A MANIFESTO FOR TECHNOLOGICAL TRANSPARENCY IN THE AGE OF WEB 2.0

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ABSTRACT

Technological transparency - the idea of understanding how systems, processes, and related mechanisms within society work - can help individuals progress beyond the mere use of technologies towards developing critical perspectives. In this paper, we highlight and advocate the importance of technological transparency in Canadian curricula by providing examples from a spectrum of technologies that we describe using the terms "open" and "closed." Further, through examples of technologies as well as a scenario from a graduate classroom where education for technological transparency was employed, we discuss how "openness" relates to knowledge production processes. To conclude, we call attention to the importance of criticality in education and discuss potential roadblocks promoting technological transparency and educational change.

INTRODUCTION: TECHNOLOGICAL TRANSPARENCY FOR THE 21st CENTURY

In *The School and Society,* one of his first significant educational works, John Dewey emphasized the need for people to understand the basic mechanisms that underpin society. He argued that the rural dwellers of 19th century America, when compared to the inhabitants of Dewey's industrial Chicago, had possessed a better understanding of the technological processes that surrounded them. The inhabitants of rural America, Dewey claimed, understood how things were made, who in their communities was involved in the process, and the implications this production process had for the lives of workers and consumers. This idea of developing an understanding of how things work is what we refer to as "technological transparency" (Waddington, 2010). Dewey thought that this knowledge and in-depth understanding of prevailing technologies would afford individuals the opportunity to become agents in the technological processes when necessary and to be aware of how systems, structures or mechanisms around them function.

In this paper, we advocate the teaching and promotion of an updated version of technological transparency within educational curricula in Canada. Through technological transparency, individuals will be able to progress beyond the mere use of technologies towards developing a holistic, critical perspective. We will highlight the importance of technological transparency by providing examples from a spectrum of technologies that we describe using the terms "open" and "closed." We will also locate some example technologies on this spectrum and explain how openness can relate to knowledge production processes. We will conclude with an example detailing how education for technological transparency was employed in a graduate classroom in the Educational Technology program at Concordia University.

TECHNOLOGICAL TRANSPARENCY AND AGENCY

How is technological change usually understood? A dominant view within the field of educational technology suggests that technology evolves "automatically" as society evolves, and that technology changes as a result of how collective needs are conveyed/understood. Such an understanding acknowledges technological change, but it does not necessarily address the mechanisms or reasons that spur such change or the consequences of these changes. We contend that such limited knowledge tends to promote apathy—it furthers the impression that systems, structures and processes cannot be changed—or, rather, that we do not care to change them. We come to believe that we, individually, are removed from technological processes.

A curriculum that emphasizes technological transparency, however, can turn this sense of apathy towards agency. The knowledge gained from understanding the ways in which technological processes work can

result in critical perspectives that change the relationship between individuals and the respective technologies. As an example, consider modern meat production. As individuals become aware of the unsettling mass production processes and the environmental, social, and ethical implications, their perceptions and demands may change. This change, however, is not always welcomed, nor does it, in all cases, provide the impetus for urgency.

When one develops an understanding of a technological process like meat production, there are, effectively, three choices as to what we can do next with this understanding. First, one could agree with the overall processes—one could agree that factory farming yields cheap, good quality meat. A second alternative is to become disquieted by the how the processes work and begin an active search for an alternative. A third potential reaction to technological transparency could be outright resistance to understanding and subsequent learning of how the processes function: "This meat production stuff is disgusting—I just don't want to know!" By remaining blind to the intricate inner workings and social consequences of technologies, one can remain within the comfortable confines of technological opacity.

It is the second outcome that can lead to an attempt to effect structural change. Within the capacity to act as an agent of change, there is the possibility of embarking on a quest to seek alternatives. Once a technological process becomes transparent on a large scale, people may start exploring alternative practices. A significant example of this is the extraction of fossil fuels from Canada's tar sands (a region in northern Alberta known for its rich and abundant supply of heavy crude oil). As a result of increased knowledge of the environmental ramifications of this type of oil production, alternatives to fossil fuels are being explored with greater vigor. Those who understand the process of oil production may choose to seek alternatives and consider themselves to be agents of change.

One can see why technological transparency may be a worthwhile overall pedagogical goal. However, a more difficult question is how this goal can be put into practice in terms of educational technology. In order to begin to hint at an answer to this question, we analyze technologies on a spectrum ranging from "open" to "closed." We argue that open technologies are particularly powerful tools for facilitating technological transparency and reinforcing user agency. Closed technologies, by contrast, can remove this flexibility and render the user apathetic.

