



For Technological Literacy Education: Comparing the Asymmetrical View of Heidegger and Symmetrical View of Latour on Technology

Eun Ju Park^{1,2}

Accepted: 24 June 2022 / Published online: 31 July 2022
© The Author(s), under exclusive licence to Springer Nature B.V. 2022

Abstract

Students today are habitual users of digital technology. However, they do not examine the nature of their relationship with technology. Even though we are all enduring severe environmental crises including the COVID-19 pandemic, our students do not appear to see the interrelated connections between the environmental crisis and themselves. A case in point is that they have difficulty drawing a connection between environmental crises and their participation in industrial civilization. This is why it is necessary to consider technological literacy seriously for our environmental education. This study seeks to investigate an alternative way to set up the relation of technology for the current environmental education by comparing the views of Heidegger and Latour on technology. Even though the question of the two thinkers starts from the same critics of the instrumentality of technology, their strategies to overcome it are quite different. While Heidegger suggests a human-centered relationship between humans and technology, Latour criticizes the limitation of this approach and maintains that more symmetrical relations with technology are needed as a form of a network between human and nonhuman actors. In this paper, I argue for the urgency of cultivating a sense of *connection* for our students' technological literacy in this environmental crisis. For that purpose, I insist Latour's advice for teachers and researchers to be considered more seriously to encourage students to take symmetrical relationship with technology in these aggravating environmental crises.

Keywords Technological literacy · Heidegger · Latour · Environmental crisis · Instrumentalism

✉ Eun Ju Park
eduzoo@ewha.ac.kr

¹ Ewha Institute for the Humanities, Ewha Womans University, Ewhayecodae-gil, Seodaemun-gu, 03760 Seoul, Republic of Korea

² Il Hyun-ro 97/11 (Apt. 104-1504) Ilsanseo-gu, 10242 Go Yang City, South Korea

The Difficulty of Teaching Environmental Crisis in this Technology-based Era

A few years ago, one of the students in my class, who happened to be a science teacher currently teaching in middle school, told me that the greatest difficulty she had was teaching students about environmental crises. When I asked her what made her feel so desperate, she told me that students no longer thought of the crises as their own problems. Whenever she had a class about environmental issues, students always responded as if those issues had nothing to do with them, that is to say, as if everything was just something happening on the other side of the earth. Their responses made it practically impossible for the teacher to motivate them to be concerned about environmental issues.

Ironically enough, ever since recognizing the seriousness of the environmental crisis, South Korea has continued with its efforts regarding environmental education. The government enacted the Environmental Education Act of 2008 and created an environmental education department under the Ministry of Environment in 2018. As a result, annual climate and environmental education are now compulsory for elementary and middle schools. A shift to an environmental point of view is being called out across various aspects of our society. Schools are continuously teaching and alerting their students about the importance of environmental sustainability. Nevertheless, the effectiveness of these measures still remains in question. With the Covid-19 and the new “social distancing measures”, decreasing outdoor activity seemed to restore nature from excessive human activities. However, online shopping has increased instead of decreasing outdoor activities: in turn, the use of disposable plastic items and waste have also seen a steep jump. On the one hand, we are in the midst of environmental disaster and thus, we are putting more efforts in educating people on the crisis; however, on the other hand, as ironic as it is, our destruction of the environment is only picking up speed. What else could this imply? To put it bluntly, it shows that we are seemingly unable to conceive the environmental crisis as our own, just as the science teacher says above. How are we to teach our students who fail to embrace the seriousness of the situation? How are we to help our students restore the sense of connection between our environment and themselves?

To answer this question, we can make a diagnosis that we urgently need education for ecological literacy. Orr (1991) had already emphasized the need for a transition from literacy-centered education of reading and writing into the ‘ecological literacy education’ of environmental sensibility. According to Orr (1989), ecological literacy requires the more demanding capacity to distinguish between health and disease in natural systems and to understand their relationship in human ones. As literacy is driven by the search for knowledge, so the sense of wonder drives ecological, and that sort of knowledge is best acquired out-of-doors (Orr 1989: 334).

However, Goodwin (2016) reports that in education for ecological literacy, even though environmental activities have steadily increased across the years, environmental literacy itself has ceased to show any conspicuous signs of rising. Why is this so? We are living in an era of environmental crisis, and at the same time we are all its direct victims. Thus, we recognize its threats, and we conduct education about the environment and various environmental activities. Nevertheless, why would the ecological literacy among students seem to fail to grow?

With our current environmental education failing to achieve any reasonable effectiveness, I feel the need for a critical assessment concerning the goals and premises of 'ecological literacy' that it pursues grows larger than ever before. The current form of ecological literacy seems to be understood as a sensibility seeking to restore the pure state of nature by focusing on the way of cultivating the sense of ecology itself¹. The way to achieving the goal of restoring ecology in turn leads to the search of the way for experiencing nature, loving and caring for life, and standing against the destruction of the environment. However, the 'pure state of nature' that ecological literacy holds as its goal presupposes a dichotomous division between nature and human civilization; or to be more specific, between nature and technology. Nature, in this case, assumes the pure state before human technology had intervened as its ideal.

