

## TEACHING TRACK FOR ETHICS OF TECHNOLOGY IN ENGINEERING EDUCATION

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### ABSTRACT

The Dutch research project “Wijs met techniek” (Tech-Wise) explores ethics education for engineering students from a tool-based, practical perspective. In the project we have made an inventory of tools that are currently used on different levels of higher education. From the experiences so far, we have proposed to build a tool-based teaching track for ethics education in engineering curricula. In the workshop we present in this paper we built on this experiences with a short tool-based exercise, called ‘Wisdom on a Delft Blue tile’. Furthermore we present the backgrounds of the project, the set up of the workshop, and the results of the exercise with the participants. From the experiences with the workshop we reflect on the next steps of the research project.

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# 1 INTRODUCTION

In a Dutch research project “Wijs met techniek” (Tech- Wise) we explore if and how practical tools for ethical deliberation on the impact of technology can be helpful in ethics education for engineering students. The approach is tool based, intended as a variation on theories in ethics and technology. It focusses on the impact of technology as a way toward ethical deliberation. Both characteristics are intended to better appeal to engineering students. In the project we cover three levels of higher education; a University, a University of Applied Sciences and a School for Vocational training.

## 1.1 Background

Systematic and critical thinking about societal and ethical aspects of technology is not yet regularly included in higher education programs. Not in the least because teachers find it rather difficult to discuss ethical questions about the impact of technology with students. However, nowadays ethical deliberation on the impact and meaning of technological choices, makes up a necessary component of the research, design and development process. As future professionals (researchers included) our present students are expected to be fully aware of societal and ethical effects of technological innovations. Therefore, educational programs should include a teaching track for ethics of technology to turn students into responsible professionals. Knowledge of ethical theories does not seem the most important aspect here. Much more, students should become sensitive for the meaning and effects of technology. Our hypothesis is that active tools will be most appropriate to learn students deliberating about the impact of technology.

## 1.2 Tech-Wise

The research project is called “Wijs met Techniek”, which can be translated as Tech-Wise, but in the Dutch regional culture can also be understood as “happy with technology”. In a first phase of the research project, experiences of students and teachers indicated that practical tools for ethical deliberation are most valuable, provided that they are to linked to explicit learning goals. The tools should be designed to cover different topics of ethical deliberation. In addition, it appeared to be important to determine direction and ambitions for ethical deliberation about the impact of technology. More than a one-time exercise, ethical deliberation should be an integrated part of the education program. Different tools should be applied toward different goals in a teaching track for ethics of technology. *In the workshop questions about aim and content of a valid teaching track for ethics on the impact of technology in engineering education, were addressed.*

## 1.3 Theory

In our research project we identified several topics for ethical deliberations based on literature (Van Beveren et al., 2018; Marin, 2020; Van der Poel, 2018) and our own experience in engineering education (Dorrestijn, 2017; Tijink & Verbeek, 2019). These topics represent ethical issues accompanying technology, the *whats or*

*whereabouts* students should learn to think about in a systematic and critical way. Taking the impact of technology (Dorrestijn & Eggink, 2014) as a starting point, we ran across topics such as the ambivalence of technology, intentional and unintentional effects of technology and changing behavior and values.

For defining direction and ambitions for ethical deliberation we used elements and levels which we came across in several definitions about reflective skills (Mittendorff, 2014; Kember et al., 2008). So, an essential element for ethical deliberation is that it should start with the use of a practical example of an innovation or new technological application concerning the professional context of the future professionals (Eggink & Dorrestijn, 2018). As to the extent and depth of ethical deliberation in engineering education we initially distinguished three different levels to deliberate on the impact of technology: evaluation, reflection and critical reflection.

## **2 WORKSHOP: TOOLS FOR ETHICAL REFLECTION ON THE IMPACT OF TECHNOLOGY**

For the workshop we decided to discuss the tool- based teaching track with the participants alongside an exercise with one of the proposed tools resulting from our initial research phase. Following the principle ‘practice what you preach’. In the workshop we first explained the background of the research project and then did the short exercise. Finally we discussed with the participants the contents of a possible teaching track for ethics of technology in engineering education, inspired by their experiences.

### **2.1 Set up of the Workshop**

The complete one-hour workshop was divided into four parts, with the following schedule;

- Introduction Research Project (10 minutes)
- Ethical Deliberation Tool “Online Conference” (30 min)
- Discussion about a Tool Based Teaching Track for Ethical Reflection (15 min)
- Questions, thoughts, remarks (5 min)

For the exercise we chose the tool ‘Wisdom on a Delft Blue tile’. From our previous experience we know that this is a tool that is simple to explain and execute in a short amount of time (van der Heijden et al. 2021). Although simple, it showed to foster the ethical deliberation on different levels, connected to the proficiency of the participants. The goal of the exercise is to write a short aforism, expressing an ethical concern or value observation from the discussion with the participants. The connection to a Delft Blue tile makes the goal explicit and recognisable (figure 1).

