

A CANVAS FOR THE ETHICAL DESIGN OF LEARNING EXPERIENCES WITH DIGITAL TOOLS

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ABSTRACT

The use of digital tools has drastically increased in engineering education, accelerated by the COVID-19 pandemic. These tools generate important ethical issues, in particular in terms of privacy and fairness. However, very few teacher training programmes address those topics, which means that teachers are often left to figure out by themselves how to address these issues when they want (or have) to use digital tools in their teaching. In this workshop, participants will be introduced to a pragmatic approach to the ethical design of learning experiences that involve digital tools using a visual thinking guide called a 'canvas'. Applied and hands-on, this workshop will help participants to develop a practical understanding of the

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specific ethical issues related to the use of digital tools in teaching and to integrate ethical reflection into design processes when digital technology is involved.

1 BACKGROUND AND RATIONALE

Digital tools are increasingly used in engineering education, and the COVID-19 pandemic has drastically accelerated their adoption. These include general purpose tools such as search engines, translation tools or content management systems, or more specialized applications like MOOC platforms, audience response systems or learning analytics. Distance/online teaching has also developed the use of video conferencing systems, online whiteboards or collaborative document edition tools. Because they generate digital traces of users [1, 2] and can potentially be algorithmically biased [3–5] – among other issues, these tools must be used with special attention to ethical questions and this is often left to the responsibility of teachers.

While the need to develop teachers' digital competence (including the use of ICT) is clearly identified [6] and an increasing proportion of teacher training curricula address it [7, 8], ethical considerations are generally remarkably absent from their descriptions [9]. This is all the more an issue that staggering developments in digital technology, in particular artificial intelligence, create new ethical challenges which require both engineers and engineering educators to acquire new specific knowledge [10]. In the conclusions of their review of published research on teaching and learning technological practices during the pandemic, Boghian, Popescu and Ardeleanu highlight the urgent need to “instruct both teachers and students on the ethical use of information technology regularly” [11].

This workshop seeks to fill this gap by proposing a pragmatic approach to the ethical design of learning experiences that involve digital tools in the form of a ‘canvas’ – a thinking tool that guides analysis and design based on three main ethical principles. In the following, we first present our ‘canvas’, before introducing the learning outcomes and the design of the workshop.

2 THE ‘CANVAS’

Frequently used in business and technology education, a canvas is a tool that implements a conceptual framework in a visual way to guide a thinking process [12]. A canvas generally takes the form of a one-page grid or diagram, which serves as a support for individual or collaborative tasks.

First developed for the humanitarian context [13], the canvas we propose implements a “principled approach” to analysis and design: central to the canvas is a set of *ethical principles* that are used as a lens to look at a specific *digital tool* when used in or designed for a specific *teaching or learning context*. The visual organisation of the canvas reflects this approach, with the principles at the centre, forming a bridge between a zone dedicated to the tool and a zone dedicated to the context, as illustrated on Figure 1.