This implies the idea that humanity's activities and technology are responsible for the destruction of nature and thus holds a negative stance toward technology. As a result, the solutions that this so called ecological literacy suggests are generally restricted to images of nature in its pure state before any pollution, or traditional cultures before the industrial development, or minor tribes who are yet to face modern technologies. I do agree on and acknowledge the fact that humanity's effort to restore nature to its original state is needed and mandatory. However, what makes ecological literacy impractical is the fact that it stands upon a kind of anti-technological point of view.

It is essential that we compare the arguments of ecological literacy with the world our students are living in. We no longer live in a primitive jungle, far from the reaches of technology. The basis for their lives has already transited from the natural environment to the artificial version. As Ihde maintains (1983: 3), "our lives are technologically textured for most waking moments." Therefore, it seems exceedingly unrealistic to expect them to abandon all the technology they were born into and return to the state of nature before modernization. In order to render possible a true ecological turn, we must first seriously ponder upon the question of what it means for the students of this technology-based society to truly have an ecological perspective. Perhaps the literacy that they genuinely need is actually "technological literacy" which can be a first step for students to have an ecological perspective. There is a considerable gap between the ecological literacy as advertised by the current environmental education and the literacy required by this technology based world our students are living in ; and this gap cannot by any means simply be ignored.

For our students living in this technology-based society, what they need is not the pessimistic view that technology is the culprit behind the ecological crisis; instead, developing a sense as to what attitude should be held regarding technology for an ecological restoration of our world. Consequently, this sense is also directly related to one regarding the relation between the world and the individual of what the desirable relation should be (Goodwin 2016: 287). Thus, not a pessimistic view towards technology, but a discretion of what parts

¹ For example, Bowers(2013) argues that we can gain ecological wisdom from the culture of the premodern era, before the dichotomous separation between mankind and nature had taken place. Therefore, since in the traditional culture before modernization, the human race could live in harmony with the ecosystem, it allows us an insight into ecological wisdom and the ecological perspective. Parakash(2013), who expanded Bower's argument even further, proposes a 'down to earth ecology' accompanying the transition from the needs of homo Oeconomicus to the virtues of soil. Then what is required for a philosophy of soil, one which will allow us to enjoy the virtues of soil fully, demands ecological literacy in the virtues of rooted dwellers to avoid the natural disasters of the modern ecology of Homo Oeconomicus(Prakash 2013: 331).

of technology are problematic, a process of thinking and reflecting upon our relationship with technology itself.

I believe that for an expansion of ecological literacy to be possible, the matter of maintaining technological literacy as its core element is no longer that of choice. In this paper, I wish to provide a rough sketch of the technological literacy required in this technology based society. In particular, I will explore the question of just what the desirable relationship between technology and mankind should be for sustainable ecology. For this purpose, in the second chapter, I will examine the instrumental perspective on technology, which is illustrative of the perceived relationship that leads to current environmental crisis. From there, I will seek the alternative for overcoming this issue by comparing Heidegger's asymmetrical perspective with Latour's symmetrical counterpart. Finally, I will argue that our environmental education for overcoming the ecological crisis in this technology based society can be ensured through developing technological literacy from a Latourian perspective.

Instrumental Perspective on Technology: Means-end Relationship

What is the cause of the current environmental crisis? Many ecologists point to the modernity as the cause of it. For example, Bowers (2013: 312) points out "the paradox of modernization" in which the more the progress advances, the more the ecosystems are increasingly put at risk. As human demands continue to grow, the viability of natural systems only declines. From this standpoint, Bowers criticizes that the form of modernity itself includes an environment-destructive quality.

In this case, what exactly is the modern attitude that is pointed out as the main culprit behind our environmental crisis? As many would presumably agree, it is none other than the dichotomy that separates 'I' from the world (human beings, objects, nature, etc.) This separation gave birth to Descartes' thinking ego, and thus the modern self was born. In turn, when the modern self started to consider other things, humans, and nature as the objects of cognition, a fundamental change in the relationship between human beings and other objects occurred. Taylor explains such relationship changes from the pre-modern era into the modern one as a process of 'disenchantment'.

In his book *The Ethics of Authenticity*(EA²), Taylor(1991) diagnoses "disenchantment" as the cause of the malaises that modern people cannot avoid feeling. Before modern times, the world had been connected within a larger order where "humans figured in their proper place along with angels, heavenly bodies, and our fellow earthly creatures"(EA 3). Pre-modern people called this cosmic order as "great chain of Being"(EA 3). Modernity is characterized as a turning point when humanity began to doubt the great chain of Being and instead chose their freedom by abandoning such orders. As a result, the only universal order was broken into pieces, and the relations between men and other beings were severed. Disenchantment in modern times proceeded in two ways: On the one hand, it changed the way humans had a relationship with the world. The modern man emerged as an authentic individual by rejecting a fixed positioning in the traditional order. On the other hand, it changed the relationships between humans and things that were intimately connected under one universal order. By rejecting the order, they are disconnected and alienated from the entire organic system. Due to this modern disenchantment, the world turned into a mechanistic universe

² EA is an abbreviation for *The Ethics of Authenticity*.

that automatically spins like a cogwheel: every being became atomized and individualized in this mechanistic universe. Without universal order, only humanity stands as an ultimate end, whereas other beings exist as objects at a distance, ready to be used as a means.

