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Human – Centered Artificial Intelligence in Education. The critical role of the educational community and the necessity of building a holistic pedagogical framework for the use of HCAI in education sector

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Βιβλιογραφική αναφορά:

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Abstract

The humanitarian and social aspect of artificial intelligence is the critical factor that will determine the next steps in all aspects of our daily lives, from work and transactions to education, information and entertainment. In the field of education, highlighting the human centric character of artificial intelligence is a prerequisite for the transformation of our educational systems in order to be able to respond in a critical and creative way to the demands of the new era.

This research focuses on the critical role of teachers in the course of the transition and highlighting the basic characteristics of the necessary pedagogical framework for the introduction and critical utilization of Human – Centered Artificial Intelligence in Education.

Keywords

Human – Centered Artificial Intelligence in Education, Artificial Intelligence Pedagogy, Teachers' views and attitudes towards AI, Intelligent Tutoring Systems (ITS), Educational Data – Mining (EDM), Learning Analytics (LA)

1. Introduction - Human – Centered Artificial Intelligence

The arrival of AI in the daily life of modern societies is now a fact, and justifiably causes a wide range of discussions about the new challenges and opportunities that emerge, but also the dangers that befall all human activity.

The adoption of new deep learning algorithms in natural language processing gave new impetus to a number of applications with the most typical examples being Chat GPT, Dale and others, which were widely used by millions of people around the world in a short period of time.

Based on the study of the literature in the field of AI, a significant shift from its technological aspect to the human centric aspect is observed, as many researchers recognize this necessity as a necessary condition for the cohesion and smooth development of modern societies (Zhao et al , 2023; Shneiderman, 2022; Yang, 2021; 2019; Riedl, M. O. (2019).).

The necessity of the human-centered aspect of artificial intelligence constitutes a universal demand as there are many concerns both in the lack of social responsibility, transparency, and trust in the planning stage (Ahmad et al, 2023) and in the catalytic effects on people's lives, the cohesion of societies and on the environment, etc. (Nakao et al, 2022).

According to Bond et al (2019), HCAI (human-centered artificial intelligence) constitutes the fruit of the synthesis of research in the field of HCI (human computer interaction) and of the field of AI (artificial intelligence) for the common good, with the ultimate goal of placing the human at its focus of interest in the development of artificial intelligence.

A fundamental principle of human-centered artificial intelligence is that the human being and his/her needs must be put at the heart of the design in terms of social responsibility and ethics of technology (Nagitta et al, 2022), with the ultimate goal not to replace but to support and enhance the human status (Bond et al, 2019; Li S., Gu X.

(2023) and the protection of his/her interests through strengthening the human need for skill building, participation in the process and well-being (Mhlanga, 2022), by developing a frame of continuous interaction in order for AI applications to work in a complementary and supportive way with humans (Herrmann & Pfeiffer, 2022).

Human-centered artificial intelligence (HCAI) must reposition humans at the focus of its interest with the goal of improving human performance in ways that are reliable and safe, while allowing for high levels of human control (Garibay et al, 2023).

Based on the above approach, HCAI should:

1. Contribute to human well-being
2. Be governed by social responsibility at the planning stage
3. Ensure the protection of personal data of every human
4. Provide for human participation both in planning and evaluation stages
5. Be governed by a transparent governance plan with the emphasis on environmental protection, independent supervision, certification, recoding and evaluating of taken actions
6. Presuppose an understanding of the basic functions of AI by the general public

Based on the above, an attempt is made to define the concept of human-centered Artificial Intelligence:

Human-centered Artificial Intelligence does not aim to replace human existence. On the contrary, it must, in terms of social responsibility, focus on optimizing the capabilities of contemporary humans in order to be able to respond to the ever-increasing demands of a constantly changing and uncharted social, economic and cultural environment.

The purpose of HCAI is to support people and societies in their continuous efforts for social welfare and cohesion, the mitigation of social inequalities, the respect of people's personal data and the cultivation of environmental responsibility with respect for universal values of peace, democracy and social justice.

The purpose of this paper is to highlight the necessity of building a holistic pedagogical framework for the utilization of Human-Centered Artificial Intelligence (HCAI) in Education, focusing on the critical role of teachers in this effort.

