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ADOPTING ARTIFICIAL INTELLIGENCE FOR THE LEARNING AND TEACHING OF GENERATION Z IN HIGHER EDUCATION

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ABSTRACT

The adoption of artificial intelligence (AI) is rapidly growing as a means to enhance learning and teaching in higher education. Previous research on the characteristics of Generation Z students and the opportunities presented by AI is scant. This study aims to contribute to AI-enhanced practices in higher education in Europe. European Universities are increasingly cooperating in creating joint degrees and courses within European University alliances. By drawing from literature on AI and Generation Z, we identify opportunities to develop higher education practices in the context of European Universities. The results show that flexibility, instant feedback, 24/7 availability and a technological orientation are all key features of AI and Generation Z students. The adoption of AI-based solutions by the use of Generation Z therefore provides a good starting point for digitising learning and teaching processes.

Key words: Artificial Intelligence, Higher Education, Generation Z, Learning, European University

1 INTRODUCTION

This study examines the adoption of artificial intelligence (AI) in higher education. Although AI is not a new invention, recent advantages observed in the field have gained significant interest among practitioners and researchers in all educational sectors. AI is the study of computer agents that observe and collect various data from their surroundings, deploy computational functions and analyses and perform independent tasks by continuously learning from new situations (Russell & Norvin, 2016). In this paper, we conducted a conceptual examination to look at how higher education could benefit from AI in terms of research and teaching, and how it could further be developed and researched in the consortium of the Ulysseus European University.

Ulysseus is one of the 41 transnational European University alliances aiming to promote European values and identity, and revolutionizing the quality and competitiveness of European higher education. Ulysseus includes six diverse partner universities that are solidly involved in the

development of their regions and cities. The universities share a common goal and aim to create a dynamic and versatile alliance constructed upon stakeholders' support while developing an agile, sustainable and proactive community to boost the four missions of the higher education institutions: education, research, innovation and service to society. Thus, the alliance will contribute to shaping the European Higher Education Area and the European Research Area and, hence, the future of Europe. Moreover, the alliance must be understood as an innovation ecosystem that develops solutions for specific research and innovation (R&I) challenges deriving from six innovation hubs, one at each partner university. The Ulysses European University gives higher education R&I a crucial role in supporting social cohesion, economic growth and global competitiveness in Europe.

This paper focuses on the opportunities of Ulysses' AI hub, especially the adoption of AI in teaching in the context of higher education from the student and higher education perspectives. We formulated the following research aims to examine the research gaps related to the adoption of AI in higher education: a definition of the value that AI technologies provide for higher education, an analysis of the characteristics of "Generation Z" with regard to higher education students, and the identification of ways to combine the opportunities of AI and the characteristics of "Generation Z" with the current pedagogical approach of European higher education. ‘

We organized the remainder of this conceptual paper as follows: The following section includes a review of the role of AI and Generation Z in higher education using relevant literature. Subsequently, the methods and conceptual framework are described. Then, we outlined findings from the systematic combing of the previous research prelevant to the research questions. In the final section, we discussed the contributions, limitations and future research avenues.

2 THE ROLE OF AI IN EDUCATION

The adoption of AI provides new opportunities to develop learning and teaching in higher education (see e.g. Mononen et al., 2021; Popenici & Kerr, 2017; Renz et al., 2020). AI enables personalisation (see e.g. Chassignol et al., 2018; Tiihonen & Felfernig, 2017) and large-scale analyses related to competence profiles, assessment, gaps and requirements that can be adapted to the educational context (Costa, et al. 2017; Ketamo et al., 2019; Yang & Li, 2018). In addition, higher education institutes are adopting machine-learning powered chats for the needs of students (Mononen et al., 2021), which enables the provision of 24/7 student services as humans are not needed in responding to the questions of students. The developer of AI-enhanced chats can also integrate external databases

into them. The integration of external databases enriches the shared information and makes the automatically generated responses of chats more accurate, up-to-date and informative.

