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**INTRODUCTION**

This module consists of two lessons. For Lesson A, students learn about mediation theory by reading a short article for homework and then discussing it in class. Instructors will lead students in discussing the values that inform design and the importance of computer scientists reflecting on those values while projects are in development. For Lesson B, students conduct their own mediation analysis by applying the ideas learned in Lesson A to a relevant and specific computer technology. This lesson provides students with practice assessing the moral values that inform computing technologies so that they may later perform such analyses on their own projects. The instructor guide provides the necessary background and explanations of the material so that everything the instructor needs to run these modules in a class are contained here, including handouts and PowerPoints. Additional resources can be found referenced throughout the instructor guide with a specific list at the end.

**PART I: OVERVIEW**

*Historical and Intellectual Context*

One of the timeless questions in philosophy of technology is the question regarding the relationship between humans and technology. In the tradition of philosophy of technology, there are two dominant classical views: (1) *technological neutrality*, the view that technologies are neutral artifacts that have no meaning until used by individuals and (2) *technological pessimism*, the view that technology is a force opposed to human autonomy or freedom. In the last thirty years, however, a third, new philosophy of technology paradigm has emerged: (3) *technological hybridity*, the view that technology and humans create each other, that they constitute each other.

With the emergence of technological hybridity paradigm, it became possible to ask meaningful questions about the ethics of technology in general and about the ethics of design in particular. The technological neutrality paradigm assumes that morally relevant questions can be asked only about the users of technology and not about the technology itself. The technological pessimism paradigm assumes that the only morally relevant questions involve opposing technology because technology is viewed as intrinsically bad or dangerous. In other words, technological neutrality focuses on the agency of the user at the expense of the asking questions about the technology, while technological pessimism focuses on the seeming determinism of the technology at the expense of asking questions about user agency.

The technological hybridity paradigm, however, not only argues that both the user and the technology must be taken into consideration but also that a third element, the designer, must also be considered. On this view, any analysis of technology must account for the agency of the user, the values embedded in the technology, *and* the decisions and/or processes of the designers. In the context of computer science, the technological hybridity paradigm requires us to ask moral questions not only about the users and the hardware/software but, most importantly, about the way the designers themselves conceive, build, and distribute their creations.

*Peter-Paul Verbeek’s Mediation Theory*

While there are several versions of the technological hybridity paradigm, this module focuses on Peter-Paul Verbeek’s mediation theory of technology. Verbeek is chair of the philosophy department at the University of Twente, a member of the Dutch Council for the Humanities, and chair of the Society for Philosophy and Technology. He has been developing mediation theory for over twenty years, and his works include *What Things Do—Philosophical Reflections on Technology, Agency, and Design* (Penn State University Press, 2005) and *Moralizing Technology: Understanding and Designing the Morality of Things* (University of Chicago Press, 2011).

The basic assumption of mediation theory is that designers of technology—including computer scientists who design hardware, software, data systems, and the like—are engaged in an intrinsically, unavoidably morally relevant enterprise. As Verbeek (2013) writes, “The design of technologies itself has become an intrinsically moral activity. Responsible design requires the anticipation, assessment and explicit design of the mediations that the technology will introduce in society. Designing mediations is inevitably a jump into an unknown future, and will always have an experimental character. But by systematically anticipating and assessing the mediations involved in the design, we at least organize these experiments as responsibly as we can. Ethics on the lab floor does not only involve processes of scientific innovation, but also of technological design.”

*The Basic Components of Ethical Theory*

All moral philosophy is built around two concepts: means and ends. The *ends* are the desired outcomes, and the *means* are the ways the outcomes are pursued and attained. Following from these two concepts are the basic questions of ethical theory: *Which means are permissible and why?* and *What ends are desirable and why?* Answers to such questions are normative or prescriptive, in that they take a stance how people *ought* and *ought not* behave.

In the context of computer science and ethics, designers must ask these two questions. In terms of desirable ends, designers must go beyond the simple “end” of creating a functioning product. Instead, designers must as themselves two questions: “What kind of behavior, what kinds of relationships, do I want to promote with the creation and distribution of this product?” and “Why are these behaviors and relationships morally desirable?”

