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RESEARCH ARTICLE

ChatGPT and the Technology-Education Tension: Applying Contextual Virtue Epistemology to a Cognitive Artifact

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Abstract

According to virtue epistemology, the main aim of education is the development of the cognitive character of students (Pritchard, 2014, 2016). Given the proliferation of technological tools such as ChatGPT and other LLMs for solving cognitive tasks, how should educational practices incorporate the use of such tools without undermining the cognitive character of students? Pritchard (2014, 2016) argues that it is possible to properly solve this 'technology-education tension' (TET) by combining the virtue epistemology framework with the theory of extended cognition (EXT) (Clark and Chalmers, 1998). He argues that EXT enables us to consider tools as constitutive parts of the students' cognitive system, thus preserving their cognitive character from technologically induced cognitive diminishment. The first aim of this paper is to show that this solution is not sufficient to solve the TET. Second, I aim to offer a complementary and more encompassing framework of tool-use to address the TET. Then, I apply it to the educational uses of ChatGPT as the most notable example of LLM, although my arguments can be extended to other generative AI systems. To do so, in Sect. 1.1, I present Pritchard's framework of cognitive character and virtue epistemology applied in education, to which I am committed in this treatment. In Sects. 2 and 3, I respectively illustrate Pritchard's (2014) solution to the TET, and I highlight the general limitations of his proposal. Thus, in Sect. 4.1 I characterize ChatGPT as a computational cognitive artifact using Fasoli's (Fasoli, 2017, 2018) taxonomy of cognitive artifacts. In Sect. 4.2, I introduce my proposal, which combines Pritchard's account of virtue epistemology with Fasoli's (2017, 2018) taxonomy of cognitive artifacts to address the TET. Finally, in Sect. 5.1, I present some epistemically virtuous uses of ChatGPT in educational contexts. To conclude, I argue in favor of a multidisciplinary approach for analyzing educational activities involving AI technologies such as ChatGPT.

Keywords ChatGPT · Extended Cognition · Virtue Epistemology · Cognitive Artifacts · Education · Cognitive Diminishment · AI · Generative AI

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1 Introduction

The rise of AI technologies is deeply influencing many aspects and sectors of society, including education. Despite the huge variety of AI applications in educational settings, one interesting AI tool that can be employed for educational purposes is ChatGPT, which is an AI chatbot (developed by OpenAI) capable of producing suitable responses and engaging in natural-sounding conversations (Deng & Lin, 2023). The basic version of this chatbot uses GPT-3.5, a Large Language Model (LLM) used for natural language processing. Like many other technologies and generative AI systems, ChatGPT gave rise to a problem of whether to ban this tool from school altogether, or promote, regulate, and teach its virtuous use (Teubner et al., 2023). On the one hand, generative AI systems like ChatGPT can be placed along a continuum with other technological educational resources, from calculators to internet-search engines and AI tools (Cunnane, 2011; Knight, 2014). On the other hand, it is also important to acknowledge the disruptiveness of this type of multifunctional tool, which is distinct from previous large language models (LLM) in its accessibility, personalization, conversational format, and cost-effectiveness (Rahman & Watanobe, 2023). Given the extensive list of chatbots and LLMs available today (Digital Learning Institute 2023; Dan et al., 2023), in my analysis I will consider ChatGPT, implementing GPT-3.5. However, what I say can be easily generalized to other chatbots and LLMs.

Sok and Heng (2023) and Extance (2023) summarized the main benefits and challenges of the possible uses of ChatGPT and AI tools within the education system.[1] These tools give rise to new ways of cheating or avoiding doing homework and assignments (Cotton et al., 2023; Mhlanga, 2023), thus leading to unfair assessments and the potential diminishment of students' capacities. Sok and Heng (2023) argue that the overreliance on ChatGPT to complete daily assignments may have a harmful impact on the development of students' fundamental capacities, such as critical thinking skills (Kasneci et al., 2023; Mhlanga, 2023; Shiri, 2023), problem-solving skills (Kasneci et al., 2023), imagination, and research abilities (Shiri, 2023). Thus, teachers' main fear is that students may increasingly tend to delegate to ChatGPT most of their homework and assignments whenever they are facing a learning challenge, thereby preventing them from properly learning and developing relevant skills. However, it is also important to educate students to appropriately use those technologies that are, and will increasingly be, crucial tools in our society. I define this problem as the 'technology-education tension' (TET). Many teachers are already aware of this issue, and they are experimenting with innovative educational activities to transform ChatGPT's risks and downsides into potential benefits for students.

[1] This tool may prove beneficial by offering 1) efficient and time-saving creation of learning assessments (Zhai 2022; 2023; Baidoo-Anu and Owusu Ansah, 2023); 2) enhancement of pedagogical practices by assisting teachers' production of quizzes, exams, syllabuses, and lesson plans (Rudolf 2023; Atlas 2023); 3) easily available personalized tutoring and feedback for students (Mhlanga 2023); 4) creation of outlines for organizing ideas (Kasneci et al., 2023) and 5) facilitation of brainstorming.

This work tries to address the 'technology-education tension', comparing two different theoretical frameworks for interpreting how students' cognitive abilities are engaged in the use of technological devices. Since Pritchard (2014, 2016) arguably offers only a partial solution to the technology-education tension (TET), I propose a more encompassing solution that combines Fasoli's taxonomy of cognitive artifacts with Pritchard's framework of virtue epistemology. Thus, in Sect. 1.1 I will present Pritchard's framework of cognitive character and virtue epistemology applied to education. In Sect. 2, I will introduce Pritchard's solution to the technology-education tension, showing that it is only partial and confined to a limited set of cases (Sect. 3). Then, I will try to offer a more encompassing framework for addressing the TET and the potential uses of ChatGPT in educational settings, by combining Pritchard's (2013, 2014, 2016) framework of virtue epistemology with Fasoli's (2017, 2018) taxonomy of cognitive artifacts. To do so, in Sect. 4.1 I will characterize ChatGPT as a computational cognitive artifact relying on Fasoli's (2017, 2018) taxonomy. In Sect. 4.2 I will argue why my framework is more encompassing and useful compared to Pritchard's for addressing the TET. Finally, in Sect. 5.1, I will present some of the students' epistemically virtuous uses of ChatGPT in educational practice. I will conclude by arguing that we should not consider EXT as the only suitable framework for explaining cognitive tool-use in educational settings.[2]

1.1 Virtue Epistemology in Education and the Technology-Education Tension

In this section, I will present the standard framework of *virtue responsibilism* (Baehr, 2011; Battaly, 2008; Zagzebski, 1996) and its application to educational practices (Baehr, 2013, 2015, 2016, 2019; Pritchard, 2013, 2014, 2016). In the rest of the treatment, I will commit to Pritchard's (2013, 2014, 2016) account of cognitive character and virtue responsibilism, which is aligned to the standard framework presented in this section. Virtue responsibilism is a branch of virtue epistemology that focuses on the improvement and development of the cognitive character of the subject (Battaly, 2008; Zagzebski, 1996). Pritchard (2016) defines the cognitive character as the interconnection between the agent's cognitive faculties, cognitive abilities, and intellectual virtues. Cognitive faculties are innate cognitive traits, such as those involved in perception or memory, while cognitive abilities, such as the capacity to perform arithmetic calculations, are acquired by drawing upon the existent cognitive faculties and are performed to complete specific cognitive tasks. Finally, intellectual virtues are cultivated, acquired, or learned cognitive character traits due to the exercise of the previous two, and they have a regulative function in the sense that they are very broad cognitive traits that drive the development and use of specific cognitive faculties and abilities (Pritchard, 2016, pp. 115–116). Moreover, virtue responsibilism considers intellectual virtues as personal excellences,[3]

[2] In this treatment the label 'tool-use' refers only to the use of representational cognitive artifacts (Fasoli 2017), leaving out other forms of tool-use.

