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Assistive Technology as Affective Scaffolding

Laura Candiotto[1] · **Mog Stapleton**[2]

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Abstract
In this paper, we argue that the affective experience that permeates the employment of Assistive Technology (AT) in special needs education is crucial for the integration of AT. "AT integration" generally means the fluid and automatic employment of AT for fulfilling certain tasks. Pritchard et al. (2021) have proposed a more specific conceptualisation of AT integration by saying that AT is integrated when it is part of the user's cognitive character. By discussing their proposal, we argue that the user's affective experience is crucial for AT integration. To better appreciate the relevance of the affective experience in AT integration, we suggest shifting the perspective from the functionalist extended cognition framework, as Pritchard et al. (2021) propose, to affective scaffoldings. In doing so we focus on the feeling of agency as the key experience to consider for understanding what AT does to the agent. We will put forth the hermeneutical tool of "phenomenal transformation" to explain how and why AT as an affective scaffolding can support the fundamental "I can" of the experience.

Keywords Assistive technology · Cognitive integration · Extended mind · Affective scaffoldings · Feeling of agency · Existential necessity · Phenomenal transformation

1 Introduction

It is not always easy to accept that you have to learn how to use a new technological device. There can be curiosity at the beginning, and sometimes also excitement about the new possibilities that will be made available. But these feelings can be combined with the anxiety and frustration of not knowing how to learn the new procedures, the effort involved in acquiring new habits, and nostalgia about leaving aside old, familiar ways of doing things. When you are *obliged* to use a new technological device in order to fulfil expected everyday tasks that you cannot perform otherwise, then this experience might even feel burdensome.

In this paper, we argue that the affective experience that permeates the employment of Assistive Technology (AT) in special needs education is crucial for the integration of AT. "AT integration" generally means the fluid and automatic employment of AT for fulfilling certain tasks. Pritchard et al. (2021) have proposed a more specific conceptualisation of AT integration by saying that AT is integrated when it is part of the user's cognitive character. By discussing their proposal, in this paper, we argue that the user's affective experience is crucial for AT integration. To better appreciate the relevance of the affective experience in AT integration, we suggest shifting the perspective from the functionalist extended cognition framework, as Pritchard et al. (2021) propose, to affective scaffoldings. By affective scaffolding, we mean those items that are employed for emotion regulation (Colombetti and Krueger 2015), such as a glass of water for reducing one's anxiety while doing a presentation, or the arrangement of the living room for feeling at ease while meeting the boyfriend's parents for the first time. We understand affective scaffoldings from a pragmatist-oriented framework (Candiotto and Dreon 2021). So, we focus on the dispositions that are produced, nourished, and reset by the agents' affectively charged transactions with the world, AT included.

✉ Laura Candiotto
laura.candiotto@upce.cz
https://centreforethics.upce.cz/en/doc-laura-candiotto-phd

[1] Centre for Ethics as Study in Human Value, Department of Philosophy and Religious Studies, University of Pardubice, Stavařov 97, 532 10 Pardubice, Czech Republic

[2] Okinawa Insitute of Science and Technology, Japan and University of Edinburgh, Edinburgh, UK

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We claim that AT integration is a matter of habitualised affective interactions with AT that have the potential to disclose action possibilities and reinforce the user's feeling of agency. To substantiate our claim, we provide a phenomenological analysis of the feeling of agency as a key factor in the cognitive *and* affective integration of AT. In focusing on the phenomenology of the feeling of agency, we thus criticise the functionalist approach of extended cognition and provide an argument in favour of a more phenomenologically insightful picture of AT integration.

This new conceptual framework enables us to focus on the agent's subjective motivation in carving out new relationships with the environment through the employment of AT. In tailoring a new affective-cum-cognitive niche through engagement with affective scaffoldings, agents can regulate and fruitfully exploit their learning struggles, making them an occasion for disclosing new action possibilities for self-improvement. Since learning to use AT and experiencing the world through it is a diachronic affair of shaping new patterns of behaviours, the notion of affective habits is crucial. It is not merely that an AT is an item that one uses to build new affective relationships with the environment, as an objectivist understanding of affective scaffoldings implies. Rather, it is about the ways of interactions with the environment through AT. Therefore, experiencing the world through AT scaffolds new affective habits. These affective habits, in their turn, shape the subsequent employment of the AT. This is the backbone of our pragmatist conceptualisation of AT as affective scaffolding.

In the first part of the paper, we introduce the extended cognition framework that Pritchard et al. (2021) propose. We agree with Pritchard et al. (2021) on the importance of investigating the conditions for genuine extended cognition and cognitive integration in the AT case. However, we argue that understanding the case of cognitive integration of assistive technology in terms of orthodox extended cognition - even where this is cashed out through a virtue theoretic framework - obscures some important distinctions in the way that cognitively integrated assistive technology is experienced as compared to when it is merely used as an instrument. In particular, it does not capture the qualitative dimension of the feeling of extension (Slaby 2014; Candiotto 2022a) and thus the distinction between the experience of agency through the technology and mere mastery of the technology.