In terms of permissible means, designers must be able to distinguish between morally permissible and morally impermissible means; that is, they must differentiate action that they must never do from actions that they may do.

The technological hybridity paradigm and, specifically, Verbeek’s mediation theory are relevant to the ethics of design because they require us to ask fundamental questions about how humans *ought to be*. If designers create technology, and if technology creates relationships, then designers have to ask themselves: what kinds of relationships are morally desirable and why? Verbeek’s mediation theory helps us ask this question.

*Purpose & Structure of the Module*

The purpose of this module on ethical design and the philosophy of technology is to use Verbeek’s mediation theory to get students thinking about the ethical dimensions of software or hardware design. Too often designers focus purely on the functionality of the technologies they create and assess those technologies only in terms of function. For example, if the software “works” as intended, then the design process was a success.

Following Verbeek (2008), the lessons in this module help students think about three forms of agency: “(1) the agency of the human being performing the action or making the moral decision [the user], in interaction with the technology, and also appropriating the technological artifact in a specific way; (2) the agency of the designer who, either implicitly or in explicit delegations, gives a specific shape to the artifact used, and thus helps to shape the eventual mediating role of the artifact; and (3) the agency of the artifact mediating human actions and decisions, sometimes in unforeseen ways.”

The module includes two lessons:

Lesson A requires students to read a short article on mediation theory as homework (before coming to class) and then provides the instructor with the materials necessary to facilitate in-class discussion based on the reading. Instructor materials include a PowerPoint slideshow and accompanying notes. This lesson provides the conceptual foundations for understanding ethical design. The full version of this lesson can be completed in a 50- to 75-minute class period.

Lesson B requires student to practice applying the ideas from Lesson A by conducting a “mediation analysis” of a specific computer technology, chosen by either the instructor or the students. Students will be provided a handout to guide them as they work in small breakout groups. The instructor can choose to have the students turn in a written mediation analysis or to simply have the students share their analysis with the class during discussion. The full version of this lesson can be completed in a 50- to 75-minute class period.

The double lesson structure of the module is designed to give instructors flexibility as they incorporate the module into their classes. Lessons A and B can be taught individually or as a pair, depending on the needs and desires of the instructor. Here are a few examples how the lessons can be used individually or in tandem:

* To use the lessons in their fullest forms, instructors would use both Lesson A and B over two class periods. In the first class period, students will come to class having read the assigned article; in class, the instructor will review the reading using the PowerPoint provided and then either facilitate a discussion as a class or have the students work through questions in breakout groups. In the second class period, students will work in breakout groups to conduct a mediation analysis of a specific technology and then share their findings with the class.
* In one abbreviated form, instructors could use only Lesson A, assigning the reading to students and then discussing it during the following class period.
* In another abbreviated form, instructors could use both Lesson A and B in a single class period. This approach may require either abbreviating or skipping the discussion portion of Lesson A. In this approach, the reading of Lesson A is used largely to facilitate the use of Lesson B in class.
* In a third abbreviated form, instructors could use only Lesson B in a single class period. This approach would require instructors to be comfortable explaining how to conduct a mediation analysis on their own. (This level of proficiency could be reach after running the module a few times in class and reading the articles provided in the suggested reading list attached here.)

*Pedagogical Note*

Some instructors may be new to teaching and discussing ethics in their computer science courses, and for that reason, some instructors may feel underprepared or even uncomfortable with their level of experience in conducting ethical analysis. But it is important to remember that, when teaching ethics, instructors are not expected to have the right answers but are rather expected to pose the right questions. Thus, the best approach for this material is the Socratic method, which emphases asking questions over providing answers. Importantly, because ethical problems are open-ended problems, the questions asked should be open-ended. The lessons in this module are not designed to help students or faculty come to definitive answers about design ethics. Instead, the lessons are designed to provide students with the opportunity to think through their own views and, most importantly, provide reasons for their views.