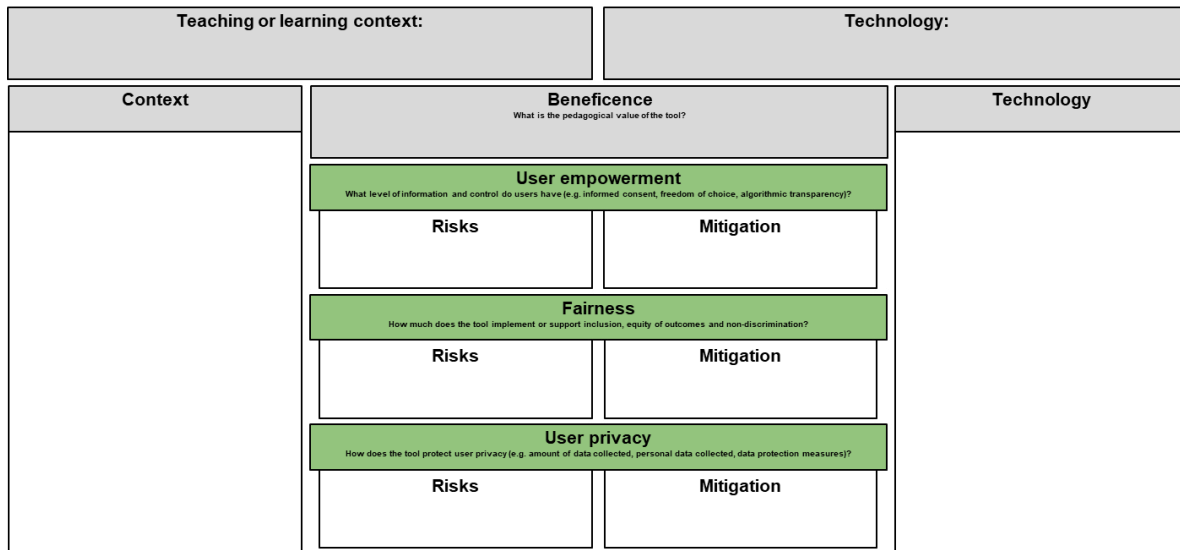


Fig. 1. The canvas with its three ethical principles at the centre.

Following a review of existing codes of digital ethics, we identified three overarching ethical principles that should be considered when using or designing digital tools:

- User empowerment: what level of information and control do users have over the tool (e.g. informed consent, freedom of choice, algorithmic transparency)?
- Fairness: how much does the tool implement or support inclusion, equity of outcomes and non-discrimination?
- User privacy: how does the tool protect user privacy (e.g. amount of data collected, type of personal or sensitive data collected and data protection measures)?

For each principle, the canvas guides participants to think about the risks associated with the use of the tool in the given context, but also to envisage mitigation options. The use of the canvas should help participants not only to develop a practical understanding of these ethical principles, but also to acquire a general methodology to integrate ethical reflection into analysis and design processes.

3 LEARNING OUTCOMES

After an introduction of the specific ethical issues related to the use of digital tools in education (as well as in general) and a presentation of the three ethical principles implemented in the canvas, participants will be given the opportunity to practice using the canvas by analysing collaboratively a real learning scenario with well-established existing technologies (e.g. Miro, Mentimeter, Google docs). Then we will step back and reflect on this experience to discuss with participants how this canvas could be used as a teaching tool, for instance as a framework for the socially responsible design of digital tools.

At the end of this workshop, participants should be able to:

- Describe examples of ethical issues related to the use of digital tools in education



- List and define ethical principles that apply to the design and use of digital tools
- Use the canvas to design and assess pedagogical activities that involve the use of digital tools
- Evaluate how the canvas can be used as a teaching tool, for instance as a framework for the socially responsible design of digital tools

4 WORKSHOP DESIGN

The workshop will implement an interactive and hands-on format with the following programme:

- Introduction: ethical issues with digital tools in teaching and learning activities and digital-specific ethical principles (interactive presentation with mini-activities, 20 minutes)
- Designing learning experiences with digital tools using the canvas (collaborative activity in groups of 4/5 people, 25 minutes)
- Reflecting on the use of the canvas and the ethical principles it implements, evaluating how it could be used as a teaching tool (collaborative activity in groups, 10 minutes)
- Conclusion: take home messages (collective summarization activity, 5 minutes)

5 SUMMARIZATION OF THE RESULTS

A total of 15 participants attended the workshop. They identified around 10 different types of software technologies that are frequently used in their educational contexts, including Learning Management Systems, forum tools, interactive whiteboards, polling systems or programming-related technologies (e.g. online programming environments or auto-grading tools).

When working in groups to design a learning experience with a specific digital tool, participants engaged with all three principles embedded into the canvas, not only the privacy aspects, as is often the focus because of laws and regulations. Mitigation options described by participants included both technical aspects, such as the types of accounts best suited to access the service, and non-technical approaches such as fairness charters for online collaboration. Some participants reported that despite some prior awareness about the potential ethical issues with the considered tool, they were sometimes surprised by either the range of data collected, the location of the data storage or the extent to which this data was shared with third parties (participants were provided with a summary of the privacy policies and terms and conditions for the considered tool).

The participants identified three different use cases for the canvas as a teaching tool:

- a. As a tool to co-develop learning experiences with students, defining which tool to use and how to use it;



- b. As a support for discussion with students about digital ethics and to raise student's awareness about the ethical issues with digital technologies;
- c. As a device to use in design activities, for instance in empathy exercises or as a more focused alternative to general analysis frameworks such as SWOT (Strength, Weaknesses, Opportunities, Threats) and PESTLE (Political, Economic, Social, Technological, Legal, Environmental) [14].

Finally, the participants also raised questions about how to engage educators more broadly with these issues, and how students, faculty and IT services could better collaborate and work together on this topic.

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