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Dmytro Mykhailov
https://orcid.org/0000-0001-8645-2742

PHILOSOPHICAL DIMENSION OF TODAY'S EDUCATIONAL TECHNOLOGIES: FRAMING ETHICAL LANDSCAPE OF THE SMART EDUCATION DOMAIN

Although smart education is one of the most rapidly expanding technological practices nowadays, we still don't know much about the consequences that new educational technologies might have on the future generation of learners. While smart education is often used as an 'umbrella term' which covers a wide variety of different trends and approaches in today's education, it seems useful to narrow the definition of this term before going deeper into the ethical analysis of smart education more in general. Considering this fact, the present paper claims that the smart education domain consists of three main components, namely, smart pedagogy, smart learning, and smart educational technologies. Keeping this in mind in what follows I propose a description of the ethical problems from every component. In the case of smart pedagogy, I emphasize the issue of new responsibilities and new competencies that come with novel digital technologies. In the case of smart learning, I am showing how big data and AI solutions might raise significant privacy issues. Finally, in relation to smart educational technologies, I focus on AI adaptive educational systems which might provide highly personalized educational solutions. Although AI adaptive educational systems can strongly improve the efficiency and interactivity of the learning experience this technological system might also lead to unpredicted consequences related to students' attention and other cognitive and metacognitive abilities. The present paper also stands in a deep relation to current discussion in contemporary philosophy of technology by questioning the ethical nature of the current digital artifacts. According to many contemporary philosophies of technology digital artifacts such as computer, AI systems and smartphones are not morally neutral. On the contrary, these digital technologies are actively changing our moral behavior, transform our responsibilities and ethical navigation more in general. As I am going to show in the present paper, digital technologies from the domain of smart education are not an exclusion.

Key words: Smart education, educational technologies, Smart pedagogy, Big Data, AI in education.

Introduction

The students in the twenty-first century are different from the students of the past. According to Oblinger and Oblinger (2005), the new generation of students is usually called 'Millennials' (also known as Generation Y, or Gen Y). One of the essential features that separate millennials from the prior generation (Gen X) is that millennials were born (and grew up) in a digital environment. This fact, together with several societal transformations also caused by digital technologies, has shaped the way how millennials study, consume information, memorizes data, etc (Jubien, 2014). For example, in contrast to a previous generation of learners millennials are multitasking which means that they would prefer to work with many tasks at the same time rather than focus on one task only. The other important difference is that millennials highly value immediacy. This means that they prefer fast responses, appreciate connectivity, and usually stay online (Demir, 2021). All this taken together clearly indicates that traditional education methodologies must be revisited while old learning models have to be replaced by new learning approaches. These new learning tendencies have been titled "Smart-education" (Zhu et al., 2016).

Within the last several decades Smart education becomes a worldwide trend in many countries (Hua, 2012; Kim et al., 2013). For example, in New York, Smart education program stresses the impact of technology in the classroom (New York Smart Schools Commission Report, 2014)[1]. This smart education program aims on enriching students' learning experience and prepare them for the 21st century economy. The latter emphasizes such characteristics as teamwork, attention to various cogni-

[1] New York Smart Schools Commission Report, 2014. https://www.ny.gov/sites/default/files/atoms/files/SmartSchoolsReport.pdf Accessed: 11 August, 2022.

tive and meta-cognitive skills, creativity, etc. The New York government proposed the following strategic priorities: focusing on the 21st century skills, applying innovative educational technologies, creating links between inside and outside learning activities, and extending the scope of online learning. Another example is the Australian government which in collaboration with IBM[2] has designed a multi-disciplinary and student-centric education system. This system connects tertiary institutions, schools and workforce training. The core strategies for implementation of this system are the following: collaborative technologies for working in groups; high quality digital learning resources for both students and teachers; computerized administration; adaptive learning programs.

A special role in today's Smart education projects is occupied by the EU "Digital education Action Plan" (DEAP)[3]. The Digital Education Action Plan (2021–2027) is a renewed European Union policy initiative to support the sustainable and effective adaptation of the education and training systems of EU Member States to the digital age. The DEAP is a six-year plan that aims to evaluate and develop proper ethical, technical and societal solutions for problems that are related to the implementation of new technologies into educational domain.

