THE PSYCHOLOGICAL IMPACT ON STUDENTS OF THE MANAGEMENT OF E-LEARNING PROCESSES WITH ARTIFICIAL INTELLIGENCE

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Abstract: *This article covers main problems and their solutions about psychological impact on students of the management of e-learning processes with artificial intelligence. Integration of e-learning models and artificial intelligence, psychological impact on students is expressed in this article. Artificial intelligence analysis, questioning, psychological effects, and a number of important factors are described.*

Keywords: *e-learning, artificial intelligence, psychology, e-learning problems, behavior.*

INTRODUCTION

Artificial Intelligence has many different definitions. In the headlines of newspaper articles, AI is a machine that thinks, understands languages, solves problems, diagnoses medical conditions, keeps cars on the highways, plays chess, and paints impressionistic imitations of van Gogh paintings. AI is often defined as a computer system with the ability to perform tasks commonly associated with intelligent beings. As this definition somewhat problematically requires us to define intelligence and is inconveniently tautological, artificial intelligence is now commonly defined as a scientific discipline; as the activity that creates machines that can function appropriately and with foresight in their environment. The first explicit definition of artificial intelligence was suggested in a funding proposal to the Rockefeller Foundation in 1955. It was based on the "conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it." This early definition rapidly led to deep controversies. In practice, the early developers of AI interpreted intelligence and thinking as mechanical processing of logical statements, thus, in effect, defining human intelligence as computation of truth values. This interpretation was historically aligned with logical positivism and attempts to formalize mathematics using purely syntactic means, but it also raised important questions about the philosophical foundations of AI. In the following section, we propose a different way to understand the nature of AI. It will help us locate the different capabilities of different types of AI in the context of learning. Adaptability, learning, and anticipatory action are commonly viewed as key characteristics of AI. We therefore use a theory of human action and learning as a starting point. For this we use a three-level model, along the lines of cultural-historical activity theory and a similar model.

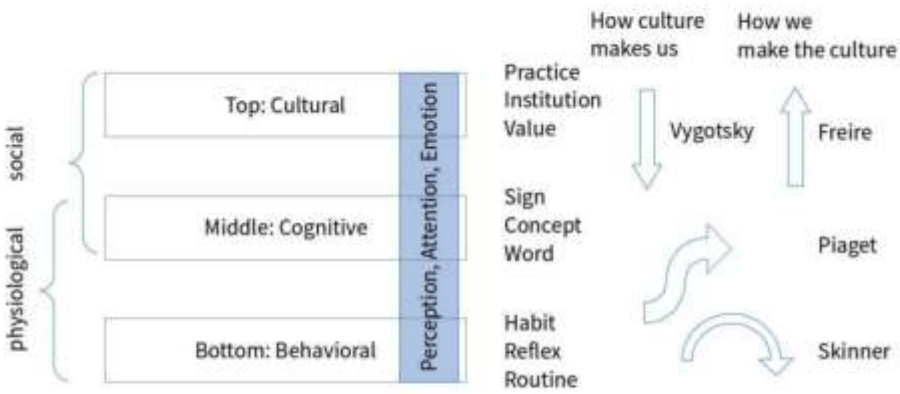
MAIN BODY

A three-level model of action for analyzing AI and its impact. Cultural-historical theory of activity distinguishes three hierarchically linked levels of human behavior. First, behavior can be analyzed as socially meaningful activity directed by culturally and socially constructed motives. Activity is realized through goal oriented acts that essentially are ways of solving problems at hand that need to be solved to accomplish the activity. Operations, in turn, implement the acts in the present situation and concrete context, using the tools available. An important aspect of this three-level hierarchy is that the levels cannot be reduced to each other. We can explain the meaning of an activity only using social, cultural and historical terms that do not make sense at the level of acts or operations. For example, we can explain the object and motive of activity by saying that we are teaching children so that they become citizens, realize their potential as human beings, and get good jobs. The "content" of this activity—how it is translated into concrete acts—depends on social institutions, norms, social division of labour and knowing, the ways in which social production is organized, and many other similar things. Most importantly, we rarely are explicitly aware of all those social factors that shape our activities. Cultural norms, values, expectations, social institutions, and other essentially contextual factors shape our activities and provide a tacit normative, emotional, and anticipatory background that allows the ongoing stream of activity to go on. This is also the level that provides the foundation for ethics of action.