[3] Baehr (2016, p. 2) defines personal excellences as qualities that "make their possessor good or admirable qua person".

enabling the agent to be more likely to acquire knowledge (Baehr, 2015, 2016; Battaly, 2008; Zagzebski, 1996).

According to this framework, intellectual virtues are not merely instrumentally valuable as a means to certain epistemic goods, but also intrinsically valuable, as manifestations of cognitive agency (Pritchard, 2014, p. 4). Thus, intellectual virtues are also held to be valuable for their own sake, like virtues more generally, as constituent parts of a life of flourishing (Pritchard, 2014; Roberts & Wood, 2007). Among the standard list of epistemic virtues, we can consider open-mindedness, attentiveness, intellectual autonomy, curiosity, intellectual courage, and intellectual tenacity (Baehr, 2011). For example, open-mindedness is a mean between the vices of naivety and dogmatism, and it consists in allowing alternative views to remain open in order to change ones' mind and to embrace the most accurate one, while attentiveness consists in paying close attention to, and maintaining focus on, the cognitive task at hand. Baehr (2016) adds that what characterizes intellectual virtues is their motivational character; namely, their orientation toward certain epistemic goods or worthy ends that make intellectual virtues intrinsically valuable or admirable. Thus, intellectual virtues do not just facilitate access to truths, but also motivate one towards them (Pritchard, 2016; Zagzebski, 1996).

In this paper, I embrace Pritchard's (2013, 2014, 2016) framework of cognitive character and virtue responsibilism, which are aligned with the standard framework of virtue responsibilism (Baehr, 2011; Battaly, 2008; Zagzebski, 1996), and its application to educational practices (Baehr, 2019; Carter et al., 2019; Hyslop-Margison, 2003; Robertson, 2009; Siegel, 1988, 1997, 2017). Pritchard (2013) reflected on what we should try to achieve from an epistemic perspective when we educate children at school, arguing that we should not reduce the aim of education merely to the instruction of true beliefs and factual knowledge. Thus, Pritchard (2016) argues that the main aim of education should consist in the development of the cognitive character and intellectual virtues of students,[4] mainly by training students to engage in epistemically virtuous ways in real-world situations (Pritchard, 2013). According to his framework, we should not simply ask a student to learn a set of basic factual information (know-that); neither it is enough for the student to simply learn how to consult Wikipedia or ChatGPT to find relevant information on a given topic (know-how). In fact, other important learning aims are the development of 'understanding' (Mollick & Mollick, 2022; Pritchard, 2013, 2016) and 'metacognition', intended here as a form of knowledge concerning the agent's awareness of the availability of tools, and the reliability (and reasons for the reliability) of those tools (Kuhn, 2000; Heersmink & Knight, 2018, p. 6). While the difference between 'mere factual knowledge' and 'understanding' of a concept is that the former is superficial, decontextualized, and it is not necessarily based on a reliable process of acquisition (Pritchard, 2016). For example, if a person uncritically trusts any web page that

[4] For an account of the development of intellectual virtues in education see Hyslop-Margison (2003), Battaly (2006), MacAllister (2012), Sockett (2012), Pritchard (2013, 2018, 2020), Byerly (2019), Baehr (2015). Along with other virtue responsibilists, Pritchard (2013; 2014; 2016) considers the development of intellectual virtues as the fundamental goal of education, given the special role they play in relation to the cognitive economy of the subject.

appears, and incidentally discovers that whales are mammals, then that person has reached a true belief but low understanding, by exerting a very low degree of cognitive agency (Pritchard, 2013). Moreover, once that person is in an epistemically unfriendly environment, that person will be more exposed to the acquisition of false beliefs (Pritchard, 2013). Instead, understanding is based on the connection of a specific concept with the relevant background knowledge and depends on an exercise of cognitive agency, thus enabling the student to flexibly apply it to new and different contexts (Mollick & Mollick, 2022).

From this perspective, if the general aim of education is the development of the cognitive character and in particular of intellectual virtues (Baehr, 2011, 2013; Battaly, 2008; Pritchard, 2013, 2014, 2016), which in turn foster cognitive abilities required for the three different types of knowledge (factual, know-how, and meta-knowledge) and understanding, then educational practices should implement the use of external technological resources, thus training the students to cope with real-world epistemic challenges (Pritchard, 2013, 2014). This can be done by asking the students to critically reflect on a topic by navigating, selecting, evaluating, comparing, and synthesizing the externally retrieved information and integrating it into their background knowledge (Heersmink & Knight, 2018; Pritchard, 2016).

However, the more cautious warn that students' overreliance on technological resources may lead them to lose some cognitive traits and abilities in a process of cognitive diminishment (Kasneci et al., 2023; Mhlanga, 2023; Shiri, 2023). The 'technology-education tension' (TET) arises between two aims of education according to virtue epistemology. The general aim of education consists in the development of students' cognitive character, which should be fostered also through the engagement in real-world epistemic challenges (Pritchard, 2013). These challenges may involve the use of technological resources, which may lead to cognitive diminishment or may prevent the proper development of some components of the cognitive character via overreliance on such external resources (Pritchard, 2016). The concerns on cognitive diminishment are justified and increasingly urgent given the introduction of AI systems such as ChatGPT in education, which can be used in a way that substitutes the use of many cognitive abilities. On the other end, these concerns should not prevent students from being educated in using these technologies since they are playing an important role in the socio-economic system. Thus, it is important to define a conceptual and practical solution to the 'technology-education tension' (TET) capable of addressing how to implement ChatGPT and similar generative AI systems in learning settings.

2 Pritchard's solution to the 'technology-education tension'

Pritchard (2016) acknowledges that if the educational aim of virtue epistemology is the development of the agent's cognitive character, then the use of technological resources in educational contexts may undermine such a goal when such use prevents or undermines the development of the students' cognitive abilities employed for specific tasks. Thus, Pritchard (2014, 2016) offers a solution to TET by distinguishing two forms of virtue epistemology: 'epistemic individualism' and 'epistemic anti-individualism.' The former considers subjects' cognitive processes as entirely internal and non-extendible by technological resources, while the latter considers them as potentially extended by social[5] or technological external resources. In this paper, I consider only 'technological epistemic anti-individualism,' and I refer to it as 'extended virtue epistemology', distinguishing it from 'non-extended virtue epistemology'. 'Extended virtue epistemology' combines Pritchard's framework of virtue epistemology with the theory of extended cognition (EXT), according to which a tool that is highly integrated and functionally contributes to the cognitive processes of one agent, under specific coupling conditions, can be considered as a constitutive component of an extended cognitive process (Clark and Chalmers, 1998). EXT is highly debated given the presence of a more moderate alternative, the embedded cognition theory (EMB), which considers cognitive processes as brain or organism-bounded and only causally influenced by technological resources, but not constituted by them (Rupert 2004). Thus, non-extended virtue epistemology is committed to EMB.