Taylor diagnoses the relationships between humans and things since the beginning of modernity as “instrumental reason” (EA 5). It is “the kind of rationality we rely on when we calculate the most economical application of means to a given end”(EA 5). The instrumental reason in the form of means-end relations replaced the divine order after disenchantment. Since the modern era, instrumental rationality has been regarded as the core principle of the relationship between humans and things in the form of maximum efficiency, the best ratio of cost to output. It is applied to every relationship, especially to humans and technology. Humans emerge as the end and things or technology as the means in the relationship between humans and technology. However, as Arendt (1958) warns us, man makes a condition, but it conditions man again. The more advanced the technology is, the more autonomous it gets. People make machines for their own convenience; however, they have to adjust themselves to the machines again. As a result, people begin to see that they are instrumentalized by the technology they have made with their own hands because they are no longer free. This is our modern malaises of technology.

The instrumental view of technology, which sees everything in terms of a means-end relationship, has become a major feature in modernity. This characterizes our attitude toward things, and to make matters worse, it dominates our attitude toward other beings, such as animals, plants, and even other human beings. What must be overcome in order for our students to develop technological literacy is the means-end relationship standing upon instrumental rationality, which is the dominant viewpoint of technology in this era. The means-end relationship renders technology only perceivable as a ‘usable object’ and no longer pays any further attention as long as it fulfills our desires. Such attitudes toward technology paralyze the sense of what consequences could follow, leading to indifference towards the destruction of the ecosystem. Then what could be the alternative to the instrumental perspective in the human-technology relationship? For this question, I will focus on Heidegger’s asymmetrical perspective in the following section.

Heidegger’s Asymmetrical Perspective on Technology

Heidegger was perhaps the first philosopher to carry out a philosophical consideration of the relation of human and technology. Even though his idea on technology is called the “classical view,” it has deeply influenced on thinking about technology up to the present day. Therefore, Heidegger’s view of technology is worth examining in this study of a human-technology relationship with ecological sustainability.

Heidegger’s views on technology start with his criticism of instrumentalism. In his essay, *The Question Concerning Technology*(QT³), Heidegger (1977) criticizes the conventional unexamined conception of technology. The well-known definition of technology can be summed up in the following two statements. The first one is, “technology is a means to an end,” and the other one is “technology is a human activity” (QT 312). Heidegger names this the instrumental definition of technology(which dominates modern relation of technology and human), and harshly criticizes it(QT 312). Why is it so that he should be critical of those

³ QT is an abbreviation for *The Question Concerning Technology*.

common understandings of technology? In fact, every item of technology, from ancient hand axes to the modern computers, is a means to an end. Nevertheless, is there anything wrong with this? As Heidegger himself admits, this instrumental definition is in fact, quite correct. However, as he indicates, although it may be correct, it does not exactly mean that it is **true**(QT 313).

The implications of Heidegger's criticism of this instrumental approach can be rephrased in two ways. On the one hand, the instrumental view limits our relationship with technology to be only a form of means-end. If we accept the instrumental view as the only kind of relationship between humans and technology, it blocks all other possible relationships. On the other hand, if we put forward the instrumental view, we find that it is not much different from the paradigm of "mastery"(QT 313). Instrumentalism is a certain attitude toward things, that is to say, "manipulating technology in the proper manner as a means"(QT 313). This sort of attitude can be called a kind of the "will to mastery." However, as the will to mastery, according to Heidegger, "becomes all the more urgent, the more technology threatens to slip from human control"(QT 313). Heidegger's warning about instrumentalism forces us to search for another approach to technology, one that goes beyond this vicious circle of will to mastery.

What, then, is Heidegger's suggestion for overcoming this instrumental relationship between technology and human? Here, we need to follow Heidegger's questions concerning technology. First, Heidegger poses the question, "what is technology?" This question invites us into a quest, the search for the essence of technology. By asking this question, it seems that he wishes to find a different kind of true relationship with technology. Why is it so that this kind of question opens up another possibility for us? Heidegger tries to convince us that through the quest for technology, we could ultimately arrive at the essence of technology, that is to say, something that is "the true" and not "the right." Furthermore, according to Heidegger, revealing the essence of technology would liberate us and enable us to have a **free relationship** with it(QT 313).

Then, what is the essence of technology that liberates us? After long and complicated wordplay, Heidegger leads us to conclude that technology is not a mere means, but a **mode of revealing**(QT 319). What does it mean? For Heidegger, revealing is "the very essence of being" (Heidegger, 1962: 101). Then, technology becomes a way of revealing the essence of being. However, such a mode of existence in technology is forced to undergo a transition in the modern era. Heidegger states that there is a fundamental difference between ancient technologies and modern industrial technology, which is based on modern physics as an exact science.

The revealing that holds sway throughout modern technology does not unfold into a bringing-forth in the sense of *poiēsis*. The revealing that rules in modern technology is a **challenging**, which puts to nature the unreasonable demand that it supply energy which can be extracted and stored as such. But does this not hold true for the old windmill as well? No. Its sails do indeed turn in the wind; they are left entirely to the wind's blowing. But the windmill does not unlock energy from the air currents in order to store it(QT 320).

