the product owner and the stakeholders in so-called SCRUM increments. The first SCRUM increment test by the product owner and the stakeholders is scheduled for April 2025, there the usability of the debriefing dashboard for the preparation of example cases by teachers will be tested. In the next iteration, a test of the usability by groups of students in an interprofessional team training is planned for late summer 2025. These SCRUM increments and tests allow the dashboard to be developed step by step, literally 'on the fly', adding new ideas and features after discussions with the project partners, and presenting new features to the end users at Münster University and Örebro University in the shortest possible time, assessing the reaction and making adjustments to the dashboard so that it best meets the needs of the target group.

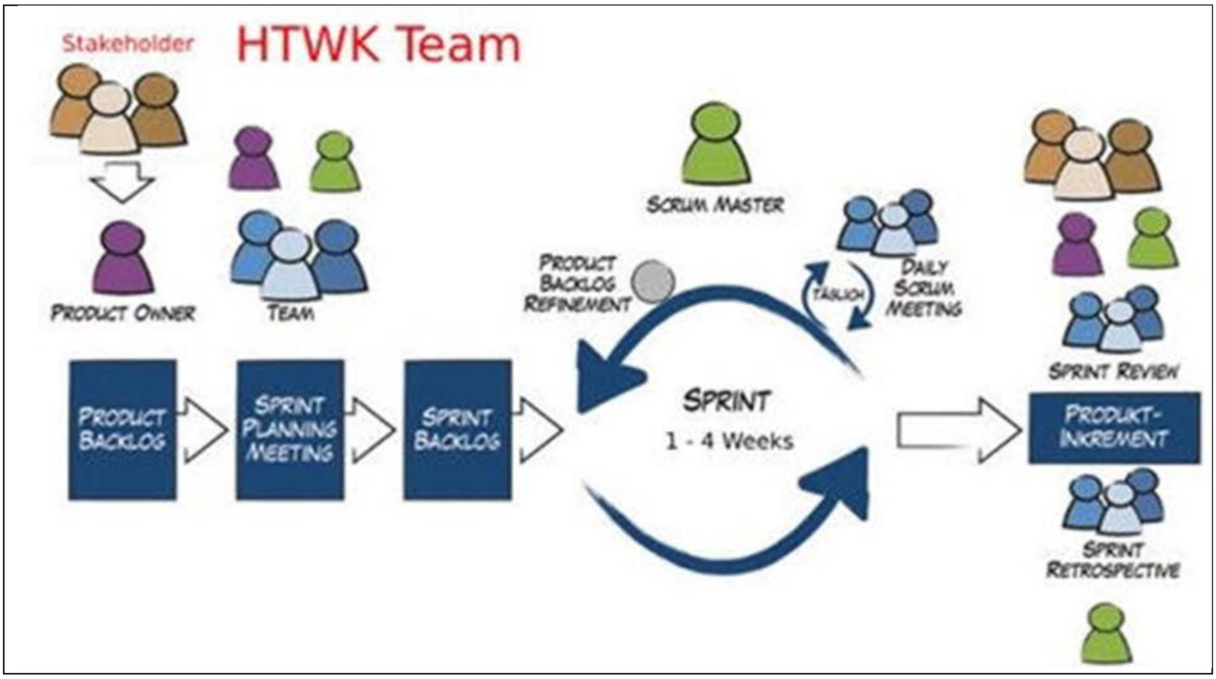


Fig.6 – HTWK Leipzig SCRUM\SPRINT

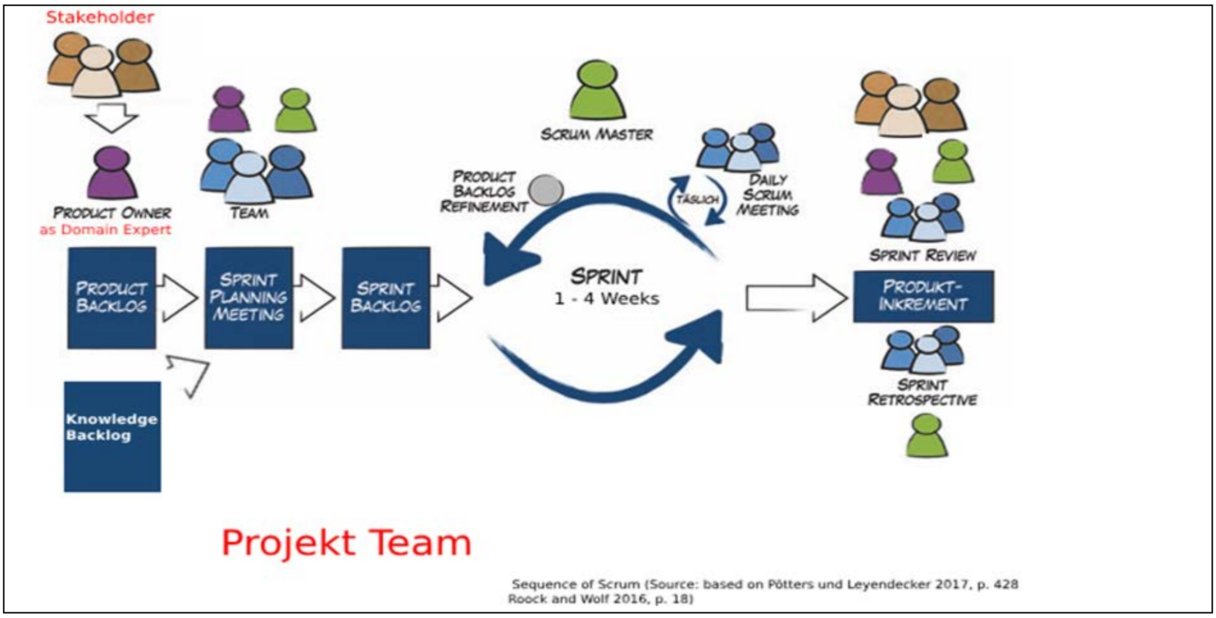


Fig.7 –SCRUM Product Owner acting as a domain expert.

Phase 1. Knowledge database engineering

Knowledge database engineering deals with the development of a knowledge base in form of an ontology (vocabulary). In our case, the possible relations between the six main elements of the CHAT activity model have to be captured in the knowledge base (e.g. the legislator as part of the community regulates the treatment options of the doctor as a subject through a specific law). These relations are put into a machine-readable structure, which provides the basic structure needed to store concrete cases and to visualize them. We decided to use for the knowledge base the special ontology language RDF, which technically uses a directed graph, i.e. a set of nodes connected by directed edges, to store the knowledge, because RDF is an open standard and easily accessible.

In the first phase of the SCRUM project implementation, anonymized and verified (by the German Medical Association) data from CIRSmedical is used to create examples of cases within our ontology specified in an RDF format, and in addition the knowledge base is enhanced by corresponding specialist literature, sources, concepts and etc. In the first test phase, other examples of cases will be created by the stakeholders and the product owner, who act as domain experts, and their feedback is then used to enhance the knowledge base, see the Fig.7 –SCRUM Product Owner acting as a domain expert.