The adoption of AI can also assist in creating new self-study courses, technology-enhanced learning methods, automated educational services, more intelligent learning environments and administrative solutions in higher education organisations (see e.g. Ocaña-Fernández et al., 2019; Pence, 2019; Zawacki-Richter et al., 2019). Students already use various social media tools in planning and selecting study paths (Dirin et al., 2021) that deploy AI in their backend systems. In addition, it is important to understand factors that create resistance or privacy concerns among users or provoke negative reactions in terms of using AI in unethical ways (Alamäki et al., 2019a). AI will also support teachers' role in education. Edwards et al. (2020) state that AI will shift teachers' roles toward a supervisor who designs AI-based instruction and provides needed support but AI will help to monitor student progress. Similarly, Luckin and Cukurova (2019) showed that significant part of duties, such as selecting knowledge domains, activities and assessments, remain teachers' responsibility although AI will provide assistance in differentiation, tracking and reporting.

Although AI provides significant opportunities and benefits for various sectors (Rantala et al., 2018), it also raises ethical doubts and risks in terms of data biases and information losses with regard to high level anonymisation (Alamäki et al., 2019b). New knowledge concerning the determinants of AI adoption in education will allow learning designers, educators and teachers to design technological solutions that diffuse faster in higher education. In addition, recent knowledge concerning the behaviour of early adopters can provide hints about the future preferences of new user profiles (Hallikainen et al., 2019).

Despite the hype around AI in higher education, AI technologies are still in their infancy. Current AI solutions represent low-level intelligence and they are still far from matching human intelligence. In everyday discussions, AI is often said to simulate human thinking and logical reasoning, although current AI solutions are still far removed from human-like cognition, emotions and behaviour. For example, AI still lacks ability in terms of meta-cognition, intuitive psychology and affection (Lake et al., 2017). Although the design, development and use of AI are in their infancy in education (Renz et al., 2020), the development-oriented and gradual adoption of AI will provide new administrative, pedagogical and educational means to develop beneficial educational practices and organisational capabilities.

3 GENERATION Z

The youngest generation in labour market is the Generation Z, sometimes called as Net-Generation, App-Generation and @-Generation. A cohort group, which contains individuals born during a specific time period who share similar characteristics and behaviours, defines a generation (Salahuddin, 2010). Following on from Baby Boomers, Generation X and Generation Y, Generation Z was born and raised in a time of rapid technological change and development. In this article, we apply the general definition, which states that Generation Z students were born between the mid-1990s and the mid-2000s (Rothman, 2016; Seemiller & Grace, 2016). There is little evidence of real differences among generations, and the academic empirical evidence for generational differences is generally mixed (Parry & Urwin, 2011). However, students who belong to Generation Z are the future of all organisations, and therefore, it is significant to understand what they need from higher education to respond to the needs of future employers.

There is a considerable amount of research on the characteristics of the previous generations, for example, Generation Y, but research on Generation Z still remains scarce. However, there is a common understanding that Generation Z has never known a world without Internet, cell phones or iPods, thus making them digital natives. They are technologically savvy and in constant contact with people 24/7, with low or no tolerance of being without digital resources (Rothman, 2016). In fact, the youngest generation experiences the highest emotional gain from smartphone use compared to the older generations (Zhitomirsky-Geffet & Blau, 2016). Moreover, they are the first generation born into an integrated and globally connected world where the Internet has always been available (Rothman, 2016). They are multitaskers and constantly question the conventional way of doing things (Chillakura & Mahanandia, 2018). Moreover, they want technology that is easy to use and that will solve their problems, help coordinate their activities or provide them with relevant information in a short period of time (Rothman, 2016). Their use of technology and their global connection to the world have been referred to as breathing – they “live and breathe” technology (Cilliers, 2017; Rothman, 2016).

At present, Generation Z students fill our classrooms and expect a teaching environment in which they can interact in a similar way they do in their virtual worlds, demanding for instant information, and replacing conventional “communication” with “interaction” (Cilliers, 2017). It is stated that, as learners, they need instant feedback, are easily bored, prefer collaboration, require flexibility and independence, need personalised learning paths and are not limited by geography, proximity or time zones (Rothman, 2016). Because the new Generation Z learners are more talented and equipped with regard to technology, it increases the complexity of education processes involving instruction, guidance and supervision (Cilliers, 2017), thus providing new challenges for higher education practices and pedagogies.