The structure of the paper is as follows: In section 2, a brief historical review of AI in education is attempted. Section 3 analyses the stages of development of Artificial

Intelligence in education. Section 4 analyses the most important models for integrating Artificial Intelligence into education. In section 5, the interest is focused on highlighting the critical role of the educational community for the introduction of AI in education. Finally, in section 6, a first impression of the primary characteristics of a holistic pedagogical framework for the introduction of human – Centered AI in education is attempted.

2. The History of Artificial Intelligence in education

The idea of integrating artificial intelligence (Artificial Intelligence) into the educational process was initiated by two main researchers, Sidney Pressey and B.F. Skinner (Holmes, Bialik, Fadel, 2019).

Initially, Pressey, who was a professor at Ohio University in the 1920s, argued that when a machine not only corrects the student but also guides him to the correct answer, then he is not only evaluated but led to a learning process (Pressey, 1950; Holmes, Bialik, Fadel, 2019). As a result of the above consideration, a machine was created which had the ability, during the evaluation of the student, to prevent him from going to the next question in case he had given the wrong answer (Holmes, Bialik, Fadel, 2019). At this point it is worth adding that Pressey was one of the first to point out that the machine in the educational process can facilitate the work of the teacher by taking over the evaluation of tests in order to save time for more interaction with his students (Pressey, 1926).

Skinner, also known as the father of behaviourism and a professor at Harvard University from 1948 until his retirement, was based on Pressey's approach (Holmes, Bialik, Fadel, 2019).

Skinner created an educational machine that allowed the student, when he answered a question, to see the correct answer so that he could compare his own with the teacher's answer (Holmes, Bialik, Fadel, 2019). It is worth mentioning that Skinner was a strong supporter of the view that the machine alone could not teach the student but acted as his personal assistant, constantly guiding him in the right direction (Skinner 1958). According to Holmes, Bialik and Fadel (2019) Skinner's view on the use of a machine which could act as a personal assistant to the student, supporting him in his

learning process could be a forerunner of the intelligent teaching systems of Artificial Intelligence in education.

An important stage in the evolution of artificial intelligence was the Test Turing in 1950 as it is considered the most important study of the fundamental principles on which AI was based. In 1956 the Dartmouth Conference was held in Hanover, NH. USA, with the participation of eminent researchers such as John McCarthy, Marvin Minksy, Claude Shannon etc. in the context of which the foundation of AI was marked.

3. The stages of evolution of Artificial Intelligence in education

3.1 Adaptive Learning Systems

One of the most important stages of the integration of Artificial Intelligence in education was with the use of the Adaptive Learning Systems (Holmes, Bialik, Fadel, 2019).

Norman Crowder in the 1950s devised an alternative solution to use machines in paper – based education, also known as programmed instruction (Crowder, 1960). More specifically, the student was shown a page with information and later followed multiple choice questions. When the student answered correctly he was transferred to the next question, but if he did not answered correctly and he was wrong then the machine would give him specific information to support him in finding the right answer. This is very important because the machine worked and reacted according to the answers of each student, so in a way it adapted to each one individually (Holmes, Bialik, Fadel, 2019).

It is worth mentioning that the first machine that worked entirely with the philosophy of Adaptive Learning was the SAKI machine which was created by the British Gordon Pask in the early 1950s and aimed to help learners to use the keyboard for data processing (Pask, 1982).

3.2 Computer –Aided Instruction

The progress of the Adoptive Learning Systems continued to grow in the following years, mostly in the 1960s and 1970s, but the attention of the researchers was focused at the Computer – Aided Instruction Systems (Holmes, Bialik, Fadel, 2019).