Instructors should not feel obligated to settle any moral issues in one or two class periods. Instead, instructors should view the modules as an opportunity to initiate and practice ethical reasoning with students. One challenge of the Socratic method is that there are no obvious or objective right answers. Another challenge is the diversity of answers that the instructor will get from students. A third challenge is that the instructor must momentarily set aside their usual position as a content expert and focus instead on being the person with questions rather than answers. (See the Resources at the end for a helpful guide to Socratic teaching.)

It should also be noted that, where possible, the reading questions and mediation analysis guidelines have been constructed using Bloom’s taxonomy (the revised 2001 terminology is used here). The reading questions consist of “lower order” questions designed to help students *Remember* (Level 1) and *Understand* (Level 2) the ideas in the assigned readings. The mediation analysis questions consist of “higher order” questions designed to help students *Apply* (Level 3), *Analyze* (Level 4), *Evaluate* (Level 5), and *Create* (Level 6). (See the resources at the end for a helpful guide to Bloom’s taxonomy.) These lists of questions are not exhaustive, so instructors are encouraged to add or modify questions as they see fit.

**PART II: LESSON A**

*Assigned Text*

Verbeek, P-P. (2015). Beyond interaction: A short introduction to mediation theory. *Interactions* *22*(3), 26-31.

*Lesson Steps*

1. In advice of the designated class period, provide students with the assigned text and ask them to read it as homework before coming to class. Students may be provided the reading questions in the Lesson A Student Handout to help them identify the most important ideas in the text. Instructors may choose to require students to submit answers to the reading questions. Remember that no student will master the ideas in the text on a first read, so this reading assignment is just a primer. The reading should take students 30 to 45 minutes to complete outside class.
2. In class, before discussing Verbeek, prompt the students to think and discuss the basic components of ethical theory, using the concepts on the handout and/or PowerPoint (though instructors need not use the slides in class). This step helps students begin thinking about right and wrong before jumping into Verbeek and design ethics. This step should take approximately 20-30 minutes.
3. In class, provide students with a copy of the Lesson A Mediation Analysis Student Handout and place them into breakout groups of 3 or 4. Assign each group a relevant technology (or ask them to pick a relevant technology of their own choosing) and ask them to collaborate in conducting an ethics analysis of that technology with reference to Verbeek’s types of influences. This step should take approximately 10-15 minutes.
4. Once students have completed their mediation analysis, ask student groups to share their findings with the class, providing reasons for their conclusions. Instructors should write all student answers on the board in a table (see example below). In small classes, it is possible to hear from every group. In larger classes, the instructor may take volunteers or call on groups randomly. This step should take approximately 15 minutes.

*Lesson Materials*

|  |
| --- |
| **Reading Questions** |
| These questions can be provided to students to help them *Remember* (Level 1) and *Understand* (Level 2) the texts as they do the readings:   1. What does Verbeek seem to mean when he says that “humans and technologies should not be seen as two ‘poles’ between which there is an interaction; rather, they are the result of this interaction…[humans and technologies] are not pre-given entities but rather ones that mutually shape each other in the relations that come about between them”? 2. According to Verbeek, what is the difference between “extension” relations and “dialectics” relations between humans and technologies? 3. According to Verbeek, what are “hybridity” relations between humans and technologies, and why does he seem to favor this way of thinking about humans and technology? 4. What is one “type of relation” identified by Verbeek? Can you think of an example of a technology *not* mentioned by Verbeek that represents this type of relation? 5. What are the four “points of contact” described by Verbeek? 6. What are the “types of influence” identified by Verbeek? Can you think of any example technologies that fit one of these types of influence? 7. What does Verbeek seem to mean when he says that “Designers materialize morality”? |

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| **Mediation Analysis Questions** |
| These questions are posed to students to help them *Apply* (Level 3), *Analyze* (Level 4), *Evaluate* (Level 5), and *Create* (Level 6) in response to the readings:   1. *Ends*: What kind of humanity does this technology seem to promote? Identify specific relationships or behaviors as evidence for your answer. 2. *Means*:What type of influence does this technology seem to impose on the human user: coercive, decisive, persuasive, or seductive? What is the evidence for this conclusion? |