The worldwide popularity of the Smart-education solutions comes along with many ethical problems which Smart-education might bring forth. For example, it is intuitively clear that current learning environments have to be redesigned based on the strengths and weaknesses of new students (Bajaj & Sharma, 2018). However, it is still unclear how this 'technological redesign' can be accomplished in a responsible way (Chaudhri et al., 2013). Moreover, there are still a lot of ethical issues that might 'pop up' during the implementation of new educational technologies into the contemporary school system. A lot of these issues are interdisciplinary and touch upon the problems from such domains as educational ethics, engineering design, cognitive sciences. These issues relate to questions like: new types of professional responsibilities among teachers, school administrative staff and students' parents; the influence of new technologies on the cognitive and meta-cognitive capabilities of students, transformation of teacher ethical obligations due to rapid technological innovations, etc (Hoel & Mason, 2018). In morally complex environments of today's schools and universities most teachers face difficulties in ethical decision-making[4]. These difficulties have to be resolved if we want to create a proper approach for integration of digital technologies into the domain of smart education.

Except for the problems mentioned above there are also several philosophical topics that are closely related to the implementation of AI into the smart educational environment. For example, the moral nature of contemporary digital technologies, which stands in the very center of contemporary postphenomenology might illustrate the philosophical dimension of the present topic. According to Peter-Paul Verbeek, technologies are not just passive objects that surrounds us, but an active mediator which change our relation to the world we are living in. Consider medical technologies, "[b]y making it possible to detect specific diseases, medical diagnostic devices do not simply produce images of the body but also generate complicated responsibilities, especially in the case of antenatal diagnostics and in situations of unbearable and endless suffering" (Verbeek, 2011, p. 1). In this sense technologies that we are using not just passively obey our will but also shape our morality, responsibilities and ethical orientation.

That is why, the present article aims to frame the moral[5] landscape of contemporary smart education. As the purpose of the current paper is descriptive in nature, I am not going to provide solutions to the complex problems mentioned below. However, the descriptive task is of vital importance for contemporary interdisciplinary research in philosophy. Given that Smart education embraces problems from various domains like psychology, design, philosophy, etc., providing a landscape might be a good methodological 'starting point'. In the present paper, the moral landscape will be framed in accordance with the framework proposed by Zhu et al. (2016) (see figure 1) where Smart education is defined by means of three main components: smart pedagogy, smart learning, and smart learning environments (e.g., innovative educational technologies).

In what follows I will take one moral issue from each domain. In the case of the educator, I will focus on some approaches from the smart pedagogy and possible ethical issues that might arise within their

[2] IBM Education, 2012. https://www.ibm.com/industries/education Accessed: 11 August, 2022.

[3] https://education.ec.europa.eu/focus-topics/digital-education/about/digital-education-action-plan Accessed: 11 August, 2022.

[4] Except for the issues mentioned above it is important to point out issues that are more closely related to various discussions from the field of today's philosophy of technology. Among such issues it is worth pointing out the problems of technological intentionality of various digital environments (Mykhailov & Liberati, 2022), mediating role of contemporary technologies (Liberati, 2020; Mykhailov, 2020; Wellner, 2020), ethical problems of responsible design and innovations (Bosschaert & Blok, 2022), etc.

[5] In the present paper I am using words 'moral' and 'ethical' as synonyms. The etymological and conceptual difference between these two notions goes out of the scope for me paper.

implementation. In the case of learner, I will analyze the problem of privacy which becomes critical with the novel implementation of the Big Data solutions to Smart education. Finally, in the case of innovative educational technologies, I will focus on AI adaptive educational tool, which increases in popularity within the last years. AI adaptive educational technology is a new technological solution for personalized learning. This technology aims in providing highly personalized set of suggestions from a specific knowledge domain (e.g., mathematics, history, etc.). In order to do so, the AI system uses sophisticated machine learning algorithms which help the system to adapt to a specific learning style and permanently improve itself. I will come back to this in the last part of the paper. Now, if we want better understand the ethical landscape of smart education, we should say several words about what Smart education is.