Psychologists and learning theorists have focused on different levels of this three-level hierarchy during the last century. Behaviouristic and associationist theories of learning have addressed mainly the level of operations. Cognitivist and constructivist theorists have mainly addressed the cognitive level, with constructionists also emphasizing the material, affective, and social context. Socio-cultural theorists, in turn, have often focused on the social, cultural and materially embedded dimensions of knowing and learning. Figure 1 depicts these three levels and maps some well-known learning theorists to these levels.17 Human learning occurs on all three levels of the activity hierarchy. When habit and routine hits an obstacle, we become aware of it, operation ceases, and action replaces it. We start to interpret the problem, and try to find a solution.18 At this level, learning consists of problem solving, creative reframing, and formation of new anticipatory models. New ways of doing and thinking emerge, can be internalized, and can become the basis for new habits and routines. Lev Vygotsky, the founder of cultural-historical theory, however, also pointed to the importance of the social and cultural level of activities that shape human thinking and learning. Advanced forms of thought are made possible because they rely on culturally and historically developed stocks of knowing.19 Cognitive level acts, thus, use resources from both the top level of activity and the bottom level of operations. Whereas Vygotsky emphasized the influence of social and cultural factors in cognitive development, critical pedagogists such as Paulo Freire and newer activity theorists such as Researchers have emphasized the role of learning in changing existing social practices. Engeström, in particular, has highlighted the role of learning in the creation of new educational practices.

Since the beginning of the 1980s, and until recently, educational applications of AI have mainly focused on the knowledge-based approach. The most prominent line of research has been concerned with intelligent tutoring systems, or ITS. These systems use a knowledge-based architecture. A typical ITS architecture has a domain model that describes the area to be learned and a student model that describes the current state of student's knowledge and learning. An expert system or pedagogical model manages the introduction of learning materials to the student through an adaptive and interactive user interface. These systems have traditionally used the knowledge-based approach, now commonly known as "gofai" (good-old-fashioned-AI). They have been successful mainly in relatively limited and unambiguous domains, such as mathematics and physics. As student behaviour and learning can also be monitored in ITS environments in great detail, intelligent tutoring environments have also been an important source of data for research on learning. The difficulty in developing ITS for broad learning domains has also switched the focus to the narrower problem of using AI and machine learning to generate teacher interfaces for student and learning monitoring, and learning diagnostics. This is commonly known as learning analytics and educational data mining (EDM).

Figure 1. Three levels of human and machine learning



In formal education, AI can have both positive and negative impact on learning. As AI is now high on the policy agenda, it may appear that AI should be applied in as many educational settings as possible. When a new promising technology emerges, and when the limitations of technology and the challenges of applying it are often not perfectly understood, technology may seem to open radically new possibilities for solving old problems. This is what happens at the early phases of the life-cycle of general-purpose technologies, and it leads to technology push. Visionary entrepreneurs and policymakers realize the potential of new technology and see all the possibilities of how it could make a difference. In the domain of learning, this enthusiasm will be mitigated when people realize that AI will not only make existing education more efficient but that it will also change the context where learning occurs and where it becomes socially relevant. Many current learning practices address the needs of an industrial society that is currently being transformed. It is easy to automate things that merely institutionalize old habits. In a changing world, this often creates frustration as the solutions can become obsolete already before they are implemented.