In the second part of the paper, we argue that a focus on affective scaffoldings can better account for this phenomenological difference, which is inherently affective as well as cognitive. Moreover, this way of unpacking cognitive integration of assistive technology allows us to acknowledge the real role that productive struggle might play in the integration of the AT (as the Pritchard et al. paper importantly highlights). We argue that productive struggle (English 2013; Murdoch et al. 2021) should be better understood in AT integration as a transition to accepting and endorsing AT. Finally, the feeling of agency is the crucial experience that is brought to successful AT integration. However, we claim that the feeling of agency should not be understood in a merely functionalist way but as an existentially charged experience (Candiotto 2022a) that unfolds the user's need for new action possibilities.

The result of this analysis is that fluency and seamless use of an AT are not the aims of extended cognitive integration and therefore necessary indicators of it. Rather, they are a means (that may or may not be reached through engaging in productive struggle) that are enabled by self-scaffolding the environment to open up new action possibilities. The result of this is that the important distinction is whether an AT can be integrated such that engagement with it engenders the dynamic experience of possibilities opening up for one, thus increasing one's feeling of agency in the world (not merely over the AT and not merely being an instance of one's cognitive agency) versus experiencing a frustration of possibilities, and thus a frustration of one's agency. This is what we call "phenomenal transformation". Finally, we conclude by stressing that our new framework is also preferable for its implications to educational theory and practice since AT integration results from the responsible choice of an autonomous agent who comes to trust AT as a reliable support for new learning opportunities.

2 AT Integration and the Feeling of Agency

For characterising AT integration, Pritchard et al. (2021) have employed the extended cognition approach for which external tools as laptops, mobile phones and smart glasses can play active roles in an extended cognitive process, especially regarding information-processing. By doing so, they restricted their analysis of AT to devices that interact with one's cognitive processes more directly by supporting the information-processing in play, such as technology that enables communication or enhances memory.

Pritchard et al. (2021) characterise AT integration as the successful transition from mere AT use to extended cognition integration (ECI). For explaining what AT integration means they employ some conceptual tools from virtue epistemology, thus referring to a hybrid virtue theoretic account of extended cognition developed by Pritchard in his previous work (Pritchard 2010, 2013, 2014, 2016, 2018). The crucial conceptual tool is the one of "cognitive character". By "cognitive character" they mean the cognitive qualities distinctive of an individual, such as the specific ways through which one evaluates a situation, understands a problem, or

interprets behaviours. For virtue epistemology, the cognitive character's key features are intellectual virtues, namely those skills, abilities, and character traits that reliably lead the epistemic agent to epistemic success. Intellectual virtues are traditionally understood in an internalist manner, such as the epistemic agent's character traits. However, in the hybrid form that Pritchard advocates, certain features of the environment can take part in the cognitive character.

This is exactly what happens with AT integration, Pritchard and colleagues claim. If one habitually employs a braille pad for reading (and so also for evaluating or interpreting a book, for example) then the braille pad would become part of one's cognitive character. It follows that if an AT is integrated into an individual's cognitive character, then AT is attributable to the individual's cognitive agency and should therefore be understood as an extension of that individual's cognitive character and not merely an instrument that the individual is using. "Attributable to one's cognitive agency" means that it is attributable to the way something is integrated into one's cognitive character and not attributable to external factors like luck or external intervention. Pritchard and colleagues also stress that when AT integration is achieved, the employment of AT is more than just that of subject-and-instrument, but instead incorporates a fluidity and spontaneity that puts it on a functional par with their use of the student's biological cognitive traits. The core idea of this virtue theoretical model of extended cognition applied to AT integration is then that by integrating the braille pad into her cognitive character, the individual can employ her intellectual virtues and thus can achieve cognitive success. The integration of the braille pad is then the material condition for employing the character's intellectual virtues in cognitive processes.

This perspective is extremely fruitful for overcoming a consumerist understanding of AT in which a user merely uses an external cognitive resource for fulfilling certain tasks. On the contrary, it discloses a scenario in which users can be empowered by AT because they can express their intellectual virtues thanks to AT. This change of perspective clearly has significant pedagogical, ethical, and political implications, not only epistemic ones. We plaudit Pritchard et al. for having stressed this wider relevance of their approach to educational policy.[1] We agree with Pritchard et al. (2021) that there is an important distinction between using assistive technology and integrating it so that it becomes part of an extended cognitive system. However, we disagree about what this difference consists in. We argue that it is not just a matter of fluency and spontaneity. A more robust feeling of agency in learning how to use an AT is in place during the productive struggle. Let us explain why.

First, it should be noted that Pritchard et al. (2021) use "extended cognition" in a loose way and their core aim is to capture the idea of "cognitive integration" as the outcome of successful employment of AT. They argue that even though assistive technologies may not be immediately fluidly and spontaneously used by the student that does not mean that they do not become cognitively integrated. Moreover, the (productive) struggle to use the technology fluidly and spontaneously is an important step in the integration of it into the student's cognitive character. This is an important step for understanding "cognitive integration" in a diachronic process of learning abilities. We agree with Pritchard et al. (2021) that *how* a person with disabilities learns to use AT is critical for determining whether it is a case of extended cognitive integration. Yet, fluency and spontaneity cannot be the only characteristics of a diachronic process of cognitive integration (Kirsh 2019). A feeling of agency and autonomy should be experienced by the user to undertake the productive struggle of learning how to use a new AT. As the research on skills has shown flow is not the defining characteristic of expertise (Montero 2015). We argue that is the feeling of agency, instead, that makes the difference between mastery of something (but still using it as a tool) and cognitive extension. By "feeling of agency" we mean the experience of being the author of action. This agentic experience is not always and necessarily out of a judgement to be the one in control. It can be a more basic and direct experience of being an agent.[2] Importantly to our thesis is that – as we will see in a moment – it is *a feeling*, namely experienced from within the concerns of our affective living body.