DEFINING OPEN AND CLOSED TECHNOLOGIES

Open technologies are technologies that allow the user (a) to understand how the technologies function on both a surface and a deeper level and (b) to become involved in their overall construction, design, and management. It is this "openness" that allows for the possibility of agency. Wikipedia is one of the best examples of an open technology—it allows for content to be completely user-generated and allows multiple users to collaborate to create artifacts of knowledge. Although users do not have control of the overall design of the environment, they are the main force behind the development of the objects that populate the environment. If a user disagrees with specific content on Wikipedia, she knows that, given the nature of the environment, she has the agency to try to change it.

Closed technologies are those where the end user is not encouraged (a) to understand how the technology works or (b) to participate in its design and/or evolution. This, from our perspective, results in an indifference towards making changes in the technology. The user accepts it as technology that "just works." The mechanisms necessary for change to occur, whether they are open channels of communication between users and designers or in-depth structural information about the technology, simply do not exist. Closed technologies are, in our current framework, entities where the single choice left to users is whether they wish to use a tool or not. Some knowingly accept that it cannot be changed and happily use the tool as it was designed, resulting in continued apathy towards promoting change to the technology itself. The Nintendo Wii is an excellent example of a completely closed technology—you can neither modify the Wii's software configuration nor can the hardware be (legally) modified. This has the advantage of making the technology easy to use, but it is unlikely to stimulate interest in the way that the technology itself functions.

THE SPECTRUM OF OPENNESS AND KNOWLEDGE PRODUCTION PROCESSES

While the notion of technological transparency was originally concerned with individuals understanding how technologies work, it can also be viewed as a factor in the knowledge production process. We hypothesize that when individuals understand the processes at work behind knowledge production, it can have a profound effect in inspiring them to modify or create knowledge of their own.

Open and closed technologies are both capable[2] of facilitating the creation of new knowledge; however, they are different with regard to the processes through which new knowledge is produced. Knowledge production technologies like Wikipedia that are open have transformed people's conceptions of the knowledge production process. Furthermore, technologies like this have allowed for the valorization of new knowledge (which traditionally may not have been considered worthwhile) and have contested the very nature of knowledge production.

With regard to the validation of new knowledge, Wikipedia has provided the public with access to an abundance of cultural stories and folklore from around the world—indigenous knowledge, silenced stories of injustice, or even traditional stories for children—information which many of us would not have had readily available access to in the past. One such example is a story from the Abenaki peoples of Eastern Canada (see http://en.wikipedia.org/wiki/Abenaki_mythology). In this story, Tabaldak, the creator of humans, also created and empowered two beings, Gluskab and Malsumis, who represented the dichotomy of good and evil. Though this story is not new knowledge for everyone (especially the Abenaki people), it is now accorded a level of accessibility and legitimacy that was previously impossible.

The ability to create new knowledge has also meant a great shift from the traditional knowledge production process. It is no longer strictly hierarchical, where the expert is the sole arbiter of worth and is able to dictate to the novice. In a technology like Wikipedia, any new information that is brought forward will usually be given some consideration for inclusion in the overall knowledge base. This very shift to inclusion has changed the foundations of what has been traditionally perceived as knowledge production. Within successful open technological frameworks, knowledge production becomes a participatory endeavor, thereby contributing to the democratization of digital spaces. The knowledge that is produced within open technological frameworks challenges the authority of expert knowledge. Individual expertise is validated and users gain a sense that they have an equal opportunity to be or become an expert and to disseminate their ideas worldwide.

Notably, even if a user's contribution is eventually rejected, the decision about the rationale for rejection will usually be relatively democratic and transparent. Each Wikipedia entry features a "Discussion" tab on which the edits are discussed, and there is also a "View History" option that allows the user to view how the article has evolved. These options allow both creators and consumers of the article to view which information is contested and to see how the knowledge has accreted (or has, in some cases, disappeared) and been validated over time. This allows the Wikipedia user to see inside knowledge production processes, which demystifies knowledge production and which may, consequently, empower the user to become a contributor in his/her own right. In general, we contend that information that is produced through collective processes within open spaces can empower individuals to be both effective users and creators of the knowledge related to the technology in question.