*Example*: On the board, the instructor should make a table with three columns: technology, ends, and means. The first column names the technology that the group is discussing. The second column provides a place for the ends (human behaviors or relationships) that the technology promotes. The third column provides a place for the means (coercive, decisive, persuasive, or seductive) that the technology uses to promote those human behaviors or relationships. So a table might be like this:

|  |  |  |
| --- | --- | --- |
| *tech* | *ends* | *means* |
| Facebook App | Sharing, openness, connectedness  Generating advertising revenue | Intuitive, navigable interface (persuasive)  Infinite scroll (seductive) |

Importantly, because computer technologies almost always promote multiple ends and almost always use multiple means, the students may identify contradictions in the technologies themselves. Thus, students may identify more than one end and more than one means for any given example technology, and these ends and/or means may even be divergent. Facebook app, for example, may use persuasive means to promote sharing and connection between people, but it also uses seductive means for generating more clicks, which is the basis for monetizing data.

*Lesson Notes*

The core ethical issues explored in this lesson focus on articulating a vision of what humans should be like (how should they behave, how should they relate to each other) and how to best promote that vision (what design decisions should be made). Verbeek helps us understand that technologies necessarily promote certain ways of being. When someone designs a computer program, they are already assuming something about they way people are or the way people should be. The point of mediation analysis and ethical assessment of computer technology is to discover our assumptions about what humans are or should be like and then decide if those assumptions are morally correct or desirable.

*Article Summary and Explanation for Instructors*

The central thesis of Verbeek’s argument in “Beyond Interaction” is stated under the “Insights” section on the first page of the article: “Responsible design does not shy away from influencing human behavior, but rather aims to give such influences a desirable direction” (26). Verbeek argues this based on two premises alluded to but not explicitly stated in the text. The first premise is that all technologies influence behavior. Following from the first premise, the second premise is that designers cannot avoid influencing behavior. If all technologies influence behavior and all technology is designed by someone, then every designer is engaged in an enterprise the product of which will influence people’s behavior. Given that such influence is unavoidable, Verbeek concludes that morally responsible designers will not only accept the fact that their creations will influence behavior but also work to design technology that has positive moral or ethical influences on people’s behaviors, which is what he means by “aim[ing] to give such influences a desirable direction.”

The reason mediation theory is important here is also stated under the “Insights” section on the first page of the article: “Mediation theory can help designers to anticipate the impact of a product on human practices and experiences” (26). In other words, mediation theory can (a) help designers understand how their technological creations will influence people’s behavior and (b) help designers consciously create technologies that will promote morally desirable relations between users.

The way Verbeek frames the argument, he is already anticipating the obvious counterargument. For some readers, the idea that technology designers should actively try to create artifacts that influence people’s behavior in certain ways might seem quite manipulative. Verbeek suggests that this should not be a concern for two reasons. First, such influence is unavoidable, which means it is not a question of deciding whether to influence or not influence. Instead, it is the unavoidable matter of deciding *how* to influence. Second, such influence should not be secret. Instead, designers should be quite open about the values that informed their design process and the explicit and implicit aims they had regarding their technological creations. Such transparency will provide users with as much knowledge as possible, helping them decide when and how to use any given technology.

To understand mediation theory, Verbeek has to explain why it is different from other dominant approaches to philosophy of technology. In the section on “Human-Technology Relations,” Verbeek summarizes two approaches that he rejects: *extension* and *dialectics*. The extension approach to technology is basically the technological neutrality paradigm, the view that technologies have no intrinsic values or disposition but that they are merely inert tools. This view places all the emphasis on the agency of the human user and can be captured in the contemporary slogan “guns don’t kill people, people kill people.” Alternatively, the dialectics approach to technology is basically the technological pessimism paradigm, the view that technologies alienate humans from themselves and nature. This view places most of emphasis on the agency of the technology, which is a force to be resisted by humans, and can be captured in the contemporary slogan “smart phone, dumb person.”