The extract above shows us that the process of modern technology does not follow the *poiēsis* that is bringing-forth, anymore. Instead, the essence of modern technology turns into

what Heidegger calls *das Ge-stell*(QT 328). Heidegger defines it as *das Ge-stell*[enframing], which is the term that gathers humanity with a view to ordering the self-revealing as standing-reserve(QT 324). He claims that enframing is an essential characteristic of modern technology. In earlier days, farmers cultivated the fields by setting them in order, sowing grain, maintaining, caring for, and waiting on the fields. When fields produced fruit, farmers harvested it. If the fields had chosen otherwise, the farmers had to wait until the field produced it. For them, the field is an object of gratitude, and they are indebted to and responsible for each other. Farmers do not challenge the soil in the field. However, the agriculture we have today is mechanized by the food industry(QT 320). By controlling the conditions so that the fields can always produce, we challenge the fields to produce food at any time. Nature has become an enormous energy reserve. By challenging the fields, the energy concealed in nature is unlocked, transformed, stored up, distributed, and switched(QT 322). Now the earth reveals itself as a coal-mining district, the soil mineral deposit, food deposit, and wood deposit, and nature is now seen as the chief storehouse of the **standing energy reserve**. This kind of revealing has been the dominant characteristic of modern technology in the sense of a challenging-forth(QT 321). In this enframing, humans also become standing reserves that are ready to be used.

Some explain that an essential distinction does not exist between Heidegger's view from classic to modern technology. For example, Riis(2011) argues that technology always takes the form of *das Ge-stell* in essence and in that aspect, technology is always modern. The danger stemming from the rule of *das Ge-stell* is thus not only that it is transient and solely directed toward contemporary Western society, but also that humans can only be humans as those challenged by the rule of *das Gestell*(Riis 2011: 104). No doubt this is a considerably persuasive analysis, but from my view, it tends to lose focus on the distinction between classic and modern technology, which Heidegger himself wanted to distinguish between the two clearly. This distinction ultimately originates from the two meanings of *poiēsis*, which lead to the two aspects of *technē*.

The Greek word *technikon*(technology) stems from *technē*, a kind of knowledge belonging to *poiēsis*, an activity of making something. As there are two kinds of *poiēsis*, we can also observe two things concerning the meaning of the word *technē*(QT 318). "*Technē* is the name not only for the activities and skills of the craftsman," but also "for the arts of the mind and the fine arts" because *poiēsis* is itself making activity something **poetic**(QT 318). Here, we can see that Heidegger stresses the distinction between two kinds of *technē* following the meaning of *poiēsis*. This distinction is likely what Heidegger had in mind when he distinguished ancient technology from modern technology as *das Ge-stell*.

Then how are we to escape this dangerous state of *das Ge-stell*? It is helpful to return to Heidegger's analysis of technology. If technology is a mode that reveals the essence of being, it becomes in itself poetic as a mode of existence. Yet if ecology takes the form of *das Ge-stell*, it stops the way of the revealing the essence of being, and is degraded to a mere skills of mastery. This distinction is important because while the former leads us to a free relationship with technology, the latter leads to the very opposite. According to Heidegger, "All revealing comes out of the free, goes into the free, and brings into the free. The freedom of the free consists neither in unfettered arbitrariness nor in the constraint of mere laws"(QT 330). Thus, it can be inferred that Heidegger's ideal technology-human relationship is a classic one based on ancient Greece and that he maintains an extremely pessimistic view of

the modern technology. According to Heidegger, *das Ge-stell* is the ultimate danger, since it causes the event of revealing (Being itself) to slip into oblivion (Botha 2013: 161).

What is crucial in the veins of this study is the issue of what ecological implications Heidegger's alternative above possesses. Many theorists express various negative opinions against Heidegger's view of technology (Caputo 1993; Harris, 1978, Ihde 1979). Among them, Botha (2003) points out that the attempt to extract concrete ecological implications from Heidegger's view of technology is in itself already flawed. The reason is that its focus lies in speculating the human-technology free relationship, not in producing specific prescriptions for action. Therefore, Botha argues that the attempt to come up with a prescription for ecological improvement with Heidegger is destined for failure. I think it makes sense, at least partially.

However, the more significant reason behind the failure of Heidegger's strategy originates from the limitations of ontic/ontological divide. Indeed, Heidegger's human being is *In-der-Welt-Sein* (being-in-the-world), which is both contextual and relational. Yet, *Dasein* (being there) is still an ontological self. In other words, only *Da-sein* who put himself/herself distanced from other *das Man* can be revealed as an authentic self as the shepherd of Being. Arendt (1978) maintains that Heidegger's *Dasein* is a being who is critical of other *das Man* who live an ordinary life, and as a result Heidegger's self inevitably lacks 'plurality'. Needless to say, Arendt would have aimed this term of plurality towards the singularity of diverse human beings; yet, in my opinion, this absence of plurality overlaps not only human beings, but other things and lives as well. In the end, *Dasein* that aims to restore its essence as the shepherd of Being is locked up inside the self by separating himself/herself from the ordinariness of other beings, as a result, easily falls into the dilemma of the mastery that Heidegger initially tried to overcome. This criticism is further elaborated by Latour as can be seen below.