However, although open technologies offer the arguably beneficial opportunity to be both knowledge users and producers, their design does pose some challenges. For example, the lack of templates and specific guidelines supporting the development of some open designs may challenge their development and long-term survival. MySpace, for example, allowed creators to have complete control over the design of their personalized webspace. Though this may have provided a certain degree of creative license, MySpace decreased in popularity in part because of the user's own muddled and complex designs which led to navigation and usability issues. In contrast, although it was a more closed technology, Facebook gained popularity through its cleaner, far more structured, less changeable environment. It usurped MySpace's crown and quickly consigned it to the dark depths of the digital abyss.

In sum, we maintain that users and creators who are aware of how open knowledge production technologies function have developed substantial new possibilities for agency. They can choose to use the tools to create new knowledge, intervene in existing processes, and criticize the means of production of knowledge. In a closed technological structure, by contrast, the production processes are opaque and users are left with a limited degree of agency—agency to use the tool or not.

EDUCATIONAL IMPLICATIONS: LESSONS FROM A CLASSROOM

Given the fact that we favor the use of technological transparency, we endeavored to structure a class activity that would promote the use of an open technology. Learners enrolled in a graduate course on online communities in Concordia's Educational Technology program were required to modify a Wikipedia page detailing the topic of "Community of Practice" (http://en.wikipedia.org/wiki/Community_of_practice). They received minimal instruction regarding the process of knowledge production, were left to search and retrieve their own knowledge base and were encouraged to develop the artifact as a collective.

The information the students posted was not only vetted by the instructor and their in-class peers, but they also received extensive comments from other sources, mainly reviewers of Wikipedia entries. As is to be expected in a classroom activity, the students were comfortable receiving feedback from their instructor and peers, but they were, however, hesitant and surprised upon realizing that their work was stimulating much discussion by contributors to the Wikipedia page (see a summary of the discussions on http://en.wikipedia.org/wiki/Talk: Community_of_practice). Once the students began interacting with these reviewers—exchanging comments, agreeing/disagreeing with changes made to their work—they quickly began to realize that their work extended beyond a class assignment. They would often return to class enthusiastically remarking

on what the online community had to say, and eventually developed a more rich understanding of how Wikipedia entries were created and modified. To us, this indicated a growing sense of engagement with the knowledge production process.

Through the use of an open technology, the students developed an understanding of the mechanisms involved in creating and modifying knowledge and information; they saw themselves as proponents/agents within the knowledge production process. Additionally, the external comments received altered the work significantly—the discussion on their Wikipedia entry led to the students generating content that would not have been created if they had been left to their own devices.

WORKING TOWARDS TRANSPARENCY

We believe one of the most important outcomes of education is the development of the power to think critically. More than 100 years ago, Dewey noted that, in order for students to become critical consumers of knowledge and effective actors in social contexts, they needed to understand how technological processes function. Technology education through a technological transparency lens can propel and reinforce these skills; this knowledge and know-how can lead to a sense of agency. Students are constantly exposed to new ideas and technologies, and education through technological transparency will allow them ask such questions as "How was this technology developed?", "Who was involved in the production process?", "What implications does such a tool have for society?" and "Does this process need to be changed, and how can I get involved in changing it?" Understanding the answers to these questions may lead to the development of agency—students will be able to decide for themselves whether they are willing to accept a particular process, or whether they want to change it and look for alternatives.

Today, the problem of technological opacity that originally concerned Dewey has grown substantially more severe. The pace of technological change has accelerated, and globalization has increased both the opacity and complexity of production processes in unexpected and disquieting ways. As a result, the need for transparency is clearer and more pressing than it has ever been. In this paper, we have argued that engagement with new, open knowledge production technologies offer a particularly powerful way of educating for technological transparency. The wave of technological change that originally concerned Dewey was industrial, but the change that we are undergoing now is related to information. It is still important to understand industrial processes, but a close look at the processes underlying information technologies may be even more critical. Our example of using Wikipedia in the classroom offers one promising example of how to do this, but there is still a great deal of work to be done in terms of designing curricula that facilitate technological transparency. Designing and executing these curricula will not be easy—it is challenging and labor-intensive to teach (or, for that matter, to learn) for technological transparency. However, creating more critical citizens is an important goal, and worthwhile educational change often requires sailing into the wind.

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FOOTNOTES

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[2] Microsoft technologies, for example, are usually closed, but they have nonetheless helped create a great deal of new knowledge.