## Tool for Ethical Reflection

Wisdom on a Delft Blue Tile

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An example of a tool designed to link to an explicit learning situation and goal

A four-century long Dutch tradition:



Figure 1. Example of a Presentation Slide, used in the workshop: 'Wisdom on a Delft Blue Tile'

The exercise 'Wisdom on a Delft Blue tile' consists of four steps; orientation, research, select, and design. For the workshop we decided to reflect with the exercise on the technology of online conferencing, as we would be all experiencing at that moment. For the orientation phase we make use of a three-minute humorous video about online meetings called "A Conference Call in Real Life". The full instructions for the participants are then as follows:

- Part 1: Oriëntation  
Watch the video 'A conference call in real life': [https://www.youtube.com/watch?app=desktop&v=DYu\\_bGbZiiQ](https://www.youtube.com/watch?app=desktop&v=DYu_bGbZiiQ)
- Part 2: Research  
The video shows what all of you have been experienced for over a year now. What do you notice watching this video? What did you observe yourselves during online meetings, presentations, teaching activities?
- Part 3: Select  
Presume that Online Conferences will be a new standard, should we be alert? What should be preserved? What do we not want to loose? - Think about certain behaviour and values.
- Part 4: Design  
Write down on a Delft blue tile an "Online Conference Aphorism" - A behaviour manifest in one phrase.

After the discussion, the resulting aphorisms will be 'written' on a tile in the workshop presentation.

For the discussion on the “Ethics Teaching Track with Tools for Ethical Reflection about the Impact of Technology” we prepared the following questions:

- Do activating tools and interventions make it more easy?
- How to address different levels?
- How to embed this in the curriculum?
- How to connect to different study topics (disciplines)?
- How to support teaching teams?

## **2.2 Execution of the Workshop**

A total of 13 participants logged in to the session, from which 12 people attended the complete workshop. We decided that it was not necessary to use the breakout rooms with this amount of participants. After the session we downloaded the meeting chat for reference.

## **3 RESULTS**

The results of the workshop can be divided in two parts; first the results of the exercise with the tool and secondly the results of the discussion about a teaching track for ethics of technology.

### **3.1 Exercise ‘Wisdom on a Delft Blue Tile’**

After watching the video the participants were asked to share their comments and observations. They were invited to take the floor or put them in the chat. These comments were mostly focussing on three themes: about being present, about communication, and about participation. About being present, some comments were: “people coming and leaving”, “the sense of ‘being there’ and ‘being on time’”, and “people doing other things at the same time”. About communication: “You lose some communication without some body language cues”, “Communication is always much harder, difficult to ensure people are looking at the same thing, distractions or diversions, missing subtle clues”, and “no structure”. The most interesting comments from an ethical point of view were about participation. The accessibility of online conferences makes it more easy to attend. Less time-consuming but also less expensive. Having more and more diverse people at the table then also makes it important that everybody is heard and feels invited to contribute, as one participant put it: “It’s (at least for some people) even more difficult to get turn to speak during online conferences, living their viewpoints or questions out. And maybe more difficult to make sure that everybody gets change to speak from meeting leading point of view.”

From the observations and comments we went to the next step; thinking about characteristics, behaviour and values that we would want to keep from online conferences. Most important aspects mentioned were: “efficiency” and “accessibility”. However, it was also mentioned that these come with a cost: “efficiency comes with the cost of personal relationships and maybe the good relations between coworkers”, and “You miss things like the chats to and from

meetings.....some of this may be help clarifying issues or positions in the meeting but also helps support things like empathy with colleagues...”. It was emphasized that we should keep human values of openness, inclusivity, politeness and empathy in mind. After the discussion, four aphorisms were concluded upon together (figure 2).



Figure 2. Text results from the Tool exercise “Wisdom on a Delft Blue Tile”.

The two aphorisms at the right concern the two topics presence and attendance. The two aphorisms at the left are about the possible changes in -social- behaviour.

### 3.2 Impacts for a teaching track for ethics of technology in engineering education

Due to some technical hick-ups in the online format, the exercise took longer than expected. Therefore there was no time left for the discussion about the teaching track.

## 4 CONCLUSION & FURTHER WORK

The results of the workshop confirm that the impact of a technology is always ambivalent. For this example, winning on efficiency and accessibility comes with a cost on the side of human values and empathy.

The exploratory study during the first research phase of the Tech-Wise project is input for a larger follow-up study. The aim of this follow-up study is twofold. On the one hand, it focuses on developing a conceptual framework for ethical reflection on the impact of technology. This framework should cover the different levels of ethical deliberation and the different levels of (higher) education, and it should be applicable or adaptable for several engineering domains. On the basis of such a framework, the various programs can formulate a vision on ethical reflection on the impact of technology with matching learning objectives for continuous learning lines. In addition, efforts are being made to (further) develop a suite of activating working

methods and tools. The aim is to develop a package of teaching materials, together with the various engineering programs, consisting of concrete ethical exercises and assignments that can be used as a continuous learning line during their entire curriculum.

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