Phase 2. Development of a webbased debriefing dashboard

Development of a webbased dashboard for debriefing of interprofessional team training requires development of a frontend for interaction with users and a backend caring for data. For the frontend, we decided to directly visualize and interact with the CHAT activity model: Users should be able to mark nodes, lines and triples in the activity diagram and to store corresponding comments (e.g. mark the triangle "Community" - "Rule" - "Subject" and store the information that ''the state (as legislator as part of the community) regulates the treatment options of the doctor (as a subject) through law 26(a) (as Rule)''), see Fig. 8. Particularly, in this way tensions between the nodes can be identified and visualized. In the user interface, if one wants to write a comment to a single point, click on the point and write a comment. If several points are involved, select a line between two points or a triangle between three points and then leave a comment. After an interprofessional team training, such tensions like misunderstandings or conflicts can be entered into the diagram, either before, during or after a debriefing, where the tensions are discussed. In the debriefing event, these entries can be recognized and discussed with the help of the dashboard. The further plan is to incorporate a kind of traffic light system that describes the status of the current entries. For this purpose, small dots are to appear between the nodes of an entry that are either red (discussion still pending), yellow (discussion in progress) and green (discussion completed). This allows to see quickly at a glance, where problems have arisen which need to be discussed. The traffic light system helps to maintain an overview of which relevant points of the meeting have already been completed.