During that time, many such systems were created in several fields. Initially CBE (Computer – Based Education) systems, as mentioned by Chen, Xie, Zou, Hwang, (2020) were tools that ran on a local computer without the use of artificial intelligence. Later they incorporated various models of intelligent systems, better known as Intelligent Tutoring Systems (Chen, Xie, Zou, Hwang, 2020). An example of this practice was the PLATO system which was created by the University of Illinois to give its students access to the educational materials of its professors, some of which were interactive and allowed thousands of students to work at the same time (Holmes, Bialik, Fadel, 2019). As mentioned by Holmes, Bialik, Fadel, (2019) also other examples of systems with the use of Computer – Based Instruction were IBM from Stanford University as well as TICCIT from Brigham Young University. One problem that the Universities faced with their respective use of their systems was they were too expensive, but the biggest problem was that they could not be adapted to a large extent individually to the students and as a result they could not contribute effectively to their personal learning methods (Holmes, Bialik, Fadel, 2019).

3.3 AI and Computer – Aided Instruction

The problem of adapting for Computer – Aided systems according to the students' needs for education was something that bothered the scientific community and in the 1970 Jaime Carbonell presented the SCHOLAR system and it is the first attempt to integrate artificial intelligence into computer – aided systems (Holmes, Bialik, Fadel, 2019). This specific system is based on an information network and can generate text, questions and answers. In this way, the student can form a type of dialogue with the machine in the form of questions and answers from both sides (Carbonell, 1970; Holmes, Bialik, Fadel, 2019).

4. Models of Integration of Artificial Intelligence in education

4.1 Intelligent Tutoring Systems (ITS)

Intelligent Tutoring Systems (ITS) model human knowledge, logic and the way of choosing a specific decision in order to work and produce results with the use of programming skills, yet in education this is not enough. Generally education consists of many subjects, and each needs an expert in the field to make the educational

process and learning viable. Also when an intelligent tutoring system is created it needs to operate someone with programming skills. According to this, it is understandable that there is a great dependence for an Intelligent Tutoring System not only on technological factors and the knowledge of many educational subjects (Hwang, Xie, Wah, Gasevic, 2020).

According to Chen, Xie, Zou, and Hwang (2020) the integration of Artificial intelligence in the educational process is mainly done through the use of ITS which are assigned specific roles depending on the model it is followed for the course.

1st role: ITS as an intelligent teacher, which is responsible for the learning systems followed (Ma, Adesope, Nesbit & Liu, 2004; Steenbergrn – Hu & Cooper, 2014; Vanlehn, 2011). There are many examples that function using this model like Cognitive Tutors where they support learning in mathematics and sciences (Anderson, Corbett, Koedinger & Pelletier, 1995) or a more recent example is the ASSISTments where this system is programmed to combine intelligent tutoring with real – time feedback to students while it informs the teachers for their progress (Heffernan & Heffernan, 2014).

2nd role: ITS as a smart learner, whose role is to provide feedback as well as enrich the learning process. It is important to mention that in order for the student to actively help in this process, he has the support of a machine or either a robot.

3rd role: ITS as an intelligent educational tool/ partner, which is responsible for collecting and analyzing the relationships between educational data. More specifically the device helps the students collect and analyze more efficiently, help them focus on more critical points rather doing low – level tasks and show the data in a possible smart way to make the students think more like the traditional MindTools.

4th role: ITS in the role of the intelligent education consultant, responsible for the correct formulation of the educational policy (Gasser &Almeida, 2017). With the use of Artificial Intelligence policymakers can more precisely understand possible problems or even trends in education and thanks to this they can build more effective educational policies for the educational community to follow (Macfadyen, Dawson, Pardo & Gasevic, 2014; Siemens, Dawson & Lynch, 2013; Tsai, Poquet, Gasevic, Dawson & Pardo, 2019).

According to Holmes, Bialik, Fadel (2019) Intelligent Tutoring Systems (ITS), which are also the most common applications of Artificial Intelligence in education, are presented using different models in the educational process.