Pritchard argues that the supporters of non-extended virtue epistemology consider technology merely as a means to an end for developing subjects' on-board unaided cognitive traits, which should take precedence over the use of technology, particularly where this use might diminish the development of some cognitive traits (Pritchard, 2016, p. 121; 2014). Thus, non-extended virtue epistemology would push educators to prevent students from using technologies in learning settings in order to preserve their on-board cognitive character, failing to train them to engage with real-world epistemic challenges involving technological resources. This is the approach that might have led to a ban on ChatGPT from schools (Shen-Berro, 2023) and might motivate those who are simply scared of introducing ChatGPT in educational contexts due to fears that the students may excessively rely on it in a passive way, thus leading to their deskilling or preventing the development of relevant cognitive abilities (Kasneci et al., 2023; Mhlanga, 2023; Shiri, 2023). In line with Pritchard's depiction of non-extended virtue epistemology, some educators suggested not getting rid of traditional technologically unaided educational practices, since the virtuous use of new technologies depends on the skills and capacities that have been developed independently of those technologies (Christodoulou 2023).

From now on, I use the label 'TET cases' to refer to those cases of tool-use in education which may lead to cognitive diminishment or may prevent the development of some portions of the cognitive character of students. Pritchard argues that, according to non-extended virtue epistemology, students' reliance on technology may imply a form of cognitive diminishment or may prevent the development of specific cognitive character traits (Pritchard, 2016, pp. 119, 122, 125). This happens because according to a brain-based view of cognition (EMB) the delegation of on-board, brain-based cognitive abilities to external resources may undermine the preservation and development of internal, brain-based cognitive abilities (Clowes 2013). Thus, according to Pritchard, non-extended virtue epistemology fails to solve

[5] The analysis of distributed cognition frameworks and of socially distributed epistemology applied in educational contexts goes beyond the scope of this work, although I will briefly mention this field of research in Sect. 5.1.

the TET and it is unable to properly fulfil the aims of education of developing the cognitive character of students via engagement in real-world epistemic challenges in TET cases. Thus, Pritchard (2014, 2016) presents extended virtue epistemology as a solution to TET cases arguing that it allows us to conceive the introduction of technological resources in education as compatible with the development of the students' cognitive character. In fact, although students may rely on external technological resources to complete cognitive tasks, according to EXT, under specific conditions for cognitive extension, it is possible to consider such tools as incorporated within an extended cognitive process of the agent. Thus, EXT implies that the cognitive character of students incorporates external resources, rather than delegating on-board, biological, internal cognitive abilities to technological devices. In this way, extended virtue epistemology better preserves the educational aims of virtue epistemology, namely the development of the cognitive character of students via technological use.

3 The limitations of Pritchard's solution

Although I am in principle open to the possibility of extended cognitive processes, EXT brings several potential problems when it comes to its practical application and implementation in real-world scenarios, such as educational contexts. First, it has been convincingly argued that the theories of extended (EXT) and embedded (EMB) cognition are explanatorily, empirically, and predictively indistinguishable since they both posit extracranial mechanisms, even though EMB does not attribute a cognitive status to the external components (Barker, 2010; Sprevak, 2010). In addition, there is no shared agreement in defining a necessary and or sufficient mark of what cognition is (Facchin, 2023; Varga, 2017), thus making it difficult to establish whether an external component may respect such a mark (Adams and Aizawa 2008). Moreover, even supporters of EXT admit that it is not easy to define the tipping point from a highly embedded cognitive system to an extended one (Farina & Lavazza, 2022, pp. 7–8; Heersmink, 2017, p. 434). To conclude, either among supporters of EXT, there is no shared agreement on defining the conditions for cognitive extension (Colombo et al., 2019). Thus, although EXT may be an elegant theoretical solution to the TET, it is difficult to establish exactly the conditions of applicability of EXT in 'TET cases'. Moreover, even if these conditions will be clarified, it may be that "cognitive extension is rare, such that most of the uses of technology in education are of a non-extended variety" (Pritchard, 2016; p. 123), as acknowledged by Pritchard himself. Thus, Pritchard (2016, p. 123) acknowledged that if the conditions of applicability of EXT are rare, then "extended virtue epistemology would not gain us much purchase on the problem in hand." In addition, even if they are not rare, they may not cover all TET cases.

However, Pritchard argues that using this framework in educational activities would encourage students to use technology in epistemically virtuous ways. In fact, he argues that cognitive extension requires the use of intellectual virtues and a great degree of cognitive agency in the engagement with technological resources (Pritchard, 2016, p. 123), fostering understanding rather than mere knowledge

(Pritchard, 2013, 2016, p. 117–118). Thus, an educator committed to extended virtue epistemology would require her students to critically engage in tool-use deploying a set of critical skills and epistemic virtues, rather than passively relying on the tool exerting a limited degree of cognitive agency. Therefore, even if the conditions for cognitive extension are not always met, this educational approach pushes toward epistemically virtuous uses of technology.

In Sect. 4.2 I present some practical examples of this educational approach, by proposing a ‘contextual virtue epistemology’, encompassing both EMB and EXT cases of tool-use. In fact, it might be the case that some epistemically virtuous uses of technology may not be sufficient for cognitive extension (Pritchard, 2016, p. 123), thus leaving open the technology-education tension for a variety of tool-uses. Therefore, we need a flexible and encompassing framework of tool-use for structuring and assessing educational activities to foster the development of cognitive character, epistemic virtues and understanding for both EXT and EMB cases of tool-use. Moreover, this framework will also offer a fine-grained characterization of extended cognitive systems when EXT applies, clarifying the forms of interdependences between brain-based and tech-based cognitive resources.

The advantages of the encompassing framework that I am proposing are that it offers a fine-grained taxonomy of different kinds of cognitive integration, which apply to all forms of tool-use rather than to a limited set of cases. This is especially relevant for interpreting how to properly implement generative AI systems such as ChatGPT in educational activities, given that it is not clear whether and how we may characterize such technologies as cognitive extenders. Although it is in principle possible to identify instances of extended cognitive processes involving ChatGPT, Pritchard’s solution to the technology-education tension may not be flexible enough for addressing all the possible uses of ChatGPT, all TET cases, and the intersection of the two. Given the inherent problems of EXT previously presented, Pritchard’s framework does not enable us to identify in real world scenarios the intersection between the sets presented in Fig. 1.

To sum up, Pritchard’s solution to the technology-education tension is affected by at least four problems. First, the conditions for EXT are not clear. Second, even if they are clarified in theory, they may not be easily recognizable in practice. Third, even if they will be clarified and easily recognizable, they may not apply to every form of tool-use and to every TET case. Fourth, cognitive tool-uses, whether they can be considered as EMB or EXT, may have different kinds of effects on different components of the cognitive character of students,[6] some of which may be detrimental. The extension of cognitive ability X may undermine the development of intellectual virtue A. Thus, EXT does not per se solve the TET.[7] Therefore, we need a framework capable of addressing

[6] In Sect. 4.2 I will define these transformations as “cognitive trade-offs”.