Let us focus on cognitive extension and see how and why a feeling of agency can play an important role in it. Cognitive extension is realised when devices are not conceived as tools but are integrated into an extended cognitive system. This means that a device is not consciously attended to as a tool, but it is integrated into the extended cognitive system by recursive interactions and automatic endorsements

[1] Perhaps it is the case that the term "extended cognition" or "extended cognitive system" can play a role in persuading policymakers that there is an important distinction between "mere use" and extended cognitive integration, and help motivate the importance of providing the resources for students to be able to become appropriately cognitively integrated with the assistive technology. But we also agree that the use of technology in classrooms whether that is in mainstream educational settings or in special needs settings does not necessarily lead to extended cognition. This means that specific educative interventions should be put in place in order to facilitate the transition to cognitive integration as a source of students' empowerment.

[2] See Synofzik et al. (2008) on the distinctions between a "feeling of agency" and a "judgement of agency". The feeling of agency plays an important role in the constitution of a minimal self. On the relationship between the feeling of agency and the self, see Gallagher 2008. Although we cannot dive into it here, we would like to signal the relevance of this line of research to the debate on the extended self (see the "conclusion").

which make it "phenomenologically transparent" to the agent. For Evan Thompson and Mog Stapleton (2009), drawing on work by De Preester & Tsakiris (2009) on the distinction between body-extension and body-incorporation, this means that the device is no longer experienced as an object and the world is experienced through it (Thompson and Stapleton 2009). To have this type of relationship with AT, the user needs to feel to lead the process, to really own the cognitive integration, i.e., to learn new habits of AT integration in an autonomous manner by engaging with the expressive structures of the environment.

It follows that to appeal to integration in one's cognitive character as fluency and seamlessness and thus being attributable to one's cognitive agency does not capture the kind of agency that is so important to the users. We argue that, differently from the extended cognition framework, the affective scaffoldings perspective can better explain the role of the feeling of agency in learning how to use a new AT. This is so because a focus on the feeling of agency can capture the phenomenal changes to one's agency in learning how to use a new cognitive tool in a diachronic manner. And this is crucial for capturing the difference between "mere use" and genuine integration.

For developing this approach to AT, we will first delve into some phenomenological considerations about the difference between use-as-instrument and extended cognitive integration (2). Then, in Sect. 3, we will turn to the difference between AT as cognitive augmentation and AT as an existential necessity out of the affective concerns of a living body. These considerations will allow us to introduce the notion of "phenomenal transformation" as the backbone of the feeling of agency in Sect. 4. Finally, in Sect. 5, we will advance our alternative framework that is rooted in affective scaffolding. We will then conclude by stressing two important implications of our approach, to the extended-self debate and to special education theory and practice.

3 Use-as-instrument versus Extended Cognitive Integration (ECI)

Pritchard et al. (2021) distinguish using technology instrumentally and integrating it into one's cognitive character. This is reasonably easy to see with the example they sketch out because it is not just that the child is using this AT to read and write - they are using it to communicate. And it is this function of communication that enables it to be integrated cognitively. Compare this with a tool that is e.g., just for reading or writing. For example, using a text-to-speech reader such as Read Aloud or Voice Dream Reader, or a speech-to-text writer like Dictate or the voice typing function in Google Docs. If I productively struggle to master these ATs, will they become integrated in my cognitive character? It is not obvious that this would be the case or that it would be enough. There also needs to be an opening up of the world that this productive struggle leads to. Let us unpack this with an example.[3] I can master Voice Dream Reader by using it. I can simply use it as a tool for reading in the same way that I read without it (except of course now I can read faster). For non-dyslexic people, this does not seem to be sufficient motivation to get through the productive struggle phase because there is not enough gain to be had from it. That is, there is not enough of a difference from what they can already do. But for the dyslexic person who struggles (often inconsistently - so struggling more at some times than at others) with reading speed and reading attention and comprehension, there is enough reward from the AT that it is worth putting in the effort and struggle.

This example speaks in favour of the productive struggle idea in respect to mastering an AT. The problem is that mastery is not the same as extended cognitive integration. What using Voice Dream Reader does for me as a dyslexic person is that it opens up the possibility of engaging with the content of texts on days that my brain is working in a way that I cannot do this without using it. And, it opens up the possibility of engaging with the content of whole books - as books - because of the possibility of reading them within the kind of timeframe that enables processing the contents as a whole, rather than in drips and drabs over an extended period. This transforms my experience of the world - my experience of the book in front of me changes to one that actually affords the genuine possibility of engaging with its contents. If I have access to an electronic copy of books as well as the physical copy on my bookshelf, then my bookshelf changes its presentation to me from being an overwhelming collection of potential knowledge that I cannot in practice access (presented to me as the frustration of possibilities) into the potential of new knowledge that is approachable and empowering. : Each book now presents itself to me as affording a genuine possibility of knowledge and engagement with it. So, the AT changes the space of possible actions and the character of my experience in a qualitatively different way from how it would for the non-dyslexic. For them, even if they put the effort into mastering the AT it would just increase the quantity of written media that they can engage with. It might be argued that AT changes the space of possible actions even for people without disability. For instance, it might be not just for the pleasure of reading more books that they learn how to use a text-to-speech reader. They might need to do so because, if not, they risknot getting the promotion they aim for, for instance if they work in a publishing house and they need