Intelligent Tutoring Systems (ITS) consists of

- The Domain Model, in which the intelligent system presents the student with knowledge about a specific field and helps him assimilate this information.
- The Pedagogy Model, in which the Intelligent Tutoring Systems represents the approaches that are made towards the educational material in teaching and learning from teaching experts of different fields (Bereiter & Scardamalia, 1989; Holmes, Bialik, Fadel, 2019).
- The Learner Model, which is the last one, and is a combination of the two previous models (The Domain Model & the Pedagogy Model). According to the Learner Model, the knowledge of a subject is transferred to the student as well as the way to conquer this knowledge (Holmes, Bialik, Fadel, 2019). In more depth of the subject, many CAI have been implementing both the Domain Model, the knowledge that is to be learnt and the Pedagogy Model, the knowledge of how to acquire this knowledge. What Leaner Model does differently is that is gathers information for the student, about their emotional state or their interactions or the parts where he was more challenged and then it adjusts to his needs so it can support him better and helps him learn more efficiently.

It is worth noting that Holmes, Bialik, Fadel (2019) believe that the Learner Model has greatly help the Intelligent Tutoring Systems (ITS) in their growth and constitutes a pivotal point in the progress of utilizing and integrate Artificial intelligence in education because they finally can adapt, at some level at least, with every student according to their special needs.

Ouyang and Jiao (2021) state that intelligent systems (Intelligent Tutor Systems) can be divided into three examples based on the role of artificial intelligence in the educational process.

The first example (AI – Directed, learner as recipient) refers to all those models that have Artificial Intelligence in the position of a guide, in the sense that they guide the student who in return receives the information given to him. In these Intelligent

Tutoring Systems (ITS) a specific path/line of learning is followed and the AI does not focus on personalized learning.

The second example presented by Ouyang and Jiao (2021) has to do with the role of artificial intelligence as a support tool to the student and correspondingly the latter now has the role of partner (AI – Supported, learner as collaborator). In these systems the artificial intelligence collaborates with the student with the aim of finding more information and in this way, learning becomes to a certain extent personalized (Baker et al., 2019; du Boulay, 2019; Rose et al., 2019; Ouyang and Jiao 2021).

The third example presented by Ouyang and Jiao (2021) refers to the model according to which the student now has a leading collaborative role (Bandura, 2006) and artificial intelligence is the facilitating tool (Law, 2019). More specifically in this example the role of artificial intelligence is to provide a high level of accuracy and effectiveness for both the students and the teacher in ways to make their corresponding tasks easier so they can each focus more where they need to (Riedl, 2019; Yang, 2021). The students this way will focus more on their studies and can find information easier while the teachers can be more active and present towards the students without tasks like grading tests.

It should be pointed out that although the third example could be the ideal case for the integration of artificial intelligence in education, according to the international literature there has not yet reached this level as most of the intelligent tutoring systems (ITS) that have been reported concern the first two examples and therefore research efforts are focused on this transition (Ouyang and Jiao, 2021).

4.2 Educational Data – Mining (EDM)

According to Romero & Ventura (2010), Educational Data – Mining (EDM) refers to data analysis based on machine learning and deep learning algorithms. This data enables them to generate systematic and automatic responses to students (Chen et al., 2020). The research that have been done on educational data – mining have formulated two different types. More specifically, statistics and visualization as well as web mining that include various technologies (Romero & Ventura, 2007; Chen, Xie, Zou, Hwang, 2020).

With the use of data-mining in education, a future prediction can be made for the progress of a student. Data mining extract the answers/knowledge of a student and create possible paths for him to follow based on the data they have collected about him.

In this way, the teacher as well as the student can determine at which points in the learning process the student faces problems and adjust his learning to solve these problems. This use of data-mining can also be done in fields where the student works alone and they act as a supporter, pointing out points that need more study and deepening. In this way, the use of artificial intelligence can be adapted to the particular needs of each student (Kim, Soyata, and Behnagh, 2018; Chen et al., 2020).

4.3 Learning Analytics (LA)

Learning Analytics were first used as a term in the early 2011 when a small group of educational researchers hosted *the first International Learning Conference* in Banff, Canada (Joksimovic, Kovanovic, Dawson, 2019). Learning Analytics focuses more on data collected from students and their objectives and then analyzing them, with the goal of understanding them better and then creating customized learning for those students on an individual level (Romero & Ventura, 2013). More specifically online students leave behind data traces, and Learning Analytics gather this data from different sources and student activities, then they analyze them so they can build a pattern of the student movements and provide meaningful insights and visualizations for the teacher or the institutions as well as the students themselves (Larusson & White, 2014).