Against these two approaches, Verbeek explains that mediation theory is part of a third approach to technology: *hybridity*. Unlike extension and dialectics, which both view technology as outside of human nature, hybridity views technology as constituting a part of human nature. As Verbeek writes, “Technologies and human beings help to shape each other. Technologies are an element of human nature: They are part of us… Technologies help shape perceptions and actions, experiences, and practices” (29). This insight is important for designers because, if technology is part of human nature, then you cannot have ethical people unless you have ethical technology. If designers fail to design ethical technology, then they will have influenced human behavior in a morally negative way. In other words, designers are not simply designing technology. They are designing human behavior and human relationships.

In the section on mediation theory, Verbeek explains that this theory recognizes three dimensions of human-technology interaction: (1) points of application/contact, (2) types of relations, and (3) types of influences.

1. Points of Application/Contact

According to Verbeek, there are four points of contact between humans and technology, but because the fourth one, “above the head,” is not part of a mediation analysis (Lesson B), it is not as important as the others. The purpose of this list is to distinguish the ways in which humans come into contact with technology.

|  |  |  |
| --- | --- | --- |
| **Points of Contact** | | |
| *Point* | *Form* | *Description* |
| To the Hand | Physical | When humans physically interact with a technological object |
| Before the Eye | Cognitive | When humans receive or interpret information provided by a technological object |
| Behind the Back | Contextual | When technology is part of the infrastructure of the human’s environment |

1. Types of Relations

According to Verbeek, there are seven types of relations, the first four derived from the work of Don Idhe and the remaining three are his own additions. The purpose of this list is to account for the various ways that the world, the human, and technology relate to each other.

|  |  |
| --- | --- |
| **Types of Relations** | |
| *Embodiment* | A relation in which the human and technology temporarily “merge” to interact with the world, like a telephone or a microscope |
| *Hermeneutic* | A relation in which the human interacts with a temporary “merger” of a technology with the world, like an MRI or a metal detector |
| *Alterity* | A relation in which the human interacts with a technology while the world remains in the background, like an ATM |
| *Background* | A relation in which technologies are part of the ambient background of human experience, like the humming of a refrigerator or air conditioner |
| *Cyborg* | A relation in which the human and technology permanently “merge” to interact with the world, such as a chip implanted in the brain (the main difference between an embodiment relation and a cyborg relation is the duration and depth of the merger between human and technology) |
| *Immersion* | A relation in which the human interacts with a permanent “merger” of a technology with the world, such as the internet of things and smart assistants (the main difference between a hermeneutic relation and a immersion relation is the duration and depth of the merger between technology and the world) |
| *Augmentation* | A relation in which there is a simultaneous embodiment and hermeneutic relation, such as with Google Glass |

(3) Types of Influences

According to Verbeek, the types of influences fall along two spectrums: visibility and force. For visibility, the influence falls on a spectrum between apparent and hidden. For force, the influence falls on a spectrum between strong and weak. These concepts can be represented on a coordinate plane (Figure 1) or in a table (Figure 2). Importantly, the terms are defined as such:

* *Coercive* influences are both apparent (highly visible to the user) and strong (required actions imposed on the user by the interface)
* *Persuasive* influences are both apparent (highly visible to the user) and weak (suggested actions offered to the user by the interface)
* *Decisive* influences are both hidden (not visible to the user) and strong (required actions imposed on the user by the interface)
* *Seductive* influences hidden (not visible to the user) and weak (suggested actions offered to the user by the interface)

Types of Influences

*Decisive*

*Coercive*

**Strong**

|  |  |  |
| --- | --- | --- |
|  | Apparent | Hidden |
| Strong | *Coercive* | *Decisive* |
| Weak | *Persuasive* | *Seductive* |

A picture containing shoji, building

Description automatically generated

*Seductive*

*Persuasive*

**Apparent**

**Hidden**

**Weak**

*Figure 1. Figure 2.*

*Example Mediation Analyses*

The categories identified by Verbeek can be applied to an everyday example, and this example shows that there are always multiple layers at play. It also shows that the influences, relations, and contacts of technology are not obvious. Instead, an interpretation of the technology must be given and supported with reasons, which means there may be disagreement about the nature of a given technology. (This example can also be used with Lesson B.)