[7] Fifth, cognitive integration with AI system, either they are EMB or EXT cases, may have transformative and detrimental effects on an affective, motivational, and existential level, potentially undermining the self and autonomy of the embedded/extended agent (Cassinadri 2022; Clowes 2020; Clowes et al.,

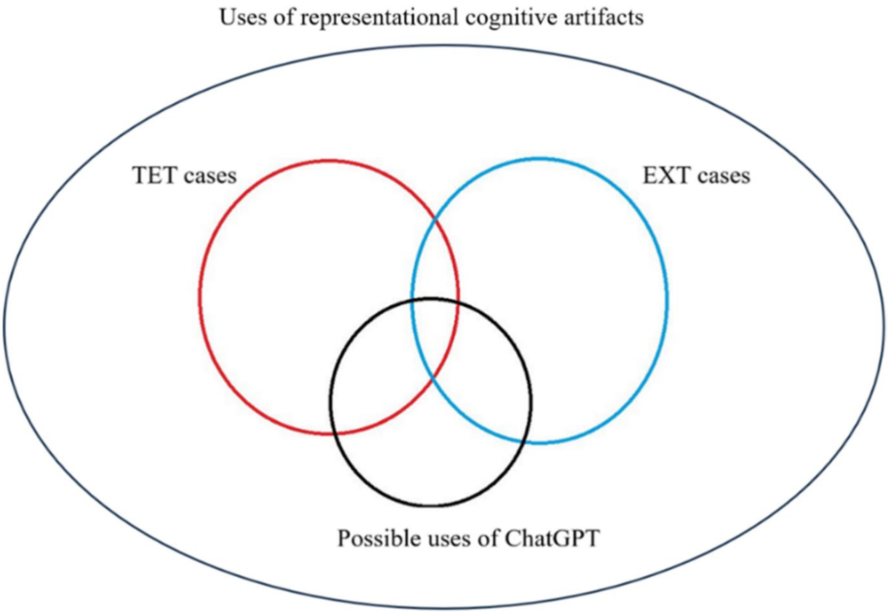

Fig. 1 The figure represents the intersection of three sets within all the possible cases of representational cognitive artifacts. The set of TET cases is on the left. On the bottom there is the set of all the possible uses of ChatGPT. On the right there is the set of all the possible instances of extended cognitive processes

these issues and that is applicable to the forms of tool-use (EMB) left out by Pritchard's solution. This framework will consider EXT as a special case of tool-use that can apply in some conditions and will offer a fine-grained characterization of different kinds of cognitive systems (embedded and extended) that explain the inner dynamics between brain-based and tech-based components of the cognitive character.

4 Contextual Virtue Epistemology applied to ChatGPT as a Cognitive Artifact

4.1 ChatGPT as a Cognitive artifact

Large language models are computational devices used for natural language processing. These models are able to generate human-like text, answer questions, and complete other language-related tasks with high accuracy (Kasneci et al., 2023). In this article I consider ChatGPT as the most notable example of a LLM, although my

Footnote 7 (Continued)

2023; Hernández-Orallo and Vold 2019). This issue is out of the scope of this treatment but is worth mentioning if we want to educate students not simply as epistemic agents but as whole human beings.

arguments can be extended to other LLMs. GPT-3.5 (Generative Pre-trained Transformer) is a third-generation, autoregressive language model that uses deep learning to produce human-like text. More generally, it can be defined as a computational system designed to generate sequences of words, code, or other data, starting from a source input called 'the prompt' (Floridi & Chiriatti, 2020). This type of statistical model needs to be trained with large internet datasets made up of texts to produce relevant results.

ChatGPT is the chatbot that uses GPT-3.5 and was released freely to the public in November 2022, reaching the record figure of 1 million users in only one week (Moe, 2022). Given its flexibility, for many people it is already part of their daily routine of work, study, and research to solve multiple tasks. It is able to automatically and flexibly generate answers to any kind of questions, summarize and explain a text or a concept, and translate and generate code for programming.[8] Despite there being no universally shared definition of 'cognitive task' (Fasoli, 2017), and despite ChatGPT not being a cognitive system per se, it can still be considered a cognitive artifact since its function is to contribute to the solving of human cognitive tasks (Norman, 1991; Heersmink, 2013; Casati 2017; Fasoli, 2018).[9] Thus, cognitive artifacts are objects that are used to perform cognitive tasks by giving us "clear epistemic benefits, as they make such tasks easier, faster, more reliable, or possible in the first place" (Heersmink, 2014, p. 1). Since ChatGPT is used to supplement operations required for the completion of cognitive tasks, I will characterize it by using Fasoli's (2017) taxonomy of cognitive artifacts. He defines cognitive artifacts as.

> physical objects that have been created or modified to contribute to the completion of a cognitive task, providing us with representations that we employ for substituting, constituting, or complementing our cognitive processes, thus modifying the original cognitive task or creating a new one. (Fasoli, 2017, p. 681)

This definition can be explained in three steps. First, cognitive artifacts can be both analog objects and devices implementing a computational system, as they are used through interaction with a device. ChatGPT is the chatbot that uses the computational model, GPT-3.5, which is used through the interaction with a personal device (Fasoli, 2018); namely, a physical object implementing a computational system. Computational systems are intrinsically multifunctional devices as their broad function is to process information by virtue of computations, which in turn enables them to perform specific functions (Fasoli, 2018). The coarse-grained macro-function of computation enables computational systems to perform micro-functions according to specific usages and purposes. Considering ChatGPT as a cognitive artifact, at the highest level of analysis it performs the macro-function of information

[8] Although this tool can also be used as an affective and emotional artifact by contributing to regulating and influencing the affective states of the user (Piredda 2020), in this paper I will characterize it only as a cognitive artifact that supports cognitive tasks.

[9] A task is "any activity in which a person engages, given an appropriate setting, in order to achieve a specifiable class of objectives, final results, or terminal states of affairs" (Carroll 1993, p. 8). Carroll defined a cognitive task as "any task in which correct or appropriate processing of mental information is critical to successful performance" (Carroll 1993, p. 10).

processing by virtue of computations. At a lower level of analysis, its function is to provide textual outputs that in turn perform a variety of specific micro-functions according to the task of the user, such as answering questions, and translating, summarizing, and correcting a text.

Here I focus on the latter level, acknowledging that each task X can be divided into further subtasks (w, y, z) in which the artifact can play a substitutive, complementary, or constitutive role.

To explain what I mean, let me return now to the second part of Fasoli's definition of cognitive artifacts, which clarifies the specific kind of contributions that artifacts offer to the user in performing a cognitive task: constitutive, complementary, and substitutive. Here I redefine Fasoli's (2017) taxonomy using the notion of 'degree of cognitive agency', namely the degree of active exercise of the resources of the cognitive character of the agent, which is composed of brain-based and potentially tech-based resources, in cases in which EXT applies.

- 'Constitutive cognitive artifacts' offer a necessary contribution to the completion of the cognitive task, which could not be completed solely by brain-based cognitive processes without the artefact's contribution.
- 'Complementary cognitive artifacts' complement a brain-based cognitive process X in such a way that 1) the agent exerts a great degree of brain-based cognitive agency, delegating to the artifact only a limited component of the work to complete the cognitive task; and 2) the cognitive task may be performed by the brain-based cognitive process X independently of the artifact's contribution.
- 'Substitutive cognitive artifacts' complement a brain-based cognitive process X in such a way that 1) the agent exerts a minimal degree of brain-based cognitive agency, delegating to the artifact most of the work to complete the cognitive task; and 2) the cognitive task may be performed by brain-based process X independently of the artifact's contribution.

To offer some examples, any kind of written text is a form of constitutive cognitive artifact that functionally contributes to the cognitive task of reading, which would not be realized independently of the external medium. A GPS may be used as a substitutive, complementary, or constitutive cognitive artifact. In the former case, the agent completely relies on the device to perform the cognitive task of spatial orientation by passively following its instructions and thus exercising the lowest degree of brain-based cognitive agency required for the effective use of the artifact. So, although the agent does not necessarily need the device for completing cognitive tasks of spatial orientation, he decides to delegate, offload, and thus substitute his brain-based cognitive agency with the processing of the device. In the case of complementary use, the agent integrates the information provided by the GPS navigator with his brain-based cognitive processes that are implied in the identification of the memorized path and of some reference point (Fasoli, 2017: 682). Thus, by intensively integrating his brain-based cognitive abilities with the processing of the device, he still performs a sufficient degree of brain-based cognitive agency. To conclude, if our brain-based cognitive abilities for spatial orientation were so weak and poor that in order to orient ourselves we would necessarily need some kind of artificial device, then it would work as a constitutive cognitive artifact for spatial orientation. However, the use of an artifact can involve different kinds of relations simultaneously.