The backend has to offer the functionality to import a data set (e.g. the outcome of an interprofessional team training, particularly the tensions noticed during the training), which is an example case for (or a realization of) the specified knowledge base, and to store the data set after its modification in a debriefing, e.g. the gained insights which have been marked by green in the traffic light system. As the knowledge base has been developed in an RDF format, the backend has to import and store data in this format. Hereby, it is important to note that all RDF entries are of the form that a subject is linked to an object via a predicate (e.g. state (as community) is linked to doctor (as subject) as it regulates him through law 26(a)) and each entry can have labels (the comments containing e.g. a tension). However, in such an entry, the ''Subject'' in the activity theory can be an object in the RDF entry (in the former example the doctor (as ''Subject'') was the object of the regularization of the state by law 26(a)), i.e. the two elements 'Subject' and 'Object' from the CHAT model are not synonymous with the subject and object identifiers in an RDF ontology. Depending on the direction of the edge (i.e. the predicate), the 'Subject' in the activity model can be a subject or an object of the RDF model, depending on the direction of the edge. The nodes can be used to store the corresponding roles of the team in the training and thus describe the individual actions of an entire activity: ‘State regulates via law 26(a) the Hospital Doctor 1’ or ‘Hospital Doctor 1 instructs Nurse 1 to prepare patient for operation’. Further, an RDF ontology can also be visualized by other generic tools (instead of the developed dashboard), if viewed as directed graph, the start point of an edge is referred to as subject, the edge itself is the predicate, and the end point is the object, resulting in a triple for each entry of the data set.

GitLab

GitLab - a web-based code repository management platform (based on the popular Git control system) is used to manage the product backlog, sprint backlogs and distribute tasks across the team. GitLab's out-of-the-box tools are used for project management. These include task boards, schedules and planning tools to help organize work. GitLab allows to save written code online and develop code in a team. GitLab provides us with the tools for repository management (storing and managing code by creating different development branches, continuous integration, regular review, testing and deployment of code after changes have been made) and for monitoring the development process (tracking performance and identifying bottlenecks) so that the team can respond quickly to any issues that arise.

Making a Mockup

In software development, a mockup is a static representation of a user interface or design for an application or website. It serves as a visual guide that shows what the final product will look like, often including elements such as buttons, menus, icons, and layouts. Mockups help stakeholders visualize the design without requiring functional code. Therefore, Mockups are an essential step in software design. Key aspects of mockups include:

1. **Visual Design**: Mockups present the aesthetic aspects of the application, including colors, typography, and images, giving a sense of the overall look and feel.

2. **User Experience**: They can illustrate how users will interact with the interface, although they generally do not include any functional behaviour.

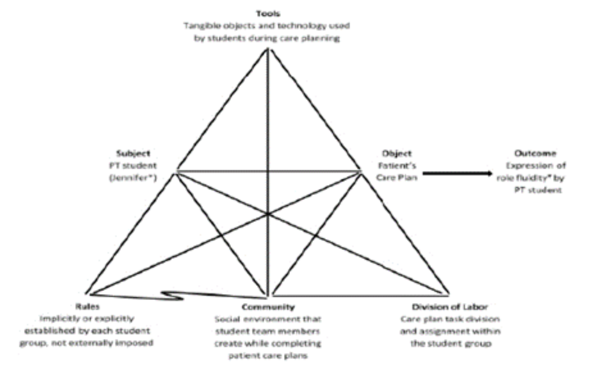
3. **Communication Tool**: Mockups facilitate communication between designers, developers, and stakeholders, ensuring that everyone shares a common understanding of the design.

4. **Feedback and Iteration**: They allow for gathering feedback early in the design process, enabling teams to make adjustments before development begins.

5. **Tools Used**: For the creation of our mockup, Figma is used as common tool to create mockups.

Mockup for Debriefing Dashboard.