According to Chen, Xie, Zou and Hwang (2020), this method does not differ much from the Educational data-mining method, with the only difference being that they focus and use different technologies. The Learning Analytics use the method of Machine Learning in education. According to Chen et al, (2020) Learning Analytics is too specifically made for each learning context, and it cannot yet be used across different courses and that provides a challenge. It is pointed though that is this method overcomes this challenge then the use of Learning Analytics will greatly increase and even more integrate advanced techniques to support learning even further.

4.4 Use of Robots in the educational process

The use of robots either as a device or as a platform can now be integrated into the educational process through artificial intelligence. According to Chen et al., 2020, the robot can either collaborate with the teacher or replace him with the aim of improving learning process. Based on the findings of the research made by Chen et al. (2020), the course became more personalized and adapted to each student, helping them to stay focused with enthusiasm as well as not losing their pace with enriched / multiple information. Educational robots also enable students, through reinforcement learning, to create their own learning experiences (Chen, Zou, Xie, Cheng, Liu, 2022).

5. Artificial intelligence in education: The critical role of the educational community

(Anastasiades, 2023)

5.1 Research for recording the opinions of teachers about the potential effects of artificial intelligence on the Greek education system

5.1.1 Pilot Research ID

A. Research Organization: University of Crete | Pedagogical Department D.E. | E.DI.B.E.A (Anastasiades, 2023).

Scientific Coordinator: Panagiotes Anastasiades, Professor, University of Crete

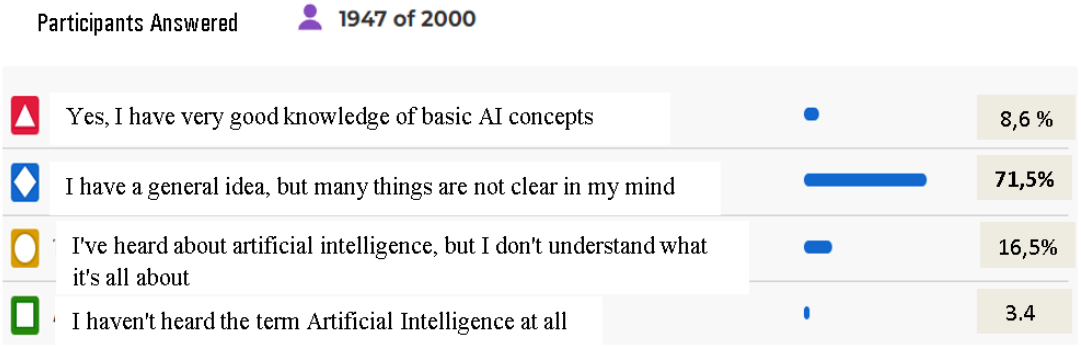
B. Purpose of the Research: Initial – exploratory recording of opinions regarding the effects of Artificial Intelligence on people's daily lives, with the aim of forming research – methodological framework for future research.
C. Type of Research: Descriptive – quantitive pilot research.
D. Research Period: 27/2 – 1/3 2023
E. Sampling Period & Research Sample: Non – random sampling, without statistical weights, with a self – selected sample of 2000 people, the vast majority of whom declared themselves teachers.
F. Research Method & Data Collections Means: Survey of opinions using questionnaire [4 closed and 1 open question], via internet.
G. Limitations if the Research: Non-random sampling does not allow generalization of conclusions to the general population. Self-selected sampling involves degrees of bias, as self-selected participants usually tend to be those who are more interested,

motivated, informed, or have stronger or even absolute positions on the issues under investigation.

H. Research Ethics: All the rules of anonymity and confidentiality of the data were observed, as well as informing the participants about the purpose of the research and no ethical dilemmas arose.

5.1.2 Research Findings

Q1. Do you think you are sufficiently informed about the topics related to Artificial Intelligence?



The vast majority (71.5%) of teachers who responded to the survey stated that they have a general knowledge about AI but many things are not clear in their minds, while 20% either have not heard at all or have heard for AI but they don't know what it is about. Only 8.6% stated that they have good knowledge about AI. From the answers of the teachers who participated in the research, the urgent necessity of informing the members of the educational community on issues related to AI in their daily life not only as teachers but also as citizens is highlighted.