> Complementarity, constitution, and substitution are thus recognized as the three possible fundamental relationships between cognitive artifacts and our cognitive processes. Nevertheless, cognitive artifacts often not only interact with one of our cognitive abilities at a time, but may engage our cognitive system in many ways simultaneously (Fasoli, 2017, p. 679).

Consider a recipe which substitutes our brain-based cognitive abilities for memory, but it needs to be read to perform its function. Thus, cognitive artifacts either modify the original cognitive task they support or create a new one. This framework enables us to recognize the variety of ways in which an artifact may contribute to the completion of a cognitive task (X), by framing its functional contribution at different levels of analysis and dividing each task into sub-tasks (y, w, z, etc.). Although cognitive artifacts tend to engage our brain-based cognitive system in multiple ways simultaneously, performing multiple sub-functions contributing to multiple sub-tasks, it is often possible to practically identify their primary feature and function.[10] For example, a GPS navigator may be used as a substitutive cognitive artifact for spatial orientation and as a constitutive cognitive artifact for reading the names of streets (Fasoli, 2017, p. 679), which can be considered as a sub-function of orientation. Thus, any task can be decomposed into sub-tasks at a lower functional level, and each sub-task can be completed by the conjoined artefactual contribution and human cognitive agency. These conjoined interactions can take the three fundamental, shifting, and blurred forms of complementarity, constitution, and substitution. In the following image (Fig. 2) I show how a GPS navigator can simultaneously perform a substitutive and constitutive contribution for the completion of a cognitive task.

This framework may be used to empirically analyze the regularities and dynamics of the cognitive diminishment of a set of cognitive abilities (Barr et al., 2015). One reasonable hypothesis is that cognitive diminishment may be the gradual result of a process in which a tool is irreversibly used, firstly, as a complementary cognitive artifact, then gradually as a substitutive one before finally reaching the point in which the contribution of the tool is necessary for completing the task (constitutive use). The more the computational power and functions of our portable devices increase, the more we may tend to delegate complex and multiple operations to them, and this may lead to the phenomenon of cognitive diminishment (Fasoli, 2016). For these reasons, it is also useful to apply Fasoli's taxonomy of cognitive artifacts to ChatGPT, given that its major threat is to substitute human cognitive abilities for many relevant cognitive tasks at different levels. By slightly modifying Fasoli's definitions (2017, p. 681; 2018), I characterize ChatGPT as an intrinsically multifunctional computational cognitive artifact that can be used to

[10] So, it is a linguistic simplification to say that "an artifact is used in a substitutive, constitutive, and complementary way", given the multiple levels of interaction and the potential division of each task into subtasks. However, in the rest of this treatment, when I say that an artifact is used in one of these three ways without further specification, I will refer to the higher-level task (X) to which it contributes.

GPS's substitutive contribution to the task of 'spatial orientation'	
Maximum delegation of cognitive work to the artifact.	Exercise of minimum degree of brain-based cognitive agency required for reading information for mapping the artifact's indications in the external environment.
GPS's constitutive contribution to the sub-task of 'reading text'	
Necessary artifactual contribution for completing the cognitive task.	Exercise of the brain-based cognitive agency required for completing the cognitive task.

Fig. 2 The GPS' contribution to the task of 'spatial orientation' can be substitutive at the highest level and constitutive at a lower level for a specific sub-task of 'reading text'

contribute to the completion of several cognitive tasks (which can be decomposed into sub-tasks at different levels of analysis), by providing us with textual representations that we can employ to substitute, constitute, or complement our brain-based cognitive processes and abilities, thus modifying the original cognitive task or creating a new one.

I incorporate Pritchard's (2016) notion of 'cognitive abilities' in my characterization since they can be realized by a variety of cognitive processes. Moreover, it is important to stress that the use of the label 'constitutive cognitive artifacts' does not automatically imply cognitive extension. For example, the page you are reading is a constitutive part of the cognitive process of reading, but it is not a 'cognitive' part of that process. I leave open the possibility that technological tools may respect the criteria for cognitive extension, whatever they are. This is why in the characterization of ChatGPT I used the notion of 'brain-based cognitive processes and abilities', which are the ones that engage ChatGPT as an external component. However, it is possible to consider the system *human + tool* as an extended cognitive system. Thus, Fasoli's taxonomy also offers a fine-grained characterization of the different kinds of extended cognitive systems when EXT conditions are respected.

- Constitutive-EXT: an extended cognitive system that performs at least the extended cognitive process X and in which the agent cannot perform and display the brain-based cognitive agency for completing the cognitive process X independently of the artifact's contribution.
- Complementary-EXT: an extended cognitive system that performs at least the extended cognitive process X in such a way that

1) the agent performs a great degree of brain-based cognitive agency for completing the cognitive process X, using the technological resource for performing only a partial component of the cognitive work necessary for X;
2) the agent can perform and display the brain-based cognitive process X independently of the artifact's contribution.

- Substitutive-EXT: an extended cognitive system that performs at least the extended cognitive process X in such a way that

1) the agent performs only a minimal degree of brain-based cognitive agency for performing the cognitive process X, using the technological resource for performing most of the cognitive work necessary for X.
2) the agent can perform and display the brain-based cognitive process X independently of the artifact's contribution.[11]

4.2 Contextual Virtue Epistemology, Cognitive Trade-offs, and Cognitive Artifacts

Although Pritchard's framework offers useful insights, given the limitations expressed in the previous section it is not sufficient for addressing the TET. First, we need a framework applicable to all conditions: those in which EXT criteria are met and those in which are not. Second, we need a framework capable of grasping complex dynamics involved in tool-use. Pritchard (2016, p. 120) distinguishes between 'enhanced extended cognitive systems' in which the technology is incorporated within the cognitive character of students and 'diminished non-extended cognitive systems', when the use of the tool implies an offloading and partial degradation of the cognitive character. However, this distinction is not sufficiently fine-grained to account for the complex, heterogenous, and multilevel ways in which cognitive artifacts are integrated into the cognitive character. For example, it is possible that the use of a device may contribute to the enhancement, and potentially the extension, of cognitive ability X, at the cost of a diminishment of cognitive ability Y and/or intellectual virtue Z. Moreover, it is also possible that a cognitive ability X, such as spatial orientation, may be extended by a device at the cost of a poorer performance of the system, due to malware or a software update that undermines some of its functionalities (Clowes et al., 2023). In principle it is possible that the delegation of specific brain-based cognitive abilities to technological resources, and the subsequent diminishment of the brain-based capacity, may in turn foster the development of other components of the cognitive character, giving rise to what I call 'cognitive trade-offs' or simply 'trade-offs'. By cognitive trade-offs I mean the equilibria and dynamics of enhancement and diminishment of different components of the cognitive character, considering both biological and technological resources within embedded and extended cognitive systems. Therefore, Pritchard's (2014, 2016) simple dichotomic distinctions between non-extended and extended virtue epistemology, as well as embedded-diminished systems and extended-enhanced ones, are not sufficiently fine-grained for grasping the dynamics between technological and biological components involved in complex, contextual, multilevel, and ever shifting forms of cognitive tool-use.

[11] I leave for EXT theorists to define whether and how the latter cases may be genuine instances of EXT. According to Pritchard (2014; 2016) cognitive extension requires a great degree of cognitive agency, so it would be unlikely to admit a substitutive extended cognitive system. See Marconi (2005) for an argument against the possibility of substitutive extended cognitive systems.