4 RESEARCH APPROACH OF THIS STUDY

The aim of this study is to develop the learning and teaching practices and processes of Generation Z with regard to advanced educational technologies in higher education. The research approach employed in this examination is conceptual research (Meredith, 1993) as we do not conduct empirical data collection and sampling for our target phenomena. More specifically, we focus on the needs and context of the Ulyseus European University, which represents networked university learning and teaching within the European Union. We conducted a scientific literature review on the role of AI in education and the characteristics of Generation Z and used this to create a conceptual model of AI opportunities from student and higher education perspectives. We apply an abductive research approach as our aim is to develop research and teaching practices in higher education. Such an abductive qualitative research approach (Dubois & Gadde, 2002) enables us to establish explanations regarding the conceptual model while analysing previous research in an iterative manner. We simultaneously review, analyse and process previous literature on AI, Generation Z and higher education pedagogies to build a new understanding of our research questions. In selecting an iterative and constructive research process, we are able to develop a deeper understanding of our research phenomena. In addition, an abductive case study allows us to simultaneously contribute to the theoretical understanding and identify practical implications (Gummesson, 2000) that will help the readers to utilise the findings in developing AI-based learning, teaching and research in the context of higher education.

5 CONCEPTUAL MODEL OF AI OPPORTUNITIES FOR GENERATION Z STUDENTS IN EUROPE

We adopted the key findings of scientific literature review on the role of AI in education and the characteristics of Generation Z to the context of Ulyseus European University. Based on that analyse, we identified five categories regarding the opportunities presented by AI in higher education from the Generation Z perspective (Table 1). The first column in the Table 1 shows that AI enables the creation of personalised learning paths by analysing student profiles and matching the identified profiles to relevant courses. AI is also able to customise self-study courses based on students' learning styles, needs and preferences. It provides real-time feedback based on students' selections and responses with regard to the learning tasks in self-study courses. Machine-learning powered chats or social robots replace human advisors by providing basic assistance and information concerning the practical questions that students have related to their studies. Specific AI-based applications or solutions generate sophisticated solution propositions, advice or recommendations based on students' competence profiles or other background information. They can provide assistance in searching for thesis topics or relevant literature for theses or in finding new jobs. AI will provide significant opportunities to automate administrative student and study processes as AI algorithms are experts in managing administrative process where similar routine issues constantly repeat.

Table 1. AI opportunities from the Generation Z perspective in the context of Ulyseus European University.

AI opportunities for higher education	Characteristics of Generation Z as students	AI-enhanced learning in Ulyseus European University
AI solutions create recommendations and personalise learning paths based on students' profile data (e.g. application programming interface integrations between learning management systems). (Chassignol, et al., 2018; Tiihonen & Felfernig, 2017)	Generation Z requires flexibility, independence and personalised learning paths (Rothman, 2016).	AI-enhanced solutions provide versatile learning paths. Thus, AI assists students in building their learning paths by collecting courses in joint degrees from various partner universities within the alliance
Self-study courses with automatic assistance built into intelligent learning environments. AI algorithms provide real-time feedback about learning and customise learning content (e.g. intelligent and adaptive online courses). (Chassignol, et al. 2018).	Generation Z students require instant feedback, multitask and are easily bored. (Chillakura & Mahanandia, 2018; Rothman, 2016).	A large course offering provides specialisation in specific topics (e.g. exotic languages, rare programming languages or niche technologies), as part of Ulyseus flexible programmes.

Automatic student services shared by conversational chatbots and social robots respond to students' questions and information needs (e.g. machine-learning-based chatbots or social robots). (Edwards, et al. 2018; Mononen, et al. 2021).	Generation Z is constantly interacting, available 24/7 and not limited by geography and time zones. (Cilliers, 2017; Rothman, 2016).	AI-enhanced student services ensure that when experiencing problems help is available regardless of the time or location as part of the Ulysseus Digital Platform services
Sophisticated AI applications dedicated to specific information needs provide deep insight into students' learning needs (e.g. library assistants, job search assistants, skill profile assistants). (Ketamo, et al. 2019).	Generation Z requires new types of guidance, supervision, instructions and learning environments (Cilliers, 2017).	Chatbots and other intelligent assistants will replace in future study instructors, match competence profiles and suggest relevant courses and jobs by using large databases across universities. This is a future possibility and prospect for Ulysseus.
AI-enhanced and automatic administrative processes help students in planning studies and selecting proper programmes (e.g. course management, assessment and study planning systems). (Costa, et al. 2017; Ketamo, et al. 2019; Yang & Li, 2018).	Generation Z relies on interactive technology and prefers working online (Rothman, 2016).	Automated administrative processes save resources and align educational practices and processes in future within European Universities.