[3] We offer this example as a phenomenological exploration of the first-person experience of dyslexia of one of the authors.

to read many manuscripts per week. So, it might be claimed that learning how to use text-to-speech reader will open the possibility of being successful in their job. However, we insist, this would still be a case of cognitive augmentation. The reason is that the opening of a space of possibilities does not simply mean that a user can achieve more thanks to AT. On the contrary, our claim is that a certain type of agency would not be available without AT. This is not in terms of what one can get from it, but in terms of autonomy.

This means that extended cognition cannot be equated to cognitive augmentation and, specifically in respect to our topic, that cognitive integration is not only augmentation or, in terms of learning outcomes, the addition of abilities. We will come back to this with further details in the following section. For now, it is enough to stress that this is because cognitive integration shapes the user's experience (in a holistic manner), by disclosing new action possibilities and expressive qualities of the environment as the feeling of agency. The feeling of agency is then put forth in the engagement with the environment through processes of sense-making that shape both the environment and the user in a specific manner depending on the context. In our case, the context is learning how to use a new AT and, so, the feeling of agency is an expression of the student's autonomy and confidence in the learning practices. This means that the phenomenology of cognitive integration should be taken into due account if we want to provide a complete account of what it means to be integrated with an AT and distinguish it from use-as-instrument.

4 Assistive Technology as Augmentative versus Augmentative Technology as Assistive

The purpose of Pritchard et al. (2021) was to make a distinction between using AT and becoming integrated with AT in a way that we can then think of it as extending our cognitive character, the intellectual virtues in particular. They argue that rather than it being a problem that assistive technologies are not immediately able to be fluently used and experienced transparently, it is an opportunity because this struggle plays a role in the system becoming cognitively integrated. The idea is that this productive struggle involves struggling to master it for a particular purpose and playing around with different ways of personalising it. This allows or enables the person doing this to develop agency.

Their argument seems to point to our same goal, i.e., focusing on the feeling of agency in cognitive integration. And they start from our same acknowledgment that it is often the case that there is a struggle in learning how to use AT. However, they do not work on the phenomenology of agency, especially in its temporal dimension, rather they just signal the actual agency achieved when users can control AT. From the way they talk it sounds as though this agency is rather part of the cognitive character, being a part of the manipulation of information processing. They think that this productive struggle leading to this eventual cognitive agency is a sign of - or rather constitutes - genuine cognitive integration with that assistive technology rather than a mere using of it.

However, this does not distinguish cases in which assistive technology is really working as assistive technology for people with disabilities rather than as an augmentative technology for people without disabilities. To make this distinction, a deeper investigation into the phenomenology of agency is needed. Let us come back to the example we already explored in the previous section. Think of the distinction between using a technology such as text-to-speech for dyslexia compared to someone using it just because they want to be able to read books faster. There is *a qualitative difference* in what the technology affords the user in each case. Where it is augmentative technology (i.e., a neurotypical competent reader using a text-speech app) even where it is fluently used and so might in a sense be considered to be a part of an extended cognitive system it is not qualitatively the same because it is not opening up the same kind of agentic possibilities in the way that it is when it's being used as an assistive technology, namely when the user cannot do otherwise. This is because for the person using it as an augmentative technology it is simply an opening up of more of the same (qualitatively the same but quantitatively different) whereas the person using it as an assistive technology is opening up a world of possibilities that were not there before or that were just experienced as frustrated possibilities (i.e., it is qualitatively different and not merely quantitatively different).

This means that in the case of AT there is an "existential necessity" in place. Candiotto (2022b), by advancing the "not possible without principle" has developed an argument for the socially extended mind that is an alternative to the "parity principle". The "not possible without principle" focuses on the existential necessity that impels cognitive extension. In our case, this means that cognitive integration cannot be equated to augmenting abilities because the world of possibilities disclosed by an existential necessity of using AT is *different* from the one of the neurotypical people who use if for cognitive augmentation. There is an existential necessity that urges the users with disabilities to learn how to use a new AT. And this is not just for going faster (as for cognitive augmentation).

It might be argued that even neurotypical people might be compelled to learn how to use AT. Coming back to the example introduced before, a person working in a

publishing house might need to do it for not losing their job. They might receive pressure and feel concerned about not being able to pay their mortage. This is certainly an existentially charged situation. We do not want to deny it. Neither we want to claim that an existential necessity pertains only to disabled people. However, a crucial difference is still in place. The necessity in the case of the person working in a publishing house is contextual. By claiming this, we do not want to assume an essentialist view of disability. On the contrary, most of the time, a disability emerges out of the demands that are imposed on people in certain environments. This also implies that a neurotypical person can become "disabled" in certain environments.[4] Still, there are some disabilities that are there, no matter what. Of course, these disabilities might be experienced as more frustrating in certain environments than others, but we should not deny the difference between the space of possibilities that are available to a neurotypical person and a person with disabilities. There is no parity between the two cases: There is no parity as functionally equivalent and there is no parity from a phenomenological perspective. Most importantly, it would be ethically wrong to assume their parity. Not acknowledging this difference could even jettison special needs education and disability rights.