Thus, I propose to expand Pritchard's framework, calling it 'contextual virtue epistemology'. My framework can be used also in those TET cases in which EXT does not apply and can grasp the complex dynamics involved in tool use, whether they are of the EMB or EXT variety. It enables us to properly distinguish different kinds of tool-use and eventually different kinds of extended cognitive systems, by specifying the dynamics and contributions of brain-based and tool-based resources. For those TET cases in which EXT criteria does not apply and therefore the preservation of the cognitive character of students is challenged, contextual virtue epistemology enables us to distinguish at least three interrelated issues: 1) what is the brain-based cognitive ability that the technology may substitute and ultimately diminish, 2) whether this substitution is desirable or not depending on the context, and 3) how the epistemically virtuous use of a substitutive, constitutive, or complementary cognitive artifact may imply a development of some brain-based cognitive abilities and intellectual virtues that outweighs the offloading of other brain-based cognitive abilities. These questions are the ones that we must face before introducing generative AI systems in education, acknowledging that they might not always extend students' cognitive character and potentially diminishing part of it. While for those cases in which EXT conditions are met, enabling us to posit extended cognitive systems, my framework distinguishes the different forms of interdependence, dynamics, and trade-offs between brain-based and technological cognitive resources.

Thus, contextual virtue epistemology does not necessarily ban the use of cognitively diminishing technologies, as non-extended virtue epistemology would suggest to preserve the brain-based cognitive character (Pritchard, 2016, p. 120). Nor does it simply posit extended cognitive systems to solve the TET. Rather, it first offers an analytical and descriptive tool for grasping the potential dynamics and trade-offs involved in tool-use. Second, it invites us to contextually evaluate and weigh case-by-case the benefits and risks involved in cognitive trade-offs. Third, it suggests that educators ought to distribute different forms of tool-use within the overall educational curriculum to develop the cognitive character of students according to these evaluations.

For what concerns the first point, I rely on Fasoli's revised taxonomy of cognitive artifacts presented in the previous section. When it comes to the contextual evaluation of cognitive trade-offs, I cannot offer here a comprehensive normative evaluation of the different components of the cognitive character, since it is context-dependent and it must be addressed in a multidisciplinary way, involving psychologists, pedagogists and philosophers. However, we can preliminarily rely on Pritchard's considerations regarding the differential importance of the components of the cognitive character.

> The point is that when virtue epistemologists urge the developing of the subject's cognitive character, they do not have in mind that all aspects of that cognitive character should be equally worthy of development (Pritchard, 2016, p.124).

As we have seen in the first section, Pritchard, along with other virtue responsibilists, consider intellectual virtues the most important cognitive character traits.

Given that cognitive artefacts engage with different cognitive processes simultaneously, rather than discretely (Fasoli, 2016, 2017, 2018), the reliance on technology X may undermine the development of some specific brain-based cognitive abilities A and B, while boosting other parts of the brain-based cognitive character, such as the cognitive ability C and the intellectual virtue Z. Or alternatively, a technology X may extend the cognitive ability C, preventing the development of the intellectual virtue Y. How should we address and evaluate these cases? These possibilities reveal that Pritchard's solution of using EXT is not sufficient for addressing and solving all TET cases. Rather, we need to engage in a complex and contextual evaluation of the dynamics involved in complex cognitive trade-offs.

An educator committed to 'contextual virtue epistemology' in one case may want to push and develop pupils' naked-brain capacities for making simple arithmetic calculations, banning the use of digital calculators in early stages of development. In another setting, she may accept that the use of digital calculators may undermine, in the long run, the students' brain-based cognitive abilities for mental computations, given that it is not a socially relevant skill, at least relative to our technological environment. In the second case, the educator might appreciate the epistemic humility and metacognitive capacities of students who understand that it is epistemically preferable to use a digital calculator to complete a complex computation during a physics exam, rather than relying on their 'naked brains' (Cassinadri & Fasoli, 2023). This type of epistemically virtuous tool-use of the calculator may be considered either as an instance of embedded or extended cognition, depending on the criteria for the latter. However, what is relevant is the dynamics and degrees of cognitive agency performed by the students in combining their brain-based and technological resources for reaching understanding (Pritchard, 2013).

Moreover, while EXT conditions may apply, we should also evaluate the overall effects on the (extended) cognitive character of students, and the potential trade-offs involved between its biological and technological components. Distinguishing between constitutive, complementary, and substitutive extended cognitive systems may be relevant in some educational circumstances, such as early stages of cognitive development, in which educators aim to develop and preserve intrinsically worthy brain-based cognitive character traits. However, this cautious approach that considers important the development of a brain-based cognitive character traits does not necessarily imply that the "educational development of a subject's on-board unaided cognitive traits should take precedence over the use of technology, particularly where the use of technology might lessen the development of those cognitive traits" (Pritchard, 2016, p. 120). Non-extended virtue epistemology, as presented by Pritchard (2016, p. 120), would imply that students are not trained to use those tools since they may substitute some of their brain-based cognitive abilities, as happened with the ban of ChatGPT in some school districts (Shen-Berro, 2023).

Instead, contextual virtue epistemology enables us to face the TET brought about by ChatGPT even though it may extend students' cognition only in some specific cases. Simply banning it from schools as non-extended virtue epistemology would suggest (Pritchard, 2016, p. 120), or simply identifying the conditions of cognitive extensions met by this tool, do not seem satisfactory solutions. The first option is inadequate because we should train students to face real-world circumstances that involve the use of generative AI systems in epistemically virtuous ways. On the other hand, specific uses of ChatGPT may respect EXT conditions for a specific set of cognitive abilities preventing the development of intellectual virtues. Thus, educators need to evaluate, experiment, and distribute different educational strategies and activities capable of incorporating the use of ChatGPT and other generative AI systems within the educational curriculum in ways that pursue the fundamental aims of education. For example, educators may want to develop the students' metacognitive knowledge, intellectual virtues, and critical thinking skills, by asking students to write and analyze a text using ChatGPT. The chatbot may be used as a *substitutive* cognitive artifact for performing the sub-cognitive task of inventing a story and as a *complementary* cognitive artifact for exercising higher-level cognitive abilities and intellectual virtues. ChatGPT may be used as a constitutive cognitive artifact in learning phases, acting as a temporary scaffolding by gradually shifting its role from a constitutive to a complementary one. This means that students should still be able to invent a story or create an argument without any technological support; just as a pilot should still be able to fly a plane without technological assistance (Bliszczyk, 2023).

Two studies revealed that some airplane pilots who spent most of their flying careers operating highly automated airplanes performed poorly in their unaided manual flying skills (Casner et al., 2014; Ebbatson et al., 2010). This example highlights that we normatively prefer that airline pilots know how to fly manually in case of a bug in the autopilot system, and thus we negatively evaluate their brain-based cognitive deskilling. For at least three reasons, the same goes for other brain-based cognitive abilities that may be still important to develop independently of their potential for at least three reasons. First, there might be cases of technological failure or hacking. Second, cognitive extensions may not be neutral with respect to the development of the overall cognitive character, potentially giving rise to different kinds of cognitive trade-offs. Three, technological hybridization and extension may produce cognitive, affective, motivational, and existential effects on the extended human being, some of which may be detrimental.[12] Thus, even if EXT conditions apply to specific forms of tool-use, it is important to distinguish the different types of cognitive extension, since educators may evaluate differently these types of cognitive extension during different periods of cognitive development and may structure the educational curriculum accordingly.