Table 1 shows how the opportunities presented by AI technologies, on the one hand, and the general characteristics of Generation Z learners, on the other hand, result in a new model of AI-enhanced learning in the Ulysseus European University. As learners, Generation Z needs flexibility, independence and personalised learning paths, and, as individuals, they are easily bored and also require instant feedback during learning and multitasking (Rothman, 2016), providing new possibilities for AI in terms of answering these needs (see the second column in the Table 1). The youngest generation is constantly connected and involved in interactions, meaning they are available 24/7 (Rothman, 2016), resulting in a need for them to have immediate responses with regard to their problems. As technologically talented, global citizens, they require new types of guidance, supervision, instructions and learning environments (Cilliers, 2017). As technology plays a pivotal role in the lives of Generation Z members, who have been raised with Internet and smartphones, they expect everything to be fast and instant (Chillakura & Mahanandia, 2018), including administrative processes.

6 DISCUSSION

Due to technological development and the characteristics of Generation Z, the higher education system in Europe needs a digital transformation along with the advancement of AI, thus challenging the traditional system of learning and teaching. The literature on AI in education (see e.g. Chassignol et al., 2018; Ketamo et al., 2019; Tiihonen & Felfernig, 2017; Zawacki-Richter et al., 2019) shows that AI creates significant opportunities to develop learning and teaching in higher education. This study shows that the adoption of AI creates value for the learning and teaching of Generation Z students, who represent those in higher education today. There are special individual characteristics that should be considered in the pedagogical arrangements of higher education. This study provides an initial understanding of how AI could help to elaborate learning, teaching and administrative processes to better meet the special needs of Generation Z.

An essential advantage of AI is that it is able to replace human work in some specific tasks, enabling the provision of 24/7 student services. Additionally, it is able to make conventional educational technology more intelligent by analysing students' needs, preferences, progress and possible mistakes. Thus, personalised learning paths and customised self-study courses respond to the needs of individual learning styles. AI solutions are also able to provide suggestions or even make corrections to students' choices or responses by automating administrative tasks. Thus, AI simulates the human activities of teachers, facilitators and study instructors by replacing them in some specific tasks. However, it is not able to replace human interactions, such as emphatic encounters with teachers or study instructors, but it is a useful assistant in specific and routine-type tasks and learning needs. In fact, AI creates new opportunities for teachers to focus on the facilitation and learning where help is most needed among of students. Thus, AI assists teachers to do their teaching work better if AI is adopted pedagogical way.

The findings of this study should be tested empirically. Further research is also needed into how increasing intelligence affects the learning results of Generation Z. Additionally, we observe a need for empirical research to clarify how AI will enrich studies of Generation Z by providing versatile course selection and study instructions. Researchers of educational technology could explore possible causality between the adoption of AI, attitudes, satisfaction, perceived usefulness, study progress and learning results. The pragmatic experiences of adopting AI in higher education open up new research opportunities to examine pedagogical implications. Finally, more research is needed into how the opportunities presented by AI could provide some part of the emotional intelligence required in higher educational practices.

7 CONCLUSIONS

AI includes a large collection of technological opportunities. As it consists of learning algorithms that continuously analyse data for adapting to changing situations where it works, it is a suitable technological choice for initiatives where assistance, facilitation and recommendations are needed. Similarly, the students of Generation Z expect flexibility, instant feedback and constant interaction through various digital channels. Thus, we recommend that higher education organisations across Europe set up pilots and development projects where they can adopt AI to respond to the needs presented in Table 1.

We acknowledge that there are several limitations of this study. For example, the lack of empirical research results provides only a limited understanding of the needs and possibilities with regard to AI in higher education. Moreover, as there is little experience in terms of the wide range of opportunities AI provides for education, and because technology is developing rapidly, the results are only indicative. However, the results provide new understanding about the opportunities of AI to the context of the Ulyseus European University. This helps to evaluate educational opportunities that AI could provide for the Ulyseus and more broadly European higher education fields. The next steps could be to design and launch small pilot projects where students and teachers could gain practical experiences from the adoption of AI to learning and teaching.

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