Imaging a person at home, holding their smart phone, which is connected to the Wi-Fi, and browsing the newsfeed on the Facebook app. Here, we have all three points of contact involved. The smart phone is the physical contact. The app is the cognitive contact. And the Wi-Fi (and the broader telecommunication networks that provide internet access) is the contextual contact.

|  |  |  |  |
| --- | --- | --- | --- |
| **Technology** | **Point of Contact** | **Type of Relation** | **Type of Influence** |
| *Facebook App* | To the Eye (Cognitive) | Embodiment or Hermeneutic | Seductive |
| *Smart Phone* | To the Hand (Physical) | Embodiment | Persuasive |
| *Wi-Fi / Internet* | Behind the Back (Contextual) | Immersion | Decisive |

Likewise, we can also identify three types of relations. The phone represents an embodiment relation because the phone acts as an extension of the human body. The app might represent a hermeneutic relation because the app actually organizes theworld for the user; the app might also be an embodiment relation for the same reason as the phone. The Wi-Fi and internet would most likely represent an immersion relation because it is experiences by the user as perpetually merged with the world.

Finally, the phone, the app, and the internet can all be analyzed to determine the extent to which they impose coercive, persuasive, decisive, and/or seductive influences. The Wi-Fi and internet most likely impose a *decisive* influence because the mode of communication is determined (strong) by the structures of telecommunication networks but most people do not really understand how such networks actually work (hidden). The smart phone most likely imposes a *persuasive* influence because the physical phone is clearly visible to the user (apparent) and the user interface suggests but does not always require certain types of uses (weak). Finally, the Facebook app most likely imposes a *seductive* influence because features like refresh and infinite scroll are designed to keep users engaged and clicking (weak) without them realizing the app is promoting such behavior (hidden).

Importantly, there are no “obvious” answers in a mediation analysis. All conclusions in a mediation analysis should be supported with good, clear reasons, and compelling counterarguments are always possible.

**PART III: LESSON B**

*Relevant Texts*

There are no assigned readings for this lesson, but the in-class activity is based on the following articles:

Verbeek, P-P. (2006). Materializing morality: Design ethics and technological mediation. *Science, Technology, & Human Values* *31*(3), 361-380.

Verbeek, P-P. (2013). Technology design as experimental ethics. In S. van den Burg & Tsj. Swierstra (Eds.), *Ethics on the laboratory floor* (83-100). Basinstroke: Palgrave Macmillan.

*Lesson Steps*

1. In class, provide students with a copy of the Lesson B Mediation Analysis Student Handout and place them into breakout groups of 3 or 4. Assign each group a relevant technology (or ask them to pick a relevant technology of their own choosing) and ask them to collaborate in conducting a mediation analysis of that technology using Verbeek’s concepts. The first stage of this analysis will require them to determine (a) the point of contact, (b) the type of relation, and (c) the type of influence that the given technology embodies. This step should last approximately 10 minutes.
2. Once students have completed the first stage, ask student groups to share their findings with the class, providing reasons for their conclusions. Instructors should write all students answers on the board in a table (see example below). In small classes, it is possible to hear from every group. In larger classes, the instructor may take volunteers or call on groups randomly. This step should take approximately 15 minutes.
3. Next, have students work on their groups again, only this time they should use their mediation analysis to decide if the technology they analyzed is ethically desirable or not. To complete the second stage of the analysis, they will have to (a) identify one characteristic of desirable human relationships/behavior that the technology *promotes* and (b) identify one characteristic of desirable human relationships/behavior that the technology *impedes*. Groups may choose which characteristics they wish to use, though they may be derived from the materials and/or discussion from Lesson A. This step should last approximately 10 minutes.
4. Once students have completed the second stage, ask student groups to share their findings with the class, providing reasons for their conclusions. Instructors could add these findings to the table on the board. In small classes, it is possible to hear from every group. In larger classes, the instructor may take volunteers or call on groups randomly. This step should take approximately 15 minutes.