The organism-bound skills that we normatively evaluate as worth-preserving are context-dependent since our evaluations culturally evolve according to the techno-social environment (Pritchard, 2014, p. 2). This point has profound implications

[12] Cognitive extension does not solve per se complex moral problems inherent to human-AI interaction such as manipulation, given that there might be AI systems that extend cognition but undermine the agent's self and autonomy (Cassinadri 2022; Clowes 2020; Clowes et al., 2023; Hernández-Orallo and Vold 2019). While I have no space to develop this pressing issue here, it is worth mentioning within educational research since we should not treat students simply as epistemic cognitive agents, but rather as whole human beings.

on how educators normatively evaluate the cognitive trade-offs according to the socio-economic context and the supposed intrinsic value of some components of the cognitive character (Baehr, 2016; Pritchard, 2014; Roberts & Wood, 2007). This context-dependency, and the potential substitutive role of AI systems, make us question what the relation between education and the socio-economic system should be. As presented in Sect. 1.1, virtue responsibilism considers the development of the subjects' cognitive character as an intrinsic good for the contribution it plays to human flourishing, which is valuable for its own sake (Baehr, 2016; Pritchard, 2014; Roberts & Wood, 2007). Thus, it is a political and ethical matter to first establish what brain-based cognitive character traits are worth preserving and cultivating[13] independently of their potential delegation to or extension via AI systems, within our socio-economic system. Then, we must evaluate whether and how these fundamental components of the cognitive character may be technologically extended, as well as the implications of their extension on the overall cognitive, affective, motivational, and existential profile of the extended human being. Finally, educators should experiment ways for developing them either in an extended or non-extended way, training students to use technological resources in epistemically virtuous ways. Thus, in the next section I will offer some practical examples of epistemically virtuous uses of ChatGPT in educational practices.

5 Contextual Virtue Epistemology in Action

5.1 Epistemically Virtuous uses of ChatGPT in Educational Settings

Contextual virtue epistemology is aligned with the theoretical and practical proposals of several scholars and experts in education, reinterpreting them within the theoretical framework of virtue epistemology, using Fasoli's taxonomy of cognitive artifacts. So, in this section I sketch and mention some practical applications of contextual virtue epistemology in planning educational activities for developing the cognitive character of students. Pritchard (2013) argues that educational practices may begin by imparting truths and factual knowledge (know-that) before moving to the development of pupils' cognitive abilities (know-how), understanding, metacognitive knowledge, and intellectual virtues. This shift should be based on gradually training students to exert an increasing degree of cognitive agency over solving epistemic and cognitive tasks, sometimes exposing them to increasingly unfriendly epistemic environments. It is necessary to gradually exercise intellectual virtues such as intellectual autonomy, intellectual humility, attentiveness, intellectual carefulness, intellectual thoroughness, and open-mindedness to appropriately navigate, evaluate, interpret, use, and integrate environmental information with our set of beliefs and background knowledge.

Santiago Arango-Muñoz (2013, p. 147) defines some criteria for trusting external information that must be learned by students in order to be capable of using such

[13] See Robert and Wood, (2007) for an account of the fundamental elements of the cognitive character that contribute to human flourishing.

information in a virtuous way. The criteria are coherence (namely the accordance of that information with a set of beliefs), consensus (the fact that other people endorse them), intelligibility (the fact that they are easily understandable), and relevance (which increases the likelihood of attaining epistemic goals). Heersmink and Knight (2018, p. 9) stress the importance of the reputation of the source, which is learned through experience and enculturation. Heersmink (2018), and Heersmink and Knight (2018) applied the framework of virtue epistemology to internet search, but this has not yet been done for the use of chatbots in education. Cognitive artifacts such as ChatGPT can be placed on a continuum with other technological resources that are allowed in educational and examination activities, such as open-book exams (Knight, 2014), as well as internet-allowed exams (Cunnane, 2011).

The 'zero trust framework' is an interesting experimental proposal in line with Pritchard's idea of gradual exposition to epistemically unfriendly environments. This framework proposes to use specific generative AI systems designed for educational purposes that expose students to false and misleading information that they must recognize and criticize to complete specifically designed tests (Dan et al., 2023; Gravel et al., 2023; Stratachery, 2022). In these activities the artefact partially substitutes students' recall of a specific concept, engaging them in utilizing their metacognitive knowledge in evaluating and comparing the information they recall from their biological memory and the information that the tool is offering.[14] The evaluation and integration of this information may be based on Arango-Muñoz's (2013) criteria of coherence, consensus, intelligibility, and relevance. In this kind of activity, the artifact offers a complementary contribution to the exercise of the epistemic virtue of intellectual autonomy; namely, the willingness and ability to think for oneself (Baehr, 2011; Heersmink, 2018). This ability consists in a virtuous equilibrium between skepticism and the acknowledgement of one's epistemic limits (intellectual humility) and the subsequent willingness to change one's mind (open-mindedness) if the external information is recognized as sufficiently coherent, intelligible, and relevant. Thus, the zero-trust framework also fosters the development of intellectual carefulness; namely, the capacity to not acquire false beliefs, intellectual thoroughness, and the disposition towards a deeper understanding of concepts.

As long as the goal of specific educational practices is merely the acquisition of a set of true beliefs in a memory store, then artifacts can easily substitute this kind of cognitive ability (Sparrow et al., 2011). Instead, the guiding principle for the implementation of ChatGPT and similar AI systems within educational practices should be the gradual shift suggested by Pritchard (2013), from the mere acquisition of factual knowledge to development of know-how, understanding, metacognition, and intellectual virtues. Since ChatGPT can write text and can be used as a substitutive cognitive artifact for different tasks, many teachers around the world argue that we need to rethink writing assignments

[14] If we consider the task as 'not being deceived by the AI tool,' then such a tool performs a constitutive contribution to the task. However, since we are interested in developing students' abilities in different contexts, it is more useful to consider the task in more general terms such that the tool simply performs a complementary contribution.

and their evaluation criteria in a complex, interactive, holistic, and processual way (Gimpel et al., 2023; McCormack, 2023). The general challenges consist in 1) creating assignments in which these kinds of cognitive artifacts are used in a constitutive and complementary fashion, rather than simply preventing their substitutive use, and 2) in educating students to understand under which conditions it is epistemically preferable to use an external device in a substitutive way to complete a task.

Considering the first point, it is important to specify that unless we define the task in terms of the specific use of the artifacts themselves, these kinds of AI tools offer merely a complementary contribution to many tasks, which can also be completed without their specific support. By allowing students to use a variety of AI and internet-based tools, the evaluation should focus on the degree of cognitive agency required for the epistemically virtuous navigation, selection, elaboration, use, and integration of the technologically acquired information with their background knowledge. Given that for chatbots it is very easy to produce many examples, and since they still make a lot of mistakes, both factual and logical (Sok & Heng, 2023), a fruitful way for implementing ChatGPT's complementary contribution to various tasks consists in asking students to compare and evaluate its outputs and justifying their evaluation criteria (Ferlazzo, 2023a; Miller, 2022). For example, students may analyze and evaluate ChatGPT's capacity to apply a concept in different contexts by asking the chatbot to produce several examples. This kind of activity tests and reinforces students' understanding and use of concepts that they already master by pushing them "to name and explain inaccuracies, gaps, and missing aspects of a topic" (Mollick & Mollick, 2022, p. 3). Moreover, students may rank the AI outputs, from the most correct, coherent, and relevant to the least, and justify their evaluation criteria (Mollick & Mollick, 2022; p. 3). In addition, they may improve the ChatGPT's output by adding relevant information, clarifying points, correcting mistakes, and providing evidence for what has been claimed by the bot (Mollick & Mollick, 2022, p. 6). These kinds of assignments contribute to the development of students' intellectual autonomy, intellectual carefulness, intellectual thoroughness, and attentiveness (Baehr, 2011) since the development of such virtues depends on their exercise. The following table (Fig. 3) illustrates ChatGPT's simultaneous complementary and substitutive contributions for the completion of a cognitive task and sub-task.

