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Methodology for the Participatory Design of a Learner-Facing Analytics Dashboard

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Abstract: In this work-in-progress paper, we describe the participatory design approach we adopted for the inclusive design of a student-facing learning analytics dashboard. The objective is to involve learners throughout the design process to help prevent instructors' biases ending up in the design. The design participants developed learner personas, use scenarios and storyboards to capture the broad spectrum of students' abilities, skills, objectives, and situations. These guided the decisions made for the essential features, functions, and interactive behaviours of the dashboard and for its initial functional implementation.

Keywords: Participatory design, learning analytics, dashboard, personas

1. Introduction

Learning Analytics Dashboards (LAD) designed for students are tools capable of monitoring and communicating learning analytics data directly to the learners themselves. These systems can empower students, assisting them in measuring their learning progression, fostering their ability to reflect critically, and enhancing their self-regulated learning competencies (Molenaar, Horvers, Dijkstra, & Baker, 2019). However, despite the rapid pace of these dashboards' development, our comprehension of their effective design, how these tools facilitate or fail to support learning, and the reasons for their general lack of adoption among students remain unclear (Bodily, & Verbert, 2017). The purpose of our research is to create novel designs of LADs that support all learners in the most inclusive manner, and that foster engagement and trust, leading to regular use over time especially by struggling students. In this work-in-progress paper, we describe the participatory design approach we have adopted for the inclusive design of such a dashboard.

Participatory Design (Spinuzzi, 2005) is a user-centric methodology that involves all key stakeholders in the design process, aiming to better anticipate, understand, and fulfill their requirements. This approach encourages stakeholders (especially end-users) to collaborate with designers, researchers, and developers throughout the innovation journey, contributing not only to decision-making but also to the generation of ideas (van Oorschot, Snelders, Kleinsmann, & Buur, 2022). In the context of educational technology, participatory design entails learners, instructors and designers collaborating to develop prototypes and evaluate design ideas. The benefits of participatory design are numerous. Beside preventing personal biases ending up in the instructional design, instructors can gain a deeper understanding of learners' needs, preferences, and experiences. This generally leads to more effective and inclusive solutions. Involving learners in the design process can also help build trust and create a sense of ownership.

2. Methodology and Results

2.1 Data

Our project uses learning traces generated by one cohort of around 240 telecommunications engineering undergraduate students enrolled on a course on Multimedia Fundamentals. The course presents a variety of digital learning resources and activities on the Virtual Learning

Environment (VLE), including reading materials, interactive videos (H5P technology), quizzes, and exercise worksheets. Students are expected to complete all the learning activities before attending a synchronous tutorial each week. In the 2022 iteration of the course, each student engaged in a total of 65 digital learning activities. Daily records were maintained of their digital footprints (Bourguet, 2022).

2.2 Design Process

The participatory design process we experimented with comprises three phases. The first phase involves an 'initial exploration of the work', aimed at understanding the context of learning. The second phase, referred to as the 'discovery process', is highly interactive and employs methods like brainstorming, persona creation, and storyboarding. The third and final phase involves 'prototyping' the educational resource or technology. Six students from the course were selected to join as uncompensated participants in the project. Alongside a final year undergraduate student, tasked with creating a functional prototype, and the course instructor, they formed the participatory design team. A total of eight participatory design sessions were held (a cumulative 20 hours), with some conducted online and others in person.

During the initial phase, covered in the first two sessions, the goals were to establish through guided discussions a consensus on the participatory design workflow; to foster a shared understanding of the learning context (learning objectives, course expectations, delivery mode, learning activities, and students' digital traces); to raise awareness of ethical concerns related to the adoption of learning analytics; and to discuss principles of inclusive design. Specifically, the data collection, and how digital traces could be used to personalise the learning experience were discussed. Ethical concerns were also addressed about the potential impact of using LADs for students, staff, and the university, as well as the privacy concerns that might arise. The team agreed on a workflow for every meeting, which included identifying and discussing problems, generating and summarising ideas, and creating a meeting summary.

The discovery process spanned the following three sessions with the objectives to generate ideas for the LAD's usage, content, and appearance; to develop learner personas that represent different student profiles; and to craft scenarios and storyboards for each persona. A brainstorming session, resulting in a word cloud of attributes allowed the participants to elicit the characteristics that should be used to describe as broadly as possible their fellow students. Referring to themselves, to their friends, classmates and acquaintances, the project team then endeavored to instantiate these variables, discussed how these traits affected the students' ability to learn, and what LAD features could best support them.

The final stage of the design process comprised the last three sessions aiming to draft various paper prototypes, and to discuss graphical and functional elements of the LAD, like interactivity, customisation, and adaptation (see example in Figure 1.b). The online platform Excalidraw, which allows multiple users drawing on the same whiteboard, was used to support this highly collaborative task.