Q2. The latest developments in the field of Artificial Intelligence make you feel for the future:

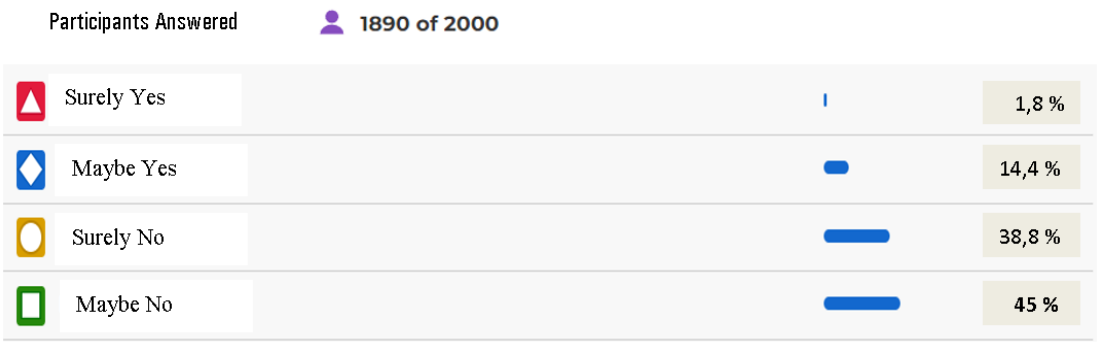
Regarding the feelings that were caused in teachers by the latest developments in AI (chat GPT etc.), the results can probably be characterized as encouraging, as 61.9% of the respondents stated that they are positive: either optimistic (40.9%) or excited (21 %). On the contrary, 38.1% state that feelings of fear (37.3%) and pessimism (0.8%) are dominant. In conclusion, from the responses of the teachers who participated in the research, an important challenge emerges in order to make use of the positive attitude of the majority for the use of AI in everyday school life. On the other hand, special care should be taken in order for a significant part of the community (about 40%) to be informed in depth about issues related to AI.

Q3. In the following years, according to your opinion, the progress in the field of Artificial Intelligence:

In the question about the potential effects of AI on their daily life, the vast majority (78.2%) consider that they will be mostly negative: Reduction of jobs (45.9%) uncontrolled social unrest (22.3%). A quarter of the respondents favors the positive

developments regarding AI and considers that employment will be strengthened. Finally, it is interesting that approximately 6% of the respondents believe that the advent of AI will create a completely different social environment, in the context of which we may not have to work. In conclusion, the vast majority of respondents express strong social concerns which can be characterized as reasonable. Therefore, it is necessary to undertake important information and awareness initiatives in this direction as the issue of the social and humanitarian aspect of AI emerges as dominant.

Q4: Do you believe that in your profession/ field of expertise will the Artificial Intelligence replace you until your retirement?



In the question about the possibility of replacing the teaching profession by AI systems, the vast majority of respondents (83.8%) consider that there is no danger.

Q5. In conclusion when you hear the term artificial intelligence what comes to your mind? Pls write up to 3 keywords*

*It should be noted that the keywords with the highest frequency of occurrence are shown proportionally larger than the keywords with the lowest frequency of occurrence.

Based on the findings in question 5, the vast majority of responses highlight the technological aspect of AI (Robots, Technology, Machines, Neural Networks, Machine Learning, etc.) as the primary focus. A second aspect that emerges concerns social issues (Fear, anxiety, alienation, isolation, etc.). The Third aspect refers to AI considering that it represents the future and evolution and science. Finally distinct is the presence of topics related to ethics, creativity and plagiarism.