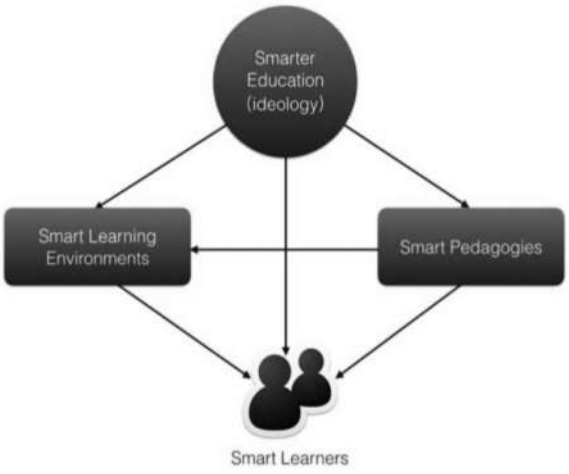

Fig. 1. Research framework of smart education

Source (Zhu et al., 2016)

1. What is Smart education and smart learning environments?

Demir et al., define smart education as an "effective and coherent use of information and communication technologies to reach a learning outcome using a suitable pedagogical approach" (2021, p. 3). Another research provided by Jang defines smart education as "an educational system that allows students to learn by using up-to-date technology and it enables students to study with various materials based on their aptitudes and intellectual levels" (Jang, 2014). In this sense, smart education not only pays significant attention to stimulating thinking and student's creativity but also emphasizes the differences between students and their learning styles. Said different, Smart education is about personalization.

The trend toward personalization comes with the trend toward 'interdisciplinarity' in contemporary science (Shemshack & Spector, 2020). Findings from various fields such as neurophysiology, educational psychology, the science of learning and philosophy give us new insights into how students learn, consume and memorize information, transform data into knowledge, etc. However, arguably one of the most important findings brought into play within the last decade was an idea that there is no one and only learning style. In other words, individuals usually learn in different ways. For example, up to now there are at least four different learning models. Some of them suggest that students differ in accordance with the dominant sense such as visuals, audials, etc (Bajaj & Sharma, 2018). Although there are different learning models there is one a simple insight underneath all of them. This insight is that if one wants to make an educational process more efficient than one has to take into consideration the difference between individual learning styles.

An important part of tasks related to personalization is played by various novel technologies. There is no place to analyze all of them that is why I will refer to a more generalized model that summarizes all smart education technology in one framework. According to Demir (2021) technologies in smart education could be generally divided into three groups, namely: essential/transforming technologies, enriching technologies, supportive technologies (see figure 2).

Essential technologies are technologies that "strongly transform traditional education into smart education combined with new or improved teaching methods. These technologies are learning management systems, smart/ambient intelligent classrooms, and virtual classrooms" (Demir, 2021, p. 10). These technologies are required for the realization of smart classrooms. They form the necessary infrastructure for the inclusion of enriching and supporting information technologies.

Enriching technologies are technologies that make the learning experience fuller. Incorporating some of these technologies into educational environment increases both the learning and teaching experiences (Demir, 2021, p. 10). However, these technologies do not radically transform the learning environment. Among the most frequently used enriching technologies in Smart education, it is worth mentioning such technologies as extended and augmented reality, open and private educational resources. Finally, the last set of educational technologies is supportive. These technologies facilitate the learners and teachers in making the educational process better.