The second challenge consists in educating students to understand under which conditions it is epistemically preferable to use an external device in a substitutive way to complete a task. Given the pace of technological development, future LLMs and generative AI systems may not be prone to mistakes (Wei et al., 2022). In that case, it may still make sense to create comparison exercises in which students are asked to compare 'perfect' artificial outputs with 'imperfect' ones and to analyze their differences. Moreover, we should educate students to autonomously evaluate under which conditions it is epistemically preferable to use a device in a substitutive way, by exercising both their metacognition and intellectual humility. In both cases, students should provide a report with an explanation and justification of the choices and strategies they performed during the task in

<table>
<tr><th colspan="2">Artefactual complementary contribution to the task:
‘understanding concept A’</th></tr>
<tr><td>The artefact contributes to the task by providing different examples in which concept A is applied.</td><td>The human agent exercises a high degree of brain-based cognitive agency involved in understanding: cognitive faculties (perception, working memory…), cognitive abilities and intellectual virtues (intellectual autonomy, intellectual carefulness, attentiveness…).</td></tr>
<tr><th colspan="2">Artefactual substitutive contribution to the sub-task:
'generation of examples in which concept A is applied'</th></tr>
<tr><td>Maximum delegation of cognitive work to the artifact.</td><td>Minimal exercise of brain-based cognitive agency in generating the prompt.</td></tr>
</table>

Fig. 3 ChatGPT used as a complementary cognitive artifact for exercising the understanding of a concept, according to Mollick and Mollick’s (2022) example

using the tool. This would guarantee that even if students will offload to chatbots part of their work, they will nevertheless be forced to exert a significant degree of brain-based cognitive agency.

Josh Thompson, who works on this problem for the National Council of Teachers of English, argues that in writing assignments we should shift the focus from the writing product to the writing process (Kelley, 2023). The holistic evaluation of the process instead of the product is not a novelty in educational practices since it is ordinarily done in artistic schools where students are asked to present their ‘process diaries’ as well as in ‘inquiry learning processes’ (Ferlazzo, 2023a). Complex and interactive assignments in which ChatGPT is used as a ‘constitutive’ cognitive artifact require the single student to virtuously formulate relevant inputs (prompts) and then critically examine, evaluate, edit, and use the chatbot’s outputs, thus exercising a significant degree of cognitive agency.[15] The generation of appropriate inputs requires the exercise of a reverse-engineering capacity for predicting how the model will produce coherent and relevant outputs according to the input provided, while the evaluation and integration of outputs are forms of critical assembling and editing, which are not mere mechanical activities but rather creative processes (Dragga & Gong, 1989; Fyfe, 2022). We need empirical analyses that show that this kind of exercises may prove to be useful for the development of capacities that contribute to human flourishing, such as critical thinking skills, as well as the motivational and affective character of students’ intellectual virtues. Even if AI systems do outperform humans in solving many relevant tasks,

[15] In this case, the artefactual contribution is constitutive since the task consists in an epistemically virtuous use of the artifact itself.

educators should still try to instill in students a form of self-care toward the development of their cognitive character.

Considering the relevance of real-world educational activities, Shapiro and Stoltz, (2019) suggest that educational practices should involve a variety of activities in which physical and manipulative experience can enhance and positively influence students' learning of concepts (Glenberg, 2008, 2010; Konya et al., 2015). They argued so by considering experimental evidence on embodied cognition, which is concerned with the interaction of brain, body, and world, revealing the sensory motor grounding of knowledge (Barsalou, 1999, 2008; 2016; Lakoff & Johnson, 1999). This approach should be complemented with an even more encompassing framework of tool-use, which should include both representational (Fasoli, 2017; Heersmink, 2013) and non-representational artefacts (Malafouris, 2013).[16] Thus, educational practices and evaluations should combine different moments, activities, and technologies, complementing on-field research and experiences with in-class communication, presentation activities, oral discussions, and critical thinking sessions and dialogues (Lipman, 1998). We can also imagine and plan scenarios in which the chatbot also takes part in a debate, collective activity or Socratic dialogue (Dan et al., 2023). Technologically supported activities performed individually by students in writing tasks can also be employed and translated into a group dimension, where students are asked to coordinate their abilities in a collective cognitive ecology, thus developing cognitive, social, and argumentative abilities. Collective practices within complex cognitive ecologies imply a commitment toward 'epistemic social anti-individualism' (Pritchard, 2016). Further research is needed to analyze educational group dynamics in which AI tools and LLMs contribute to knowledge and metaknowledge-forming processes by combining the frameworks of distributed cognition (Hutchins, 1995; Palermos, 2016; Theiner et al., 2010) and social epistemology (Palermos, 2022a, b).

In conclusion, to address the TET and to pursue the fundamental aims of education we should embrace a variety of theoretical frameworks within the 4E cognition debate (Newen et al., 2018) and the overarching framework of cognitive ecology (Hutchins, 2010). Within a cognitive ecology encompassing human agents, artifacts, and cultural scaffoldings, there are heterogenous systems interacting on different levels in interdependent ways. Thus, we should not reduce the system to a single level of analysis, neither should we create rigid ontological and explanatory boundaries to restrict the explanations of complex phenomena since "every theory implies a set of ontological commitments and every ontological commitment emphasizes some kinds of connections over others" (Hutchins, 2010, p. 706). Thus, I proposed a flexible framework, which is compatible with both EMB and EXT for addressing various, complex, and context dependent agent-artifact dynamics of agent-artifact integration. This paper suggests that it is not sufficient to consider only one 'E' (extended) for addressing the TET and the educational challenges of the information society. Rather, it might be useful to combine the insights offered by different theoretical frameworks, coming from

[16] The framework I presented here is limited to representational cognitive artifacts.

the philosophy of technology and the philosophy of cognitive sciences (Fasoli, 2016, 2017), pedagogy, psychology (Ryan and Deci, 2000), and the psychology of education.

6 Conclusion

In this article I presented the aims of education according to virtue responsibilism, which consist in the development of the cognitive character of students via engagement in real-world scenarios in epistemically virtuous ways. Considering that our environment is full of technological resources for completing cognitive tasks, an overreliance on such technologies may prevent the development of some parts of the cognitive character of students. I argued that Pritchard's (2013, 2014, 2016) framework of extended virtue epistemology offers only a partial and limited solution to this technology-education tension (TET). Thus, I proposed to expand it using Fasoli's (2017) taxonomy of cognitive artifacts, realizing a contextual virtue epistemology. This expanded framework enables us to address TET cases either if the tool extends the agent's cognition or not. Fasoli's framework offers a new and fine-grained taxonomy of embedded and extended cognitive systems, which may be constitutive, complementary, or substitutive. Thus, I applied this framework to ChatGPT, characterized as a cognitive artifact that can be used to substitute, complement, or constitute the students' cognitive abilities in an embedded or extended way and that can elicit the exercise of relevant intellectual virtues (Baehr, 2011). Contextual virtue epistemology allowed me to analyze and present from a cognitive and epistemological perspective some of the educational practices involving ChatGPT proposed by teachers, educators, and scholars.

Abbreviations EMB: Theory of embedded cognition.; EXT: Theory of extended cognition.; TET: Technology-Education Tension; LLM: Large Language Model

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