Therefore, the existential necessity perspective as alternative to the parity principle enables us to appreciate that there are existential concerns and needs that shape cognitive integration as a struggle in special needs education. Concerns and needs are affectively laden because they are the basic ways in which agents are motivated to remake themselves to reply to their vulnerability and precariousness.[5] It is from this perspective that we can grasp the existential meaning of a feeling of agency unlocked by AT.

5 Phenomenal Transformations through Assistive Technologies

In this section of the paper, we analyse how the user experience is transformed by the employment of AT. In focusing on the *how* of the integration, we will develop an approach that gives voices to the agent's experience, especially in terms of the affective dimension of their concerns and needs. We take affectivity as a social affair, namely as the feeling quality of the interactions with the world, that are always situated in specific contexts (Slaby 2018, Candiotto 2019). This felt dimension of the experience is prominent in the feeling of agency in learning how to use AT and it is at the core of what Pritchard et al. refer to as "productive struggle".

We claim that to properly understand how a productive struggle works, we need to explore the *phenomenology* of AT integration. This is fundamental for understanding how productive struggles can bring around a transformation of the experience of the world as embedded in specific situations, interactions, problems and opportunities. We call this transformation of the experience of the world a "phenomenal transformation" since it is a transformation of the *how* of the experience from a first-person perspective. Much work should be done in order to analyse this concept, unpack its nuances and develop its implications. We will use it here as a hermeneutical tool for tackling the specific kind of transformation that takes place in learning to use AT in special needs education. As we have already introduced, our main claim is that this transformation is regarding the feeling of agency in terms of disclosure of action possibilities that without AT would be prevented. Owning these new action possibilities is what a feeling of agency conveys.

As we have already introduced, there is a question of whether what assistive technologies are doing is enabling users to have the same kind of experiences as those that people without disabilities have (i.e., without having to use technologies). In the previous section, we argued that this is not the case. Here we want to focus in particular on the phenomenal transformations that take place when people with disabilities use AT. There could of course be augmentative technologies that do change the shape of the user's experience but typically it is not the case that when users are using technology that is designed for people with disabilities (i.e., "assistive technologies") the shape of their experience will be changed in terms of the way that they are opened up to the world. This is because they are already open to the world in that way. So, it might change the quantity of their experience but it is not changing the quality of their experiential space. But phenomenal transformations have all to do with the quality of experience. So, the person using an assistive technology but in an augmenting way is not having the same phenomenal transformation as someone using it in an assistive way.

A phenomenal transformation pertains to the first-person experience. It is embedded in the personal context of the life of the agents. As embodied, it is directly experienced from within the living body's concerns, needs, desires. It has an impact on the agent's style of life, habits, commitments, and ways of interacting. A phenomenal transformation is thus strictly personalised as an expression of a specific way of being and becoming.[6] We then need to avoid the philosophical temptation to generalise the experience of the AT

[4] On the performative, contextual and political character of disability, see Oliver and Barnes (2012).

[5] This line of thought has important debts to the enactive approach to 4E Cognition. See Colombetti (2014) especially regarding the role of affects in sense-making.

[6] On becoming as a fundamental concept to consider about the agent's living processes, see Di Paolo 2021.

integration for a person with disabilities in order to describe it. Instead, we can stress that the phenomenal transformation that will result from the integration of AT is something peculiar to each individual since it speaks for their uniqueness. But we can also highlight the affective dimension of a phenomenal transformation, with all the nuances of the case. A phenomenal transformation is in fact inherently affective. This is what we called a "feeling of agency".

Let us consider a hypothetical case of Jane.[7] Jane is a young woman who works as a bank employee in a small city. She takes the metro every day to go to work and twice a week she jogs home to do some physical activity after an entire day sitting in a chair. Jane wears a smartwatch that guides her through the town. She also has a Braille Note Touch in her bag. While jogging, Jane hears the social network newsfeed read aloud by her smartwatch. She sometimes also explores new neighbourhoods with the help of the GPS assistant.

Jane is a blind person who can autonomously reach her place of work. Just like everybody else, she had to learn an itinerary and this has certainly required some effort. But to learn the route and actually arrive at her final destination, Jane has to rely on AT. This means that beyond learning the route, she must learn how to use AT.

But for the moment, let us assume that she is already integrated with her smartwatch, and she fluently navigates the streets of her town. For us, it is important to notice that this orientation skill acquired through the AT integration provides Jane with a feeling of security and self-reliance that characterises the "I can" of agency. We can presumably imagine that if Jane had to go to her job without her smartwatch, maybe because it is out of charge or because she forgot it somewhere, she would feel unease and impotent and the street might well appear to her as dangerous. Maybe she would even be incapable of going to her job alone or, if she could go (because she has been doing the same route every day for 5 years), she would presumably feel a bit scared and at risk of injury.

This comparison between walking to the job with and without the smartwatch is useful because it highlights that, when integrated to AT, Jane feels empowered. The experience of the route is a confirmation of what she can do on her own (i.e., with her smartwatch). Walking to work is thus an experience of success and autonomy. It makes Jane aware of her action possibilities and it can also trigger the desire to push a bit harder and maybe go exploring a new route to reaching her destination. However, this feeling of agency is enabled by the phenomenal transformation provoked by AT integration. Without AT integration, in fact, the experience of the route would be quite different and perceived as a hostile environment that reinforces the perception of herself as a person with special needs.