Latour's Symmetrical Perspective on Technology

Latour maintains that Heidegger's idea is generally in the same line as the modern perspective of technology. In his article, *Morality and Technology: The End of the Means* (MT⁴), Latour (2002) raises a question about our modern perspectives on technology, especially in relation to Heidegger's. Latour questions Heidegger's claim by arguing that he is still tied up with the arguments he seeks to overcome. What does this mean? According to his perspective, the crucial point that Heidegger emphasizes the most is the recovery of Being. It is essential that we hear the call of Being, which is revealed as a form of the essence of technology to escape this chained relationship with technology. In other words, humans must become the shepherd of Being, not just the ready-to-use standing-reserve. It is a human who degenerates the relationship with technology, but it is also a human who can recover the essence of technology.

In Heidegger's framework, it is assumed that humans are the only end, and technology is the means to serve it. Suppose we put forward these ideas that humans are the only end, and technology is only the means in the forms of functions, extended tools, empty force, instrumentality, autonomous object, and so on. In that case, we cannot help thinking about it within the frame of "mastery." To be moral and humane, we must be the masters of technol-

⁴ MT is an abbreviation for *Morality and Technology: The End of the Means*.

ogy by tearing ourselves away from it. In this respect, Heidegger's idea is not much different from the former arguments that he criticized. According to Latour, Heidegger's idea can be summed up as "we must bind back the hound of technology to its cage" to be human (MT 247). Latour questions this dichotomy between human and technology: Have we ever been pure human beings without the help of technology? Have we ever existed in the form of humans removed from the beings of matters? Is there any pure realm of humans that has not been influenced by technology?

What then is technology? If technology does not exist in a separate realm, how should we understand it? To approach this question, Latour suggests that it is better to consider technology as an adjective, which is "**the technical**," and not as a substantive, which is "technology." It means that technology exists **in the mode of existence** (MT 248). In other words, technology belongs to the human world in a modality other than instrumentality, means, efficiency, or materiality.

In this case, what does it mean to perceive technology as a substantive, or an adjective? In order to fully understand this conception, it helps to compare with the metaphor of the black box and the network. First, to redefine the regime of technology as an adjective, Latour proposed the concept of "*fold*" to understand technology (MT 248). What is the notion of the fold? We know the phrase, "something is folded," but then, what is folded in technical action? Latour maintains that time, space, and a type of actant are folded in a technical action (MT 249). Let me elaborate on this notion. When I need a hammer to drive nails into the walls of my room, it is there, ready to be used "now" and "here in my room," as a tool for my need for nailing. However, the hammer that I am using right now does not maintain the current time. In the hammer, heterogeneous temporalities coexist; for example, the antiquity of the planet from which has molded the ore, the age of the oak that provided the handle, and the time when it was produced from the factory all coexisted.

In addition, the same applies to the space. In a hammer, different layers of places have been accumulated, such as the forest in which the oak tree grew, the mines where the ore was found, the market where I bought the tool, and so on. Moreover, a mundane hammer organizes a type of action. Without it, I would have used my fist, a hard-covered book, or even the heel of my shoe to drive the nails. As a result, I can hang my family picture, a clock, and my favorite decorations, and by this means I can make my own room. Otherwise, my housing or living would be different from how they are now. In addition, this little hammer demands a delicate balance of intensity, frequency, grip, and force control whenever I use it. In this respect, the hammer is an actor that has an agency requesting, modifying, transforming, and ability to tune. I can meet endless interesting stories of heterogeneous times, spaces, and actors whenever I unfold the hammer. They are intricate, similar to a complicated labyrinth. That is why Latour proposed to understand this technical world through the notion of "**network**" (Latour 1987). According to him, a hammer is a network that folds several layers of time, space, and other actors.

However, what happens if I fold the network? In the blink of an eye, all the intricate networks disappear, and I am left with an ordinary tool as a means. Therefore, we can say that instrumentality, which consists of a means-end relation, only appears whenever we fold the network. Latour called this a "**black box**" where technology exists as an input-output regardless of its process (Latour 1999). As technology advances, there is a tendency for the process to become opaque and unknown to us. The more complicated the network, the more we want a simpler and more convenient output. Most of the technology we use today is only

considered a convenient tool because it is treated as a black box that conceals the network inside. This is the origin of instrumentality.

Latour suggests that understanding “the technological” is to approach it as a network that has been folded various times and that consists of histories formed through multiple detours and compositions. Even a simple piece of technology, such as a hammer, is actually a network where heterogeneous temporalities, spaces and actors are connected. Therefore, redefining the technology is to unfold the network: as if we were tracing the network back through “the history of matter” (Latour 2014: 105) or as if we had upended a movie to track the storylines to their origins. Therefore, the history of matters(or things) has shown us that it has never been a straightforward means for one end. Rather, it has curved, that is, it has changed, transformed, modified its means and even ends. Thus, the history of things is in truth the story of various actors (including human and nonhuman) to meet, comprise, ally, betray, and break down. As Latour notes, if we fail to recognize how much the use of a technique has displaced, translated, modified, or inflected the initial intention, it is simply because we have changed the end by changing the means. This is because we have begun to wish for something else other than what we initially desired(MT 258). That is why technology cannot be considered a mere means to an end. Likewise, in Latour’s view of technology that understands this world as a network, there is no divide between human/things, subject/object, and society/nature. For this reason, Ihde (2003: 137) rightly commented on Latour as “the most symmetrical of all symmetrists”.