2.3 Results

For describing fellow students and creating personas, eleven variables were elicited: 'Personal Information' (including Study Location, Quality of equipment, Time availability, English skill, Learning foundation, Ability to use tools), 'Needs', 'Goals and motivation', 'Study strategy', 'Time management', 'Effort', 'Engagement', 'Concentration', 'Efficiency', 'Affective state', and 'Attitude'. Six significantly different student profiles emerged while instantiating these variables, which can be roughly classified as representing: (1) talented, (2) diligent, (3) social, (4) lacking commitment (see Figure 1.a), (5) lacking perseverance, and (6) disengaged students.

A functional LAD prototype was implemented (see Figure 1.c) and a preliminary evaluation questionnaire has been distributed to 31 students (11 identifying as male and 20 as female). The students highly evaluated most of the LAD's graphical components, with a preference for the radar charts and for the progress bars. 17 students (54.84%) indicated that

they felt the LAD could help them monitor their learning progress. 16 students (51.61%) indicated that they were satisfied with the usability and aesthetic of the LAD. Only 14 students (45.16%) indicated that they would be happy to use the LAD regularly. Clearly, more work is needed on the design of the LAD.

The respondents were also asked to identify with one of the six personas. Each persona was selected by at least one student (two of the personas were chosen by 11 and 10 students respectively), which goes some way to demonstrate the inclusivity of our approach.

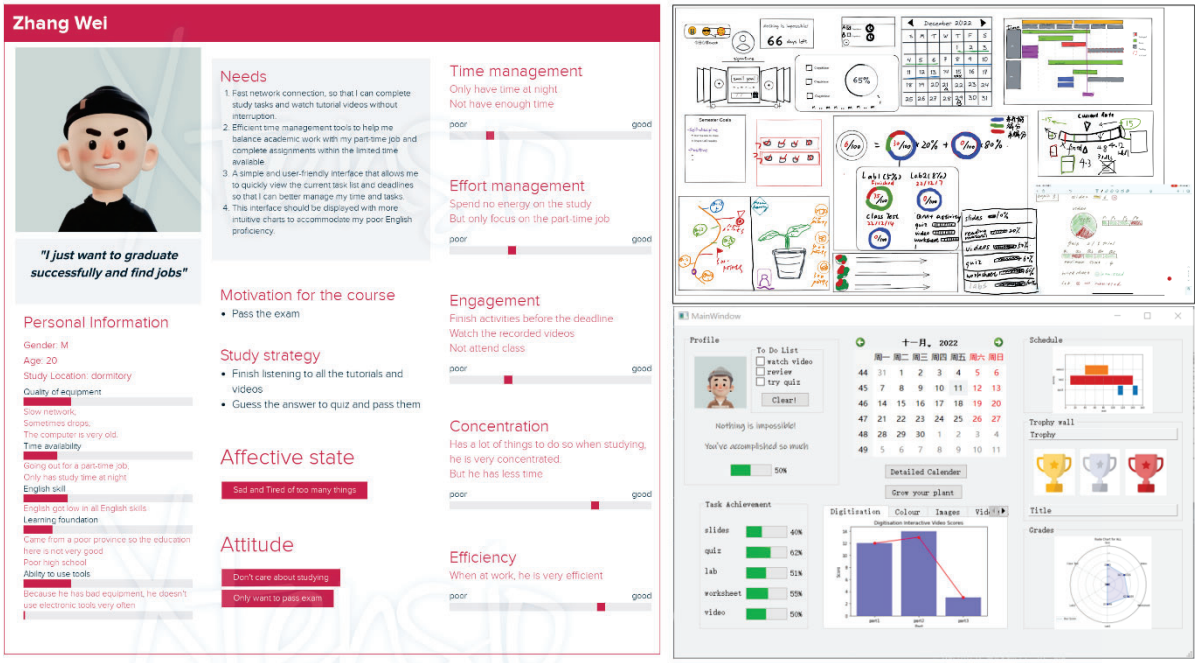

Figure 1. a. Persona; b. Paper prototype; c. Functional prototype

3. Conclusion

There are numerous advantages to employing participatory design in educational technology. In addition to mitigating personal biases in instructional design, it allows instructors to gain a more profound understanding of learners' needs, preferences, and experiences. This results in more effective, inclusive and tailored solutions.

A significant insight from this project is how small, albeit not inclusive, student-staff partnerships can effectively assist instructional designers in better considering the diverse needs, priorities, experiences, behaviours, goals, and situations of learners. It is essential to make a distinction between inclusive partnerships and partnerships for inclusivity; the work outlined in this paper is an example of the latter. The work continues, building on our shared understanding of the students' diversity of needs to build more effective and trustworthy LADs.

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