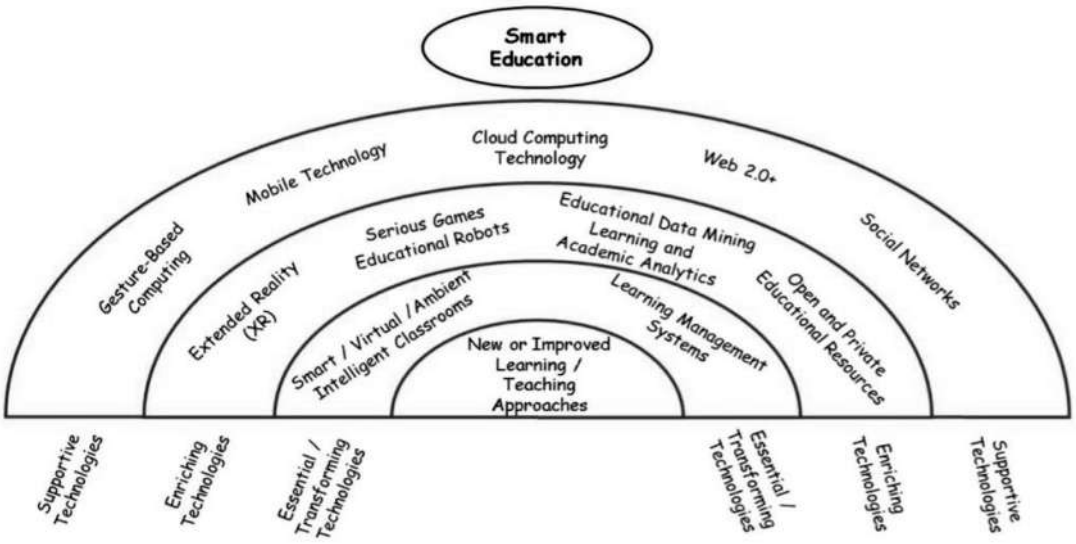

Fig. 2. Smart education framework technologies

Source (Demir, 2021)

Together all these technologies create a smart learning environment. According to Zhu, "[s]mart learning environment not only enables learners to access ubiquitous resources and interact with learning systems anytime and anywhere, but also provides the necessary learning guidance, suggestions or supportive tools to them in the right form, at the right time and in the right place" (Zhu et al., 2016, p. 4). In this sense, one of the main purposes of today's smart learning environments is to create a space where learning will be effective, flexible and efficient. These features might increase students' motivation, help in collaboration with others and might also have positive consequences on student's reflexivity.

Except for this, smart learning environments possess a significant interest for contemporary debates inside various schools from the field of contemporary philosophy of technology. For example, for the postphenomenological school of thought digital technologies are able to transform the relations between students and teachers inside the learning environments. By creating new learning possibilities – for instance, personalized learning with adaptive AI systems - digital technologies transform relations between students and their educational environment. This transformation might create new ways of knowledge consumption and new learning approaches more in general.

Ethical risk zone #1 – new pedagogy

New technologies in education lead to new learning approaches and new competencies that teachers should be ready for (Roehl, 2012). In this sense, new technologies bring new challenges that might appear within the educational process. Moreover, these challenges might also have a significant impact on teacher's intrinsic and extrinsic educational practices (Francom, 2020). Extrinsic practices embrace subject curriculum and assessment, access to resources, and usage of digital technologies (Orlando, 2013) while intrinsic factors embrace teachers' attitudes and beliefs, knowledge and skill, established routines, and vision.

Extrinsic practices can be challenged by new social media and by the rapidly changing information landscape. Moreover, the increasing number of online media platforms and other sources of information create an 'informational overload'. All this together requires that teachers should possess new responsibilities that were not required before. For example, today's smart learning environments require that teachers should be not only confident but also critical and knowledgeable while using digital technologies (Blundell et al., 2020). Said differently, digital literacy becomes one of the main priorities nowadays. For instance, teachers should be good at identifying facts from fake information, should manage 'information overload' and help students to overcome various digital difficulties ranging from a simple searching task to more complicated like data collection or working with special software (like programming tools or visual designers).

However, teachers' knowledge should include not only technological competency. What is also important in this regard is the teacher's ability to understand how to integrate content together with

the pedagogy *into* the technology (Orlando, 2013). The need to integrate pedagogy into technology seems one of the most difficult and pressing nowadays. One of the main issues here is that developing requisite knowledge can be difficult and time-consuming by permanently changing nature of digital technologies. The level of teachers' knowledge about the innovative digital technologies has a strong impact on the educational process inside the classroom (Prestridge, 2012).