The Debriefing Dashboard within the project ACTIVATE should be a visual/ functional tool designed to provide an overview of an interprofessional team training and to gain insights into the tensions that occurred during an interprofessional team training. It includes key metrics, data visualizations, and collaborative elements. The mockup is developed on the base of Cultural-Historical Activity Theory (CHAT), which is a theoretical framework to conceptualize and analyse the relationship between cognition and activity (WP3). Below on the Fig 8 presented the outline of the Dashboard mockup structure. The development of the front end as part of the Activate project pursues the goal of creating an intuitive and user-friendly interface for visualising and interacting with the relevant data.



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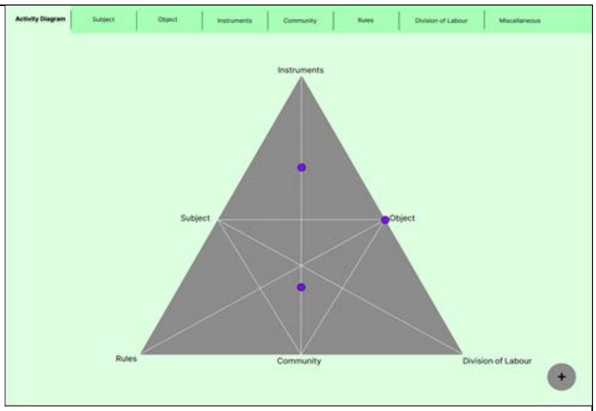
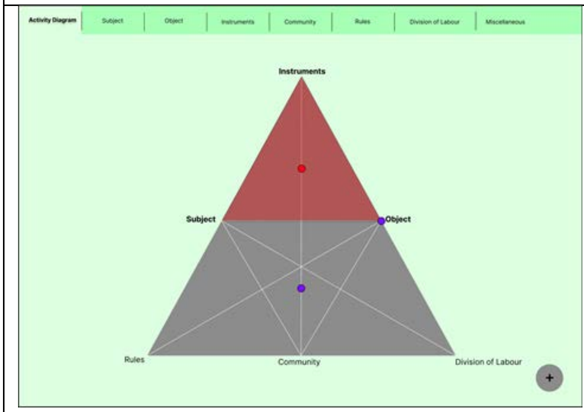
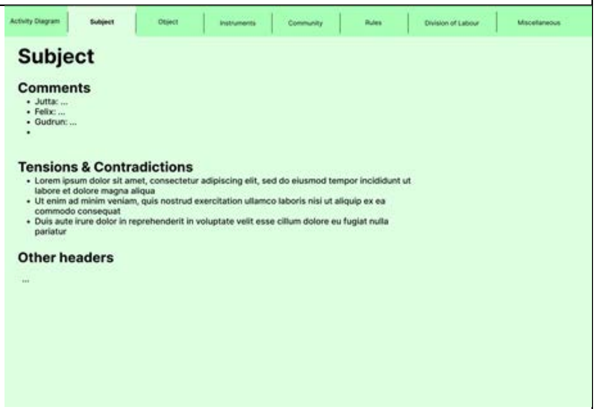


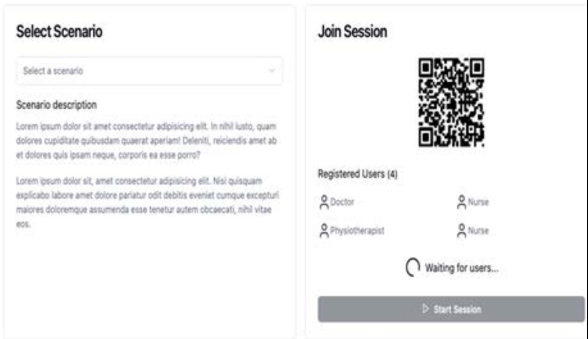
Mockup: interactive activity diagram with tabs



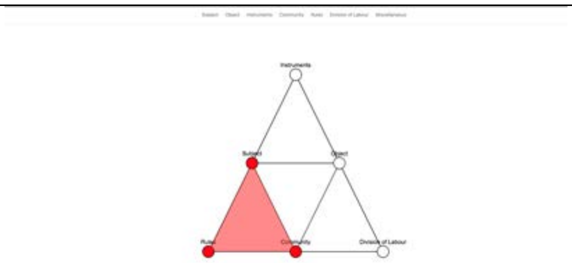
Mockup: selection in interactive activity diagram