5.1.3 Conclusion Remarks of the pilot research

Based on the findings from above the following points could be made:

a. The majority of the members of the educational community who participated in the research, stated that they were, in principle, positive in relation to the advent of AI in their daily lives, but expressed serious reservations and intense social concerns, especially regarding the potential effects both in the social and work environment as well as in their everyday life.

b. A significant lack of information is identified regarding the issues related to the potential effects of AI on their daily lives, which in any case should be addressed immediately with well-planned information and awareness actions, especially with an emphasis on the social aspect.

c. The vast majority of the members of the educational community who participated in the survey consider that the teaching profession is not in danger from the advent of AI. This finding could explain to a certain extent the fact that, while the respondents stated that they do not consider themselves sufficiently informed about the issues related to AI, the majority declare that they have a positive attitude towards it.

d. The technical aspect of AI in combination with the reservations expressed regarding the looming social effects is dominating the representations of the teachers.

5.2 Teachers' views and attitudes towards AI (Bibliographical review)

The integration of artificial intelligence into the educational process depends to a significant extent on the degree of acceptance of its use by teachers, as they will be the ones who will have to apply it in school everyday life (Chen, Zou, Xie, Cheng, Liu, 2022).

It is important to mention that artificial intelligence is something completely new for teachers and it is expected that many, especially without the necessary information, find it difficult to apply artificial intelligence techniques in their lessons (Holstein, 2017).

For this reason, many do not choose to integrate it into their teaching and generally try to avoid any contact (Lin et al., 2017). This fact is apparently a major obstacle to the further development of the use of artificial intelligence in the educational process (Chen, Zou, Xie, Cheng, Liu, 2022).

A significant amount of research has found that existing learning theories are not followed by the educational community; on the contrary, very few theoretical approaches have been applied in school everyday life (Chen, Xie, Zou, Hwang, 2020). It is worth noting that most of the theoretical approaches that have been accepted, to some extent, by the educational community, concern older theories (e.g. behaviourism, knowledge transmission model), which for a field like artificial intelligence in education that is constantly and rapidly evolving becomes an obstacle. The above finding could explain the fact that the application of artificial intelligence is found more in distance education environments (on line learning) and less in live teaching (Chen, Xie, Zou, Hwang, 2020).

One way to enhance teachers' confidence in the use of AI and how it can help the educational process would be to conduct educational experiments aimed at demonstrating that (Chen, Zou, Xie, Cheng, Liu 2022). Unfortunately, however, no such experiments have been implemented that bring positive results (Zawacki – Richter et al., 2019).

According to Chen, Zou, Xie, Cheng and Liu (2022) one way to support the effort of teachers to accept artificial intelligence in education would be to involve teachers in the process of creating the models and systems of artificial intelligence. Of course, it is important to mention that such models and systems are still at a theoretical level.

According to Kay (2012), both researchers and educators find it difficult to integrate relevant IT applications and systems into teaching practice. In order to be able to create a system that has successfully incorporated aspects of artificial intelligence, a perfect collaboration between educators and the creators of these systems is needed as artificial intelligence in the educational process relies to a high degree on both the

technology and the application of educational practices (Hwang, Xie, Wah, Gasevic, 2020).

According to Holstein et al. (2018a) the creation of a vast amount of Intelligent Tutoring Systems (ITS) for many fields in education, especially in a short period of time, would only confuse the educational community even further since the quantity would be great in number.

Additionally, what hinders teachers' acceptance to some extent is the lack of technical support (Chen, Zou, Xie, Cheng, Liu, 2022). As mentioned above, the integration of artificial intelligence in education took place with a rapid pace and is constantly evolving.

Teachers are often unable to keep up with this rapid evolution and unfortunately there is no support to cope with the demands of creating a course using artificial intelligence and applying it to educational practice (Holsten et al., 2018b).

Another important aspect of integrating artificial intelligence into education is the support it provides for the learner. Artificial intelligence can, although not yet fully, adapt the support it provides according to the capabilities and particularities of the student in order to make learning more personal (Chen et al., 2021). This, of course, conflicts with critical issues of personal data of each student, since the artificial intelligence models to adapt the course retain and process sensitive data (Chan & Zary, 2019). This constitutes a major difficulty of integrating artificial intelligence into the educational process as it causes a refusal of acceptance by the educational community (Chen, Zou, Xie, Cheng, Liu 2022), and therefore important moral and ethical issues emerge that need to be addressed immediately.

6. Conclusions - The necessity of designing a holistic pedagogical framework for the introduction of Human-Centered AI in education.