2. Ethical Risk Zone #2 – Privacy issues

Today's educational digital technologies can track students' activity by using a wide range of various algorithmic tools. For example, when students complete a particular task, visit a web page or leave a comment on a forum post, a digital system is able to track and analyze this data. Such data may consist of different parameters such as how fast did the student respond to the question, did s/he know the answer in advance or guessed, how much time did it take for him/her to carry out the various stages of the task, etc. If the system can track the time that the student spends on the specific task then the system can also find out specific weak and strong features of the particular student. Depending on this in the future, the system will be able to provide the student with personalized suggestions supporting the learner in overcoming his/her limitations (Benhamdi et al., 2017). According to Hakimi et al., "such data are particularly valuable in collecting real-time longitudinal data about learning processes that tend to be difficult to capture in other forms of education research. It enables the opportunities to link multiple forms of data together to understand learning and education, and lends itself to more computational approaches to analyses" (Hakimi et al., 2021, p. 4).

Exactly because of this reason, there is increasing attention to the ethical issues related to data usage for learning and education (Baig et al., 2020; Pardos, 2017). Such ethical issues mainly include privacy and data protection. What makes the problem even more complicated is that the ethical challenges mentioned above must be addressed across the complex architecture of the educational landscape which includes such actors as politicians, administrators, school staff, commercial software providers and other social forces who are responsible for technical data from the software and databases. All this taken together leads to questions about governance, legal regulation, and various responsibilities which are shared among different actors when it comes to ethical practice.

The other ethical problem which is related to data privacy in education is that today's so-called 'Internet empires' – big-tech companies like Apple, Amazon or Google – control how knowledge is accessed, consumed and generated (Williamson, 2020). This fact has long-term ethical consequences. One of the major problems in this regard is that the algorithmic practices of big-tech companies are not the same transparent as those by public institutions. This immediately raises the questions of public trust and many other questions surrounded public ways of using data. Digital data are never neutral and never one hundred percent objective. On the contrary, digital data is rather the products of humans' technological practices that are embedded within wider cultural, social and economic contexts (Cheney-Lippold, 2011). The usage and analysis of this data aren't neutral either. Private information about the users can be used in very different ways. Some of them are very dangerous and unethical.

3. Ethical Risk zone #3 – AI in education

Today's AI applications in smart education can accomplish a wide scope of educational tasks. These tasks are ranging from checking students' homework to grading students' exams (Woolf et al., 2013). Moreover, such AI applications as AI adaptive educational systems can define students' learning types and depend on this prepare a personalized set of learning suggestions. As I have already touched upon above, personalization is a very important part of today's educational environment (Bajaj & Sharma, 2018). Personalization is changing human-computer interaction in a way that machines can adapt to every user and transform behavior depending on each student's needs[6]. This might have a positive effect on the efficiency and interactivity of the learning process. However, there are several ethical issues that should be critically assessed within the implementation of the AI adaptive educational system in the educational domain.

It is needless to say that in the fast-approaching future students will spend more time interacting with computers and other digital technologies. This digital interaction differs from face-to-face communication and can have several ethical drawbacks that are hard to predict now. For example, spending less time in the 'live' conversation with classmates may impact such skills as emotional recognition, work-

[6] Personalization with AI solutions isn't popular only for Smart education. Such domains as medicine (Mykhailov, 2021, 2022), law (Calo, 2015), and warfare (Sullins, 2010) are also highly personalized and according to some studies the trend to personalization will increase within the next years (Shemshack & Spector, 2020).

ing in groups, and decision-making. Moreover, although AI aims to increase personalization within the educational process, there is still a danger of a reversed impact. For instance, AI will assess the whole student's personality through a relatively narrow data set that the computer will collect within learning sessions. In this way, the totality of a student's personality will be reduced to a limited amount of information about this student. This 'reductive' activity of the computer system might have very significant long-term consequences. Especially if such AI systems will have a wide implementation throughout a net of educational environments and cultural contexts.