This means that the transformation induced by AT integration not only pertains to Jane's internal landscape (her cognitive character) but the external environment as well. Action possibilities are never just in the head, but they are environmental affordances (Crippen 2022). We will come back to this in the next section where we discuss our pragmatist approach to affective scaffoldings. For now, it is enough to stress that for this reason our change of framework might be more in line with the externalist approach of extended cognition than the virtue-theoretic approach advanced by Pritchard et al. (2021)

The phenomenological difference between walking to her job place with and without a smartwatch is even stronger when there is a transition from not knowing how to use a smartwatch and actually owning it. This is mostly what happens to children when they have to learn to use AT. Imagine how different it would have felt for the young Jane to go to school for the first time alone without a care assistant. Maybe at that time, there were not smartwatches available, but she had to learn the route with a cane and through the memorisation of special points of reference on the path. However, the feeling of agency implied by the transition to autonomous agency might well have felt the same. There might have been excitement and satisfaction, maybe also a bit of uncertainty and precaution. Whatever the particular character of the experience it would certainly be a transformation of the quality of the experience.

This brings us to our main proposal. To fully grasp the affective dimension of this transformation, we need to look at AT from the point of view of affective scaffoldings. This is because the whole idea behind this conceptual framework is that these objects can shape and transform one's experience. Not only this, but they can transform one's habitual ways of interaction with the world for fulfilling some needs. Importantly, affective scaffoldings are personalised: they are the way through which individuals carve out their cognitive-cum-affective niche. This means that affective scaffoldings are not just the "neutral" extended tool of the extended cognition framework. One can shape the phenomenological space through which one experiences the world through tools that speak to them – that are meaningful. In the next section, we will show that AT is a prominent case of affective scaffolding precisely for their existential necessity.

[7] This hypothetical case has been written in relation to the working experience of one of the authors with visually impaired people. For some real life examples, see https://www.technologyreview.com/2017/08/04/150141/a-smart-watch-to-help-blind-people-navigate/.

6 Assistive Technology as Affective Scaffolding

Drawing from the extended mind hypothesis, Griffiths and Scarantino (2008) have stressed the active role of an "environmental scaffolding" in supporting emotions. The active role played by the environment should not be simply construed as a causal trigger of affective experience. Rather, the environment offers action possibilities in the form of emotions. In the affective experience, the environment is represented in terms of what it affords. Shargel and Prinz (2018) have then reframed their claim in enactive terms, claiming that emotions do not represent affordances, but create affordances as new possibilities for action. Drawing upon the notion of "environmental scaffolding," Colombetti and Krueger (2015) have defined "affective scaffoldings" as those resources that set up, drive, and regularly contribute to affective regulation. The externalist approach to emotion regulation claims that external resources are employed to adjust and manage human feelings. The core idea is that specific resources can balance human affective life if they are integrated into structured and repeated practices of interaction. Emotion regulation is then a process of manipulation of the environment feeding back onto the organism and transforming it.

Krueger (2018) has further distinguished three types of affective scaffoldings: embodied, social, and material. In embodied affective scaffoldings, the affective experience is regulated by a range of physical processes distributed throughout our bodies. In social affective scaffoldings, socially distributed feedback loops regulate the affective dynamics of individuals and groups. In the case of material affective scaffoldings, the affective experience is regulated by the material culture that is made up of objects and environments.

So why might we want to think about AT in terms of affective scaffolding instead of cognitive extension? Scaffolding might seem to be just as individualist as the extended tools,[8] so, it might be argued that cognitive integration, after all, would be a better way to be thinking about AT. Yes, there is this risk, especially if we focus, as most of the literature has done so far, on one type of affective scaffoldings only, namely material culture (Krueger and Colombetti, 2018; Piredda 2019; Colombetti 2020). Nevertheless, the concept of affective scaffolding does seem to capture the effort that the user must put in to become cognitively integrated in the first place. There is an effort in the productive struggle that comes from a system that is not yet cognitively integrated with AT. This productive struggle is the act of putting the scaffolding in place and finding the right scaffolding such that it not only supports the cognitive capacities but also replies to the existential needs of a person with disabilities. So, the process of integrating with an AT is a kind of affective scaffolding because it is changing the way that the user can affectively engage with the world and carving out new action possibilities. Affective scaffolding captures these kinds of phenomenal transformations in a way that cognitive integration does not.

Moreover, if we conceptualise affective scaffoldings in terms of habits of interaction, as suggested by Candiotto and Dreon (2021), we can avoid the reduction of affective scaffoldings to material culture. The pragmatist approach enables us to better appreciate that what an affective scaffolding does is precisely an ecological reconfiguration of the interaction with the environment for regulating the affective experience. This implies going beyond the conceptualisation of scaffolding as a strategic and consumerist use of a resource,[9] and instead undertaking a view for which an affective scaffolding is an affective transaction with the world. This transaction is a continuous process of feedback that changes the experience (aka, phenomenal transformation) in carving out new action possibilities. A transaction is not merely using an object as a tool. The object (let's keep the smartwatch as our example) is not an environmental factor but it is the channel through which Jane can experience the world in an agentic manner. In the case of AT integration, this difference is marked by a feeling of agency, the basic "I can" of owning what you are doing. Also, it is important to stress that this feeling of agency is always ongoing. It is not just a momentary feeling of ownership. On the contrary, it is a feeling of being able to be an agent in the continuous engagement with AT.