In the context of this writing effort, initially the key points of the evolution of Artificial Intelligence were mentioned, such as the Adaptive Learning Systems and computer – aided teaching systems (CAI).

Subsequently, the interest was focused on the artificial intelligence models, which are still used in the educational progress, such as Intelligent Tutoring Systems, Educational Data – Mining (EDM) systems, Learning Analytics as well as the use of robots.

In recent years, the rapid developments in natural language and Neural networks have contributed the most to the rapid introduction of AI in the educational process. The interest is focused on the creation of advanced AI educational environments which focus on supporting the student to learn at his own pace, in his own space and time and to organize his personal learning path based on his particular needs.

By combining the findings from the international literature review on the acceptance of AI applications among teachers, and the pilot research, which captured the views of the members of the educational community on AI in Greece, an initial framework of actions and actions is proposed with the aim of encouraging the community to critically utilize AI applications in teaching practice.

1. Responsible and essential information to the community (educators, students, parents) about AI (what it is, how it works), focusing on the holistic context of applications in people's lives and everyday life (at work, entertainment, commerce, entertainment, etc.).

Learning is an eminently social process and it would be a methodological mistake to deal with AI applications in education, with the absence of the social and cultural factors. Based on the proposed approach, the introduction of AI in education, under pedagogical conditions, should support in a holistic and critical way the transition to the new era by equipping teachers, students and parents with the required knowledge, skills and attitudes.

Therefore, the first urgent priority is the emergence of the new interdisciplinary framework of knowledge, skills and attitudes that is necessary for the modern citizen in the age of artificial intelligence.

We need not just a survival guide for people but a vision for humanity and education with an emphasis on the universal values of freedom, democracy and social justice.

2. Awareness raising and open dialogue with teachers, students and parents on 2 levels:

- Problems - Anxieties – Fears

Teachers as well as society as a whole are worried and concerned about the potential social effects of the advent of AI in their daily lives (concern about the uncontrolled use / autonomy of AI systems and the replacement of humans by machines and robots, the effects on the working environment, the explosion of unemployment and

the worsening of social inequalities, isolation and alienation, issues of democracy, fundamental rights and personal data of citizens, etc.).

- Challenges - opportunities

A new wonderful world is opening up before us, penetrating with incredible speed and intensity all aspects of the daily life of citizens, the private, public and social sectors (in health, transport, the personalization of services according to the particular needs of social groups as well as individuals people, in education, training, trading, business, fun, entertainment, etc.).

Challenges and opportunities on the one hand, fears and concerns on the other form the puzzle of the new social and economic reality.

Based on the above, the second urgent priority is the highlighting of the social and humanitarian aspect of AI, and the awareness of the educational community of students and parents towards this direction, in order for any initiatives and actions to step on solid ground.

3. Training of teachers regarding the pedagogical utilization of HUMAN-CENTERED AI in education, transforming the perspective, theoretical approaches, means, methods, techniques and required tools.

The emergence of the new pedagogical framework for the utilization of HUMAN-CENTERED AI in education is the third urgent priority. Emphasis should be placed on fostering critical thinking, collaborative inquiry and knowledge building, and encouraging student and teacher creativity.

The role of the student is transformed.

A. As a responsible researcher, either individually or collaboratively, with a sense of social responsibility and an absolute awareness of the importance of observing the rules of morals and ethics in research.

B. As a creator, authoritative, innovative and interactive multimodal content not only through the written and spoken word, but also all forms of art (plastic, performing, practical)

The new role of teachers

It is logical that a new role of teachers should be determined. The model of information transmission and behavioural approaches makes no sense today. We should see the teacher again as a critical friend of the student who will support him

reflectively in the investigation and discovery of knowledge, with an emphasis on encouraging critical thinking, creativity and social responsibility especially in matters of morals and research ethics in the age of Artificial Intelligence.

The construction of a holistic pedagogical framework for the promotion of HUMAN-CENTERED AI as the critical factor in the transformation of educational systems with an emphasis on the collaborative investigation and discovery of knowledge, the cultivation of critical thinking and the liberation of human creativity, is the stake of the new era.

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