Heidegger and Latour : Similarities and Differences

What are the similarities and differences between the two technological perspectives of Heidegger and Latour? Indeed, they are not only different, because they both similarly possess a shared question of modern technology. They both criticize the instrumentality of modern technology. In terms of technology for overcoming instrumentality, Heidegger leans toward the concept of *poiēsis* of ancient Greece, and Latour also relies on non-modern cultures. Additionally, they try to overcome a subject/object divide that they coincidentally understand as characterizing modernity to reveal a greater interdependence between human and other beings. This co-dependency takes the form of a “being-in-the-world” to Heidegger and “a network” to Latour. In this aspect, the two thinkers share a considerable amount of technology concern. For this reason, some scholars interpret the two along the same lines. For example, Riis (2007) points out the similarities in methodology or insight between both. Riis portrays that Latour’s philosophy of technology appears as a mirror image of Heidegger. In another study, Riis (2008) mentions that although Latour seems to criticize Heidegger at first glance explicitly, they still share common points implicitly. Thus, Latour provides an extended alternative by critically reinterpreting the thoughts of Heidegger. As a result, Riis argues that symmetry has come to exist between the two perspectives. Conty (2013) also explains that from a phenomenological point of view of phenomena coming to presence, similar aspects do seem to exist between the two.

On the other hand, some scholars argue that the two are very different and that Latour has, in fact, misunderstood Heidegger. For example, Kochan (2010: 579) criticized Latour as follows: “Latour’s repeated denunciations of Heidegger amount to a systematic tactic of dissimulation by suppressing the substance of Heidegger’s critique of modern technosci-

ence. Latour directs attention away from the not insignificant weaknesses in his own theory of mediation.” Meganck (2022: 62), taking a rather extreme position, criticizes Latour’s reading of Heidegger is wrong. Meganck declares “I do accuse Latour of deliberately reading Heidegger in an inappropriate register, viz. a register that Heidegger himself explicitly rejects, urging us to take a step back.” Also, there is another argument that Latour answered Heidegger’s unfinished question. For example, Harman (2009), interpreted that “Latour, who is better equipped than anyone to solve the problems that Heidegger leaves unresolved in *Being and Time*.”

There is a controversy surrounding how to understand the relationship between the two. However, one thing is obvious: the two thinkers faced the same question and thus shared considerable similarities in that aspect, but came to completely different paths by choosing very different strategies to answer the question. Heidegger’s strategy was the human being as *Dasein*, that is, the shepherd of Being ; Latour’s was a network with human and non-human actors. This world that we are living in is, as Conty (2013: 311) rightly points out, “hybrid entities, cyborgs and forms of intelligent emergence where subject and object, nature and culture, can no longer be so easily differentiated.” Especially in the face of the ecological crisis where humans, nature, and objects are complicatedly intertwined, the attempt to understand the phenomena in this world as a network continues to gain more and more reasoning. For example, Donna Haraway is the one who shares Latour’s ‘network’ image. In her book *Manifestly Haraway*, Haraway uses the network image in “suggesting the profusion of spaces and identities and the permeability of boundaries in the personal body and in the body politics” (Haraway 2016: 45). This critical idea of Haraway is well described in her concept of ‘cyborg’, which is, according to her definition, a “cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction” (Haraway 2016: 5). The concept of cyborg is an attempt to understand the human being as “hybrids or new communications devices” in high-tech culture beyond the traditional dualism of mind/body or human/materials (Haraway 2016: 60).

Of course, there is no obligation for us to accept everything of Latour’s suggestions. However, when we seriously turn our eyes towards our hybrid world and the environmental problems that only worsen, and when we consider the education for our students, I cannot help but agree with Harman’s following standpoint.

Unlike Bruno Latour, I regard Heidegger as the most important philosopher of the twentieth century. But this does not prevent me from siding with Latour against Heidegger. If philosophy is to make any progress in the decades to come, it is vital that we consistently oppose Heidegger and side with Latour: against the ontological/ontic distinction, against the theory /practice distinction, against the blanket contempt for mass-produced objects, against the idea that knowledge means transcendence of the world, against nothingness, and in favor of endless curiosity about all manner of specific beings (Harman 2007: 34).

For Technological Literacy Education

We are living in a highly advanced technology-based society. Technology provides new opportunities, but simultaneously eliminates others. It provides us with new products, but it generates waste we must deal with. As Lewin (2016) pointed out, technology is pharmacological, in other words, as Stiegler (2012) has argued before, it has both a poison and a cure.

On the one hand, living in a technology-based society means leading a technology-friendly life where we rely more deeply on technology than ever. On the other hand, it seems that we are far ahead of technology. This is what is at stake for our students living in this technology-based era. Our students are characterized as digital natives. They stand out for their skills in using technology, and they have no fear of it. Ironically, however, they are the ones farthest away from technology even though they rely heavily on it. They feel that issues related to technology are not their own problems. They think environmental issue is something on the other side of the globe, far away from them, and it is up to a few specialists or passionate activists to solve them. Indeed, our students are disconnected from technology. Why is this so?