So, if we understand the productive struggle implied by AT integration with the affective scaffoldings framework, we can see that a productive struggle does not simply mark cognitive integration, but it is the way through which agents regulate and transform the how of the experience. A phenomenal transformation enabled by AT as an affective scaffolding is what finally discloses to the agent a new world of possibilities that were previously inaccessible. It is only there that the fundamental "I can" of the experience can be felt by Jane too. This fundamental "I can" is this phenomenal transformation that relates back to the kind of agency that we are concerned with because it is this opening up of possibilities, this changing of the structure of the possibility space for the user, that is going to make the user feel like an agent. This means that what an affective scaffolding enables is a transformation of the how of the experience.

The phenomenal transformation that takes place in the case of AT integration could be phrased with the (maybe

[8] See Slaby (2016) an Candiotto & Piredda (2019) for this type of criticism address of the extended mind approach.

[9] For a critical interpretation of the user-resources relationship, see Slaby (2016) and Piredda and Candiotto (2019).

abused) concept of "empowerment". But we need to be careful here. To be empowered does not mean to be in full control of the ecological system of interactions between self and technology. It is not that users have now mastered that technology and they are not vulnerable anymore. The power we are referring to here by using the concept of "empowerment" is not the one that dismantles uncertainty and precariousness, but rather is one that focuses on the "I can" of existence that is re-established thanks to AT as affective scaffolding.[10] The feeling of agency that goes along with this is in terms of the possibilities available for them rather than experiencing them as frustrated possibilities.

7 Conclusion: An Agenda for Future Research

To discuss the implication of AT integration to the extended self is beyond the scope of this paper. However, we would like to flag that the focus on the feeling of agency as a crucial result of the phenomenal transformation kindled by AT as affective scaffolding can contribute to the debate on the extended self.[11] So, we would like to conclude just by sketching some important implications that come from our proposal. If the self is a construct of individuals that understand and edit themselves in relation to their experience, the phenomenal transformation kindled by AT integration is also a transformation of this self. For phenomenology, the self is found in the how of the experience, and can be conceptualised as the first-person perspective on the world (Zahavi 2005, 2014, 2015). This self can be labelled as a "narrative self", as it emerges from the numerous different processes of self-understanding disclosed by the symbolic mediation of narratives. In Heersmink's view (2017), personal identity is defined as an "environmentally-distributed and relational construct". The upshot of this conception is that "the complex web of cognitive relations we develop and maintain with other people and technological artifacts partly determines our self" (p. 3135). This has clearly important implications for our concept of self – both theoretically and ethically. These narratives are distributed, insofar as they are based on embodied interactions with artifacts and other persons. In Heersmink's view (2018), this distributed network of environmental structures partially constitutes ourselves.

So, in the same vein, we can say that AT as an affective scaffolding partially constitutes the user's personal identity. The way that Pritchard et al. (2021) cashes out the extended cognitive integration does not fully capture this aspect (although they do introduce the virtue theoretic account that points in this direction). The reason that it does not is because, they do not focus on the phenomenology of AT integration that, nevertheless is crucial for appreciating what kind of transformations AT can produce in the user's quality of life.

This leads us to stress the ethical and pedagogical reasons for preferring the affective scaffoldings view. Autonomy and self-governance are at risk within the extended mind view and preserved within the affective scaffoldings view. The reason is that AT integration in the extended mind implies automatic endorsement. On the contrary, in the affective scaffolding view, it is the agent who owns the process of carving out new actions possibilities. This of course does not mean that a user must make the effort of deciding whether to use AT every single time. Affective habits of interactions with AT are at the core of our understanding of AT as affective scaffoldings. But this view enables us to point to the dialectic between choice and endorsement that is fundamental to what we call the feeling of agency in cognitive integration. Focusing on this more nuanced and complex orchestration of choices and habitualisation is in line with some core aims of education, namely supporting the autonomy of students in answering their learning needs. Finally, it better acknowledges that learning struggles, as part of the learning process, do not result in an idealised and pacified cognitive integration, but respond to an existential necessity. This existential necessity should be valued as a core affective motivation that supports the effort of creating new action possibilities thanks to AT.

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[10] This is the pragmatist way to phrase it to which we prefer to subscribe – but it can be fruitfully also understood in terms of acquired "capabilities", in line with the famous capability approach developed by Nussbaum (2011) and Sen (1993).

[11] See Candiotto & Piredda 2019 for an introduction to the debate.