*Lesson Materials*

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| --- |
| **Mediation Analysis Stage 1** |
| These questions are posed to students to help them *Apply* (Level 3) and *Analyze* (Level 4) in response to the readings.  Given the technology under consideration, determine the following:   1. What is the point of contact between the human and this specific technology: physical, cognitive, or contextual? What is the evidence for this conclusion? 2. What is the type of relation between the human and this specific technology? What is the evidence for this conclusion? 3. What type of influence does this specific technology seem to impose on the human user: coercive, decisive, persuasive, or seductive? What is the evidence for this conclusion? |

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| **Mediation Analysis Stage 2** |
| These questions are posed to students to help them *Evaluate* (Level 5) and *Create* (Level 6) in response to the readings.  Given the technology under consideration, determine the following:   1. Does the technology promote at least one type of desirable human relationship or behavior? If yes, what is that relationship or behavior and why/how does the technology promote it? 2. Does the technology impede at least one type of desirable human relationship or behavior? If yes, what is that relationship or behavior and why/how does the technology impede it? 3. To what extent do you think the designers intentionally or unintentionally designed the technology to promote or impede these relationships and behaviors? Do you think they would make any changes to the technology if you explained your analysis to them? Why or why not? |

*Lesson Notes*

The core ethical issues explored in this lesson extend the considerations from the previous lesson. To dig deeper into the examination of ethical assumptions that guide the design process, students apply Verbeek’s mediation analysis to a specific technology in order to determine what the designers seem to have explicitly and implicitly intended and whether the end result is morally desirable, providing reasons along the way.

As the example mediation analysis attached to Lesson A shows, there are always multiple relations and influences going on at the same time, and it is not always obvious which relations and influences are at play. Because some aspects of mediation analysis can be indeterminate, there will be disagreement about how to understand whatever technologies are under discussion. This is fine because the aim is to get students to practice thinking through these kinds of questions, not to provide them with answers.

**PART IV: OTHER LESSON OPTIONS**

*Lesson C*

After completing Lessons A and B with the class, instructors may wish to implement one more stage of ethical design analysis. In any course where students are required to create their own program, instructors can require students to conduct a mediation analysis of their own project and submit it with the final project. Using the mediation analysis process from Lesson B, students would provide an account of the ways in which their own project explicitly and implicitly promotes certain types of behaviors and relationships and explains why those behaviors and relationships are morally desirable or not.

*Other Readings*

Instructors who wish to further explore the relationship between values, technology, and design should see articles by Robert J. Whelchel (1986) and Ibo van de Poel (2000) listed under Resources. Whelchel’s classic yet accessible essay argues that technology is not value free and that the values embedded in any given technology frame the way we experience reality when using that technology. Van de Poel’s essay, also accessible, provides additional argument for why designers have moral responsibilities and why they must consider the ethical implications of their products as they design them. For more general information on the history and approaches to philosophy of technology, see Verbeek (2010), Reydon (n.d.), and/or Franssen et al. (2018).

*Online Classes*

*Synchronous*: In synchronous online classes, instructors can implement the modules almost as designed with the right tools. Class discussions and breakout groups can be conducted over Zoom, with the instructor using the groups setting to simulate breakout sessions and using the screenshare setting to simulate a whiteboard where students contributions are displayed.

*Asynchronous*: In asynchronous online classes, instructors can modify the lessons and adapt them to be either homework assignments or discussion board topics. For example, Lesson A could consist of:

* A discussion board for the reading questions
* A short lecture video using the PowerPoint slideshow provided
* A discussion board or a group assignment for the ethical design analyses

Likewise, Lesson B could consist of:

* A discussion board for the mediation and ethical design analyses; or,
* A group assignment and/or presentation for the mediation and ethical design analyses

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