According to Latour, this occurs because technology becomes a black box with only input-output. When technology is black-boxed, what matters is my need and usage. When I need it, it is enough for me to buy it, use it, and after all, throw it away. What is left is instrumentality as a means-end relationship. As this process accumulates, our environment deteriorates, and as a result, it will return to us with even worse air pollution, water pollution, pandemics, and climate crises.

In this regard, Latour asks teachers and researchers to unfold the black-boxed technology, that is to say, to observe the network carefully and give a delicate layer-by-layer description of the history of things (Latour 2014: 105). In other words, we need a language to describe the story of a network that is not opaque but clear, not difficult but easier, and not shallow but in detail (Kwak&Park 2021: 410). Let me take an example for this idea. According to the 6th IPCC (Intergovernmental Panel on Climate Change) report⁵, the Earth's average temperature of will rise by 1.5 degrees in 2040. At this pace, global warming will only pick up speed, leading to more heat waves, floods, droughts, melting icebergs and a higher sea level. Who should be responsible for such a severe climate crisis? Should we rely on our scientists to devise an ingenious solution, or politicians, or ecologists to solve this crisis? Is global climate change the subject of study in natural science or social science?

Indeed, we are facing the climate crisis and other severe environmental problems such as pandemics like Covid-19, disposable garbage and wastewater from factories, air pollution and nuclear waste facilities, etc. Moreover, all of these problems share a common characteristic; each is a very hybrid issue where human/nature(materials), society(politics)/science are complicatedly intertwined. In this situation, Latour's criticism seems to be more than appropriate. We are left with an impossible choice between the gloomy prescription of some ecologists that "the world is collapsing in front of our very eyes" and the words of scientists trying to reassure us that "in order to escape these difficulties, we should calmly keep our trust in the development of science and technology"(Latour 2010).

In this situation, I think Latour's view of technology will be a great aid in cultivating the technological literacy of our students. For example, suppose that we were to teach the his-

⁵ Currently, the IPCC is working on the Sixth Assessment Report which consists of three Working Group contributions and a Synthesis Report (for more information: <https://www.ipcc.ch>).

tory of the thing ‘Carbon’ to our students who regard global warming as a faraway issue that has nothing to do with them, or an exclusive task for scientists or politicians. We can meet various actors in the history of Carbon: French chemist Lavoisier, periodic table, Carbon Dioxide, Carbon neutral, Net-zero, fossil fuel, global warming, pencil, IPCC, automobile exhaust fumes, and so on. We could regard it as a network where diverse actors come up with. At first, we can start with the ordinary black-boxed things which we use daily, such as a pencil, car or plastic water bottle. We could start from drawing the family tree of various actors, for example, tree, rubber, and graphite of pencil. Teaching the history of Carbon as a network can be compared to opening the black boxed items and retracing back the various space, time, and actors’ network hiding inside it. In this process, we encounter various alliance, betrayal, metamorphosis and detour of Carbon. In my opinion, this idea could be a good way of teaching science and technology with a humanistic attitude. Latour has already presented it in the idea of “scientific humanities” (Latour 2010; 2014).

The idea of scientific humanities is, first and foremost, even more significant to the current science education that focuses on delivering only clear, definite facts and rules in science. Gleason (2017: 574) argues that Latour’s thinking significantly impacts on K-12 science classrooms. Especially for scientific literacy, Gleason quotes van Eicjk (2012) and states that “Latour’s Actor-Network Theory helps to reimagine scientific literacy as an emergent feature of collective human action.” This challenges the tendency to equate science learning with the transmission of static knowledge, the problematic framing of science as contained by the social, and the ubiquitous understanding of learning as an act of individual cognition. In particular, Gleason stresses the significance of scientific literacy and criticizes that in current science education, the concept of nature has become unitary and homogenous (Gleason 2017: 579). Thus, laws of nature are so stable and self-evident that, given the right tools and techniques, students can discover them without much trouble. In this situation, what teachers can do is to transmit those truths at least and introduce students to the particular processes by which mute nature can be made to speak. In such science education, science is tasked with accurately representing this stable phenomenon, and nature remains an unassailable source of authority (Gleason 2017: 579).

Moreover, such idea of scientific humanities can be equally applied in today’s art and humanities education. The contemporary art and humanities education deprived of technology or science contents is not adequate for developing a humanistic attitude toward our real life in technology-based era; instead, it results in the mass production of humanities students that are both ignorant and afraid of science/technology. However, if we extend the speculative articulating method of the humanities to our nonhuman actors, the world of things come into presence vividly by slowing down the speed of science. As Latour defines the humanities, it is “an attempt at slowing down the sciences and bringing them back to earth” (Latour 2014: 81).

Furthermore, Latour’s idea of unfolding the ‘black box’ and tracing the history of matters/things allows us to understand technology as a non-fixed encounter between various humans and non-humans. This can be viewed as pressing for turning towards a performative and agential realism in our education, just as Barad (2007) had emphasized. It also goes along the same veins with what Law (2008: 634) announced, after being influenced by Haraway’s thinking: “knowing is also about performing, it is therefore about accepting responsibility that goes with knowing”. Also, as Fenwick and Edwards (2012: 3) rightly pointed out, the focus on ‘what they do’ is always in connection with other human and non-

human things. Therefore, such alertness towards the performance of science can contribute to developing our sensitivity towards ‘*connection*’ with other human and nonhuman actors by overcoming the subject/object, human/nature, and humanities(politics)/science divide we have been immersed in since modern age.