In the stage of technology push, technology experts possess scarce knowledge. Because it is scarce, it often dominates and overrides other types of knowledge. In the domain of education and training, this can become a problem as technologists easily transfer their own experiences and beliefs about learning to their designs. For example, in the field of machine learning, learning is often understood as simple association between system inputs and outputs. For learning scientists, such a concept of machine learning may be an oxymoron. Using technology, it may be possible to revolutionize learning but it is also possible to automate ideas and replicate practices that have little to do with learning. For example, the promise of MOOCs has been widely noted but we still know very little about their impact on “delivering desired learning outcomes.” As it is possible for one teacher to teach very many students in online environments, but difficult to know what the students learn, one of the great promises of AI is to do large-scale learning analytics in such environments. For example, it is often suggested that AI could be used to objectively assess student learning by scoring test results without teacher bias. Given enough human-labelled examples of data, neural AI and machine learning can easily learn to categorize students based on their test results. Yet, it is not clear that test results are accurate indicators of learning. To support learning, it may be more important to measure individual development than average performance in standardized tests. Neural AI, however, strongly prefers large datasets and standardized testing. Current neural AI systems are a natural fit with learning models that view learning as transfer of knowledge to student's mind. If learning is understood as the development of skills and competences, AI my need to be incorporated in learning processes in different ways. For example, IBM's Watson Classroom promises cognitive solutions that help educators gain insights into the learning styles, preferences, and aptitudes of each student, "bringing personalized learning to a whole new level." It is, however, not obvious that such objectives would be beneficial or relevant for learning. As Vygotsky pointed out long time ago, the development of many cognitive capabilities that define advanced forms of thinking are based on their social relevance and have little immediate relevance for an individual learner. For example, mediated communication through written text is unnatural for a child who is perfectly able to use speech from an early age. Without a complex system of social interests and practices, advanced conceptual systems such as those used in mathematics would make little sense for an individual learner. AI may thus provide exciting new opportunities for adapting learning content based on student's individual characteristics and learning style, even when large bodies of empirical research show that the concept of learning style is perhaps best characterized as an urban myth. In short, computer programs scale up very well, and AI can easily scale up bad pedagogical ideas.

DISCUSSION AND RESULTS

If we think how AI can most effectively be used in the current educational context, we easily automate things that used to be important in the past. It is therefore important to understand the impact of AI in the context of future learning and education, instead of in current systems of education and forms of learning. The analysis of the impact of AI on teaching will, therefore, be inherently linked to foresight-oriented work on the future of learning. Yet, there are some educational tasks where AI can have a clear impact. One such task is assessment in its various forms. In the conventional intelligent tutoring systems a central component is a student model that maintains information about the current state of the learner and which, based on the student model, tries to infer possible bottlenecks in student's way of understanding a domain that she or he is learning.

The current excitement about AI easily leads to technology push, where AI is viewed as a solution to a wide variety of problems in education and learning. It is probably fair to say that the potential and challenges of AI in education are still not adequately understood. AI can be understood as a general-purpose technology, and it can be applied in many different ways. Although the characteristics of technology itself may push development towards specific directions, it is always possible to use technology in many ways and for many different purposes, also in education. For policy development, it is therefore probably more important to understand why and for what we use technology than how it is used. The future promises of technology, in this view, have to be justified by making explicit the motivation of using the technology, as well as the key assumptions that underpin the stated motivation. This lifts technology to a level of policy, and we have to ask what are the objectives and goals of using it. Only if we have such a birds-eye view on technical development, we can say where we want to go and how technology can help us on the way. When the assumptions and motivations are made explicit, they can also be critically assessed. A continuous dialogue on the appropriate and responsible uses of AI in education is therefore needed.

As technology and its uses change, important contributions to this dialogue may emerge from "outsiders" who do not represent current stakeholder interests. Enabling and funding independent research on, for example, the politics, ethics, social implications, and economy of AI may be a practical way to create useful inputs to this dialogue. In the domain of educational policy, it is important for educators and policymakers to understand AI in the broader context of the future of learning. To a large extent, the debate about AI is now about the ongoing informationalization, digitalization, and computer-mediated globalization. The current estimates of the impact of AI and other digital technologies on the labour market highlight the point that the demand for skills and competences is changing fast, and the educational system needs to adapt, in particular when education aims to create skills for work. AI enables the automation of many productive tasks that in the past have been done by humans. As AI will be used to automate productive processes, we may need to reinvent current educational institutions. It is, for example, possible that formal education will play a diminishing role in creating job-related competences. This could mean that the future role of education will increasingly be in supporting human development.

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