Conclusion

In the present paper, I have provided a brief glance at the moral landscape of the contemporary Smart education domain. Of course, the ethical issues provided in this article are not exhaustive. Considering the limits of the paper I have to leave aside such moral problems as: technological addictivity, equal accessibility to educational environments, mediating role of digital technologies, etc. However, in this paper, my aim wasn't to dive into specific ethical issues but rather to frame the ethical landscape more in general. Keeping this in mind I have structured different moral issues in accordance with three main components that render the domain of Smart education. These elements were: smart pedagogy, smart learning, and innovative educational technologies. In the case of smart pedagogy, I have focused my attention on the problems related to the integration of smart pedagogy into new technological systems. As I have shown, because of new innovative technologies teachers should possess new responsibilities that were not required before. For example, teachers should be good at identifying facts from fake information, or should manage 'information overload'. These are the problems that were not so pressing before the introduction of new technologies into the educational environment. Now, however, they form a significant part of the educational practices which means that teachers should adopt to new responsibilities by creating and implementing new learning approaches.

In the case of learner, I have analyzed problems related to privacy within the usage of Big Data and AI. In this part I aimed to emphasize that digital data is never neutral and often is tend to be used in various purposes. Moreover, current algorithmic solutions are able to collect 'sensitive' data and by doing this create significant trust issues.

In the case of innovative technologies, I have provided a short analysis of the AI adaptive educational system and possible issues that it might lead to. AI adaptive educational system is an algorithmic tool for providing students with a personalized set of educational suggestions. By analyzing student's personal learning traits, the system is able to define student's learning style and deliver a personalized set of learning suggestions. In this sense, such an AI system can create a unique learning environment where the education process will be more effective and also more interactive.

From the philosophical perspective the present paper lean on the idea that stands in the very core of the many contemporary philosophies of technologies, namely, that technological artifacts not morally neutral but, on the contrary, active participants of our moral lives. This fact changes our everyday perception of technologies that we are using and show that technological artifacts are not just passive instruments but on the contrary active shapers of our moral lives.

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Михайлов Д. Є.

ФІЛОСОФСЬКИЙ ВИМІР ОСВІТНІХ ТЕХНОЛОГІЙ: АНАЛІЗ ЕТИЧНОГО ПРОСТОРУ СУЧАСНОЇ СМАРТ-ОСВІТИ

Незважаючи на те, що розумна освіта (smart education) є одним із найдинамічніших технологічних трендів сьогодні, ми ще й досі мало знаємо про філософські й етичні наслідки, до яких може призвести повсюдна імплементація інноваційних технологій в освітню сферу. У науковій літературі термін «розумна освіта» часто вживають як «загальне поняття» (umbrella term). Найчастіше цей термін охоплює широкий спектр різних технологічних тенденцій і навчальних підходів у сучасній освіті. Через це, перш ніж заглиблюватися в етичний аналіз феномену сучасної освіти, видається корисним звузити визначення цього поняття. Саме тому на початку статті запропоновано

визначення, згідно з яким розумна освіта має три основні складові, а саме: розумна педагогіка, розумне навчання та розумні освітні технології. Далі подано опис етичних проблем для кожного з цих компонентів. Щодо розумної педагогіки наголошено на проблемі нових компетенцій для вчителів та педагогів, які приходять із новими цифровими технологіями. Щодо розумного навчання – продемонстровано, як великі дані та імплементація штучного інтелекту можуть спричиняти проблеми, пов'язані з конфіденційністю. Нарешті, під час аналізу інтелектуальних освітніх технологій увагу зосереджено на адаптивних системах штучного інтелекту, які надають персоналізовані освітні рішення впродовж усього освітнього процесу. Хоча адаптивні системи штучного інтелекту можуть значно підвищити ефективність та інтерактивність навчального процесу, ця технологічна система також може призвести до непередбачуваних наслідків, які впливатимуть на різноманітні когнітивні й метакогнітивні здібності учнів у школах та університетах. Запропонована стаття також має важливе значення для філософських дискусій у сучасній філософії техніки. Згідно з багатьма сучасними підходами, дигітальні артефакти не є морально нейтральними. Зазвичай ці артефакти активно впливають на нашу моральну поведінку, змінюючи наші моральні орієнтири й трансформуючи наші загальні уявлення про мораль. У статті продемонстровано, що цифрові технології, які сьогодні використовують у смарт-освіті, не є щодо цього винятком.

Ключові слова: смарт-освіта, освітні технології, смарт-педагогіка, Big Data, штучний інтелект в освіті.

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