References

Candiotto L (2019) Emotions in-between. The affective dimension of participatory sense-making. In: Candiotto L (ed) The value of emotions for knowledge. Palgrave Macmillan, pp 235–260

Candiotto L (2022a) Extended loneliness. When hyperconnectivity makes us feel alone. Ethics and Information Technology

Candiotto L (2022b) What I cannot do without you. Towards a truly embedded and embodied account of the socially extended mind. Phenomenology and the Cognitive Sciences

Candiotto L, Dreon R (2021) Affective scaffoldings as habits: a Pragmatist Approach. Front Psychol. https://doi.org/10.3389/fpsyg.2021.629046

Colombetti G (2014) The feeling body. Affective science meets the enactive mind. MIT Press

Colombetti G (2020) Emoting the situated mind: a taxonomy of affective material scaffolds. J Philos Lang Mind Arts. https://doi.org/10.14277/Jolma/2723-9640/2020/02/004

Colombetti G, Krueger J (2015) Scaffoldings of the affective mind. Philos Psychol 28:1157–1176. https://doi.org/10.1080/09515089.2014.976334

Crippen M (2022) Emotional environments: selective permeability, political affordances and normative settings. Topoi 41(5):917–929

De Preester H, Tsakiris M (2009) Body-extension versus body-incorporation: is there a need for a body model? Phenomenol Cognitive Sci 8:307–319

Di Paolo E (2021) Enactive Becoming. *Phenomenology and the Cognitive Sciences*, 20: 783–809.English, A. R. (2013) *Discontinuity in Learning: Dewey, Herbart and Education as Transformation* Cambridge: Cambridge University Press

English A (2013) Discontinuity in learning: Dewey, Herbart and Education as transformation. Cambridge University Press, Cambridge

Gallagher S (2008) Self-agency and mental causality. In: Kendler KS, Parnas J (eds) Philosophical issues in Psychiatry: explanation, Phenomenology, and nosology. The Johns Hopkins University Press, Baltimore, MD

Griffiths P, Scarantino A (2008) Emotions in the wild. In: Robbins P, Aydede M (eds) The Cambridge handbook of situated cognition. Cambridge University Press, pp 437–453

H Pritchard D (2010) Cognitive ability and the extended cognition thesis. Synthese 175:133–151

Heersmink R (2018) The narrative self, distributed memory and evocative objects. Philos Stud 175(8):1829–1849

Heersmink R (2017) Distributed selves: personal identity and extended memory systems. Synthese 194(8):3135–3151

Kirsh D (2019) When is a mind extended? In: Colombo M, Invien E, Stapleton M (eds) Andy Clark and his critics. Oxford University Press, pp 128–142

Krueger J (2018) Schizophrenia and the scaffolded self. Topoi 39:597–609. https://doi.org/10.1007/s11245-018-9547-3

Krueger J, Colombetti G (2018) Affective affordances and psychopathology. In: Bortolan A, Salice A, (eds) Discipline filosofiche, special issue: philosophical perspectives on affective experience and psychopathology, pp 221–247

Montero B (2015) Thinking in the zone: the Expert mind in action. South J Philos 53:126–140

Murdoch D, English AR, Hintz A, Tyson K (2021) Feeling heard: Inclusive Education, transformative learning, and productive struggle. Educational Theory 70:653–679

Nussbaum M (2011) Creating capabilities. Harvard University Press, Cambridge, MA

Oliver M, Barnes C (2012) *The New Politics of Disablement*. London: Palgrave Macmillan 2012

Piredda G (2019) What is an affective artifact? A further development in situated affectivity. Phenomenol Cogn Sci 19:549–567

Piredda G, Candiotto L (2019) The affectively extended self: a Pragmatist Approach. HUMANA.MENTE J Philos Stud 12(36):121–145

Pritchard DH (2013) Epistemic virtue and the epistemology of education. J Philos Educ 47:236–247

Pritchard DH (2014) Virtue epistemology, extended cognition, and the epistemology of education. Universitas: Monthly Review of Philosophy and Culture 478:47–66

Pritchard DH (2016) Intellectual virtue, extended cognition, and the epistemology of education. In: Baehr J (ed) Intellectual virtues and education: essays in applied virtue epistemology. Routledge, London, pp 113–127

Pritchard DH (2018) Extended virtue epistemology. Inquiry 61:632–647

Pritchard DH, English AR, Ravenscroft J Extended cognition, assistive technology, and education., Synthese (2021) https://doi.org/10.1007/s11229-021-03166-9

Sen A (1993) Capability and well-being. In: Nussbaum M, Sen A (eds) The quality of life. Clarendon Press, Oxford, pp 30–53

Shargel D, Prinz J (2018) An enactivist theory of emotional content. In:Naar H, Teroni F (eds) The ontology of emotions. Cambridge University Press, Cambridge, pp 110–129

Slaby J (2014) Emotions and the extended mind. In: Salmela M, von Scheve C (eds) Collective emotions. Oxford University Press, Oxford-New York, pp 32–46

Slaby J (2016). Mind invasion: Situated affectivity and the corporate life hack. Frontiers in Psychology, 7, 266

Slaby J (2018). Affective arrangement. In J. Slaby & C. von Scheve (Eds.), Affective societies: Key concepts (pp. 109–118). Routledge

Synofzik M, Vosgerau G, Newen A (2008) Beyond the comparator model: a multifactorial two-step account of agency. Conscious Cogn 17:219–239

Thompson E, Stapleton M (2009) Making sense of sense-making: reflections on enactive and extended mind theories. Topoi 28(1):23–30

Zahavi D (2005) Subjectivity and selfhood: investigating the first-person perspective. MIT Press, Cambridge, MA

Zahavi D (2014) Self and other: exploring subjectivity, empathy, and shame. Oxford University Press, Oxford

Zahavi D (2015) You, me, and we. The sharing of emotional experience. J Conscious Stud 22:1–2, 84–101