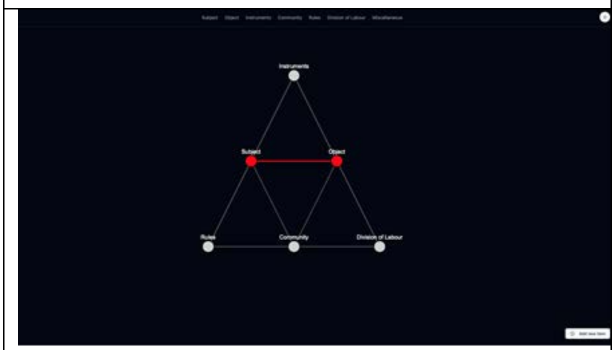
Mockup: text-based editor with tabs



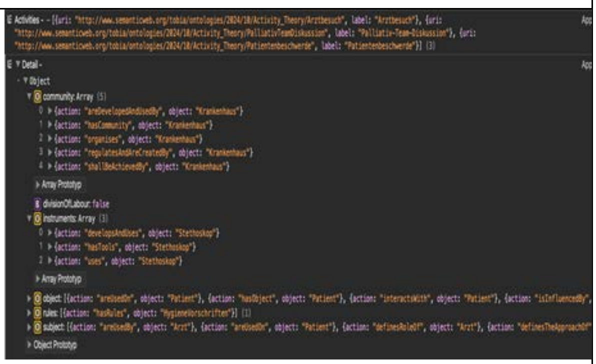
Functional Prototype: Login Screen



Functional Prototype: interactive activity Diagram



Functional Prototype: Editing Tensions



Functional Prototype: Knowledge Base

Fig 8 – Upper left: Theoretical basis; Green: Mockup; Lower Half: Functional Prototype of Debriefing Dashboard.

The user interface is clearly structured to enable efficient information processing and interaction with the web application.

The front end consists of three central components:

(1) an interactive activity diagram, which provides a visual representation of the relationship in the data, particularly the tensions,
(2) a text-based editor for annotation and commenting, which enables semantic analysis and contextualization of data relationships.
(3) a tabular view divided into several tabs, which allows a structured presentation of the continuous text data.

These modular components help to improve the user experience and optimize navigation within the application. The interactive Activity diagram is one of the most important components of the web app. It is able to intuitively visualize all relevant relationships between the data. It should also be possible to add new data such as tensions or new relationships easily and intuitively, which are then transformed into new data.

An activity diagram consists of six nodes that represent different data categories of data:

(1) Instruments: Tools that are used in the current activity (e.g. formal instruction of a nurse by a doctor).
(2) Subject: People taking actions in the current activity (e.g. doctors or nurses).
(3) Object: People on which the activity takes place, i.e. on which the action takes place (e.g. patients or relatives).
(4) Rules: Rules that regulate the activity or that have been discussed (e.g. a certain law).
(5) Community: Communities or networks involved in the current activity (e.g. hospital staff, home caring organization).
(6) Division of Labour: Information about the division of labour within the activity (e.g. therapeutic measure or diagnostic measure).

Summary and outlook.

The development of a dashboard based on activity theory for the debriefing of interprofessional teams, as described, is to be continued in the further course of the ACTIVATE project. In addition to software tests, the dashboard will be tested by teachers and students from healthcare professions at the Universities of Münster and Örebro, and the results of these tests will be used for further development.

In future, the automatic transcription of the cases dealt with during training is to be implemented, allowing the dashboard to be pre-filled automatically instead of the lecturer having to prepare the content manually. The integration of such automated transcription technology will significantly increase the efficiency of the dashboard. It could not only reduce the preparation effort for teachers, but also improve the timeliness and accuracy of the discussions in the debriefing.

In addition, continuous improvement of data analysis and visualization technologies could further optimize the interactions of team members within the dashboard.

One could also imagine the implementation of AI-supported feedback mechanisms, based on the transcriptions to create personalized learning paths for the team members. This would allow learning progress to be tracked more effectively and targeted interventions to promote team competences can be implemented. The ongoing research and application of these technologies promises to transform the teaching and learning processes in interprofessional teams in healthcare professions in the long term and further optimize patient care.

Literature

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