When this kind of teaching becomes possible, our students may finally cease to regard technology as mere means ready to be used, but as the “under-ego” that has formed themselves. Then our students might take the technological issues as their own part of being, not a far away story that has nothing to do with them. Ultimately, in my opinion, what Latour aims to indicate through his discussion is the human being with the sense of *connection*. This is the very thing that technological literacy so dearly needs.

References

- Arendt, H. 1958. *The Human Condition*. The University of Chicago Press.
- Arendt, H. 1978. Heidegger at Eighty. Murray, M.(ed.). *Heidegger and Modern Philosophy*. New Haven: Yale University Press. 293–303.
- Barad, K. 2007. *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. NC: Duke University Press.
- Botha, C. F. 2013. Heidegger, technology and ecology. *South African Journal of Philosophy* 22 (2): 157–171.
- Bowers, C. A. 2013. Toward an ecological perspective. *Critical Conversations in Philosophy of Education*, 310–323, Online.
- Caputo, J. D. 1993. *Demythologising Heidegger*. Indianapolis: Indiana University Press.
- Conty, A. 2013. Techno-phenomenology: Martin Heidegger and Bruno Latour on how phenomena come to presence. *South African Journal of Philosophy* 32 (4): 311–326.
- Fenwick, T., and R. Edwards. 2011. Introduction: Reclaiming and Renewing Actor Network Theory for Education Research. *Educational Philosophy and Theory* 43 (S1): 1–15.
- Fenwick, T., and R. Edwards. 2012. *Researching Education Through Actor-Network Theory*. MA: Wiley-Blackwell.
- Gleason, T. 2017. Science Education and the Nature of Nature: Bruno Latour’s Ontological Politics. *Educational Studies* 53 (6): 573–586.
- Goodwin, T. 2016. Educating for Ecological Literacy. *The American Biology Teacher* 78 (4): 287–290.
- Haraway, D. J. 2016. *Manifestly Haraway*. Minneapolis: University of Minnesota.
- Harman, G. 2009. *Prince of Networks: Bruno Latour and Metaphysics*. Vic.: re.press: Prahran.
- Harris, K. 1978. *Heidegger as a political thinker*. IN: Murray.
- Heidegger, M. 1962. Being and Time. (trans). eds. J.& Macquarrie, and Robinson, E. NY: Harper& Row.
- Heidegger, M. 1977. The Question concerning technology. IN *Basic Writings*, ed. D. F. Krell, NY: HarperCollins Publishers. (Original work published 1953).
- Ihde, D. 1979. *Technics and Praxis*. Boston: D. Reidel Pub.
- Ihde, D. 2003. If Phenomenology Is an Albatross, Is Post-phenomenology Possible? In & E.Selinger(eds), *Chasing Technoscience: Matrix for Materiality*, ed. D. Ihde, 131–146. Bloomington, IN: Indiana University Press.
- Kochan, J. 2010. Latour’s Heidegger. *Social Studies of Science* 40 (4): 579–598.
- Kwak, D. J., and E. J. Park. 2021. Mediating process for human agency in science education: For man’s new relation to nature in Latour’s ontology of politics. *Educational Philosophy & Theory* 53 (4): 407–418.
- Latour, B. 1987. *Science in Action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.
- Latour, B. 1999. *Pandora’s Hope: Essays on the Reality on Science Studies*. Cambridge, MA: Harvard University Press.
- Latour, B. 2002. Morality and technology: The end of the means. *Theory Culture & Society* 19 (6): 247–260.
- Latour, B. 2010. *Cogitamus: Six lettres sur les humanités scientifiques*. Paris: La Découverte.
- Latour, B. 2014. How better to register the agency of things. In. *The Tanner Lectures on Human Values*, 79–117. Yale University.
- Law, J. 2008. On sociology and ST. *Sociological Review* 56: 623–649.
- Lewin, D. 2016. The Pharmakon of Educational Technology: The Disruptive Power of Attention in Education.
- Meganck, E. 2022. Heidegger and Latour on the Danger Hiding in Actuality. *Human Studies* 45: 47–63.

Orr, D. W. 1989. Ecological Literacy. *Conservation Biology* 3 (4): 334–335.

Orr, D. W. 1991. *Ecological Literacy: Education and the Transition to a Postmodern World*. State University of New York Press.

Prakash, M. S. 2013. Whose ecological perspective? Bringing ecology down to earth. *Critical Conversations in Philosophy of Education*, 324–339. Online.

Riis, S. 2007. Genealogies of modern technology. *Danish Yearbook of Philosophy* 42: 97–110.

Riis, S. 2008. The Symmetry Between Bruno Latour and Martin Heidegger: The Technique of Turning a Police Officer into a Speed Bump. *Social Studies of Science* 38 (2): 285–301.

Riis, S. 2011. Towards the origin of modern technology: reconfiguring Martin Heidegger's thinking. *Continental Philosophy review* 44 (1): 103–117.

Taylor, C. 1991. *The Ethics of Authenticity*. Cambridge: Harvard University Press.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.