Education and training for sustainability. Towards Artificial Intelligence: an exploratory investigation on teachers.

Educazione e formazione per la sostenibilità. Verso l'Intelligenza Artificiale: un'indagine esplorativa sui docenti.

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Abstract

The move towards a future green planet requires that we all learn to live and work in sustainable ways. Teacher professional learning is very important for innovation and sustainability in our education systems. The competent use of Artificial Intelligence (AI) in education is fundamental to achieve some sustainable development objectives through the training of new generations. From our survey of newly appointed teachers (responsible for active citizenship training) emerges the awareness of the role of AI in the ecological transition and in the development of a circular economy, the failure to apply AI in current teaching-training programming and the need to be trained on the use of AI and the risks of its improper use.

Keywords: sustainable development; AI; teachers' educational attitude.

Sintesi

Il passaggio verso un futuro pianeta verde richiede che tutti impariamo a vivere e lavorare in modi sostenibili. L'apprendimento professionale degli insegnanti è molto importante per l'innovazione e la sostenibilità nei nostri sistemi educativi. L'uso competente dell'Intelligenza artificiale (IA) nell'istruzione è fondamentale per raggiungere alcuni obiettivi di sviluppo sostenibile attraverso la formazione delle nuove generazioni. Dalla nostra indagine su docenti neo immessi in ruolo (responsabili della formazione alla cittadinanza attiva) emerge la consapevolezza circa il ruolo dell'IA nella transizione ecologica e nello sviluppo di un'economia circolare, la mancata applicazione dell'IA nella programmazione didattico-formativa corrente e l'esigenza di essere formati sull'utilizzo dell'IA e sui rischi di un utilizzo improprio di essa.

Parole chiave: sviluppo sostenibile; IA; atteggiamento educativo dei docenti.

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[1] Paragraph 1. is to be attributed to M.V. Isidori. The others are common to all the Authors.

1. Introduction

The move to a greener planet requires that we all learn to live and work in more sustainable ways. Teacher professional learning has been identified as one of the most significant catalysts for bringing innovation and sustainability into our education systems, and thus equipping learners to contribute to this transition (Mulà & Tilbury, 2023). The European Union (2022) has adopted a Council Recommendation on learning for the green transition and sustainable development. This formally calls for Learning for Sustainability (LfS) to become a key priority area in education policies and programmes, and for support to be given to educators through training and professional development in this area. Learning for Sustainability is concerned with building the knowledge, skills, values and attitudes to engage with the major issues threatening both people and planet. The Action Plan for Digital Education 2021-2027 (cite), in addition to providing measures for inclusive and high-quality digital education and training, highlights how the use of digital technologies is also fundamental to achieving the objectives of the Green Deal European Union and climate neutrality by 2050. Digital technologies are important tools for the ecological transition, as well as for the transition to a circular economy. Artificial Intelligence (AI) has represented one of the most radical innovations of the 21st century. The role played by innovative technologies has grown progressively in recent years to become an integral part of the educational process (Gocen & Aydemir, 2020; Karsenti, 2019). In 2018, the European Commission proposed a series of actions to promote excellence in AI and ensure accessibility (https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence). In addition, the coordinated plan on AI to tackle the 2021 COVID-19 pandemic focused on the exchange of knowledge and expertise, and developed the collaboration between different networks as well as promoted diversity and inclusion. In 2022, ChatGTP (https://chat.openai.com/auth/login), a text chat developed by OpenAI, was made available. It provides written texts thanks to AI in response to any question you want to ask. What we could call a real revolution achieved through open AI systems, requires us to review the role of teachers and in general the sustainable education and lifelong learning sector. In this respect, the design of training courses for teachers has produced significant changes both in teaching and in the relationship with technologies (Chen, 2019; Tavčar & Horváth, 2019; Marangi, Pasta & Rivoltella, 2022). UNESCO (2021) has always adopted a human-centred approach to promote international dialogue on universal aspects of AI in areas related to education, science, environment, economy, communication and information with a focus on gender equality, sustainable development and digital innovation. The DIG4Future Project (Save the Children, 2023), which sees the participation of four European countries (Italy, Romania, Bulgaria and Greece) intends to invest in the training of secondary school teachers, in the training of operators who carry out educational activities in extracurricular contexts, and in the co-construction of tools and educational paths that respond to the development needs of students and that promote inclusive activities and practices related to Artificial Intelligence. According to the Digital Economy and Society Index (DESI) (EC, 2022), digital transformation is increasingly widespread in Europe. Italy has started the implementation of a series of reforms of the vocational education and training system, which indicates, in line with the above, 50% of the institutions engaged in the use of 4.0 technologies. The Italian Law 92/2019 speaks of digital citizenship education, also known as "Digital citizenship", which means the ability of an individual to consciously and responsibly use virtual means of communication. Between 2021 and 2022, more than 19,000 events were organized. They aimed in particular at primary and secondary school students as part of the national strategy for digital skills. Those initiatives focused mainly on encouraging the development of digital skills in

teachers' professional training. It is therefore essential a specific didactic training for the teaching aimed at evaluating the ethical dimension and the transparency of AI in order to correctly evaluate its effectiveness (Chiu, 2021; Hamal, El Faddouli & Harouni, 2021; Stadelmann, Keuzenkamp, Grabner & Würsch, 2021). Starting from these premises, we carried out a cognitive study about the attitude of the newly appointed teachers, of all orders and degrees, of the schools of the Abruzzo region towards open intelligence systems. In particular, the attitude, the use of artificial intelligence models, tools and applications was investigated, in the context of the digital transition. The aim is to detect – beyond prejudices and opinions of the teachers on the use of AI in favor of the ecological transition – the current uses and applications of AI in educational programming, the possible risks of improper use of some open intelligence systems both by teachers and by learners. This refers to the development of a sustainable society.

2. The sample and the survey

In our survey, the sample is composed of 84 teachers, 91.6% females and the remaining 8.4% males, aged between 26 and 45 years. The survey envisaged the dissemination of an online questionnaire (provided by Google Form) structured with 39 items, divided into the following three sections:

1. section A (ascriptive data): consists of a series of items aimed at detecting gender, age group, education and grade of school in which the teacher serves;
2. section B (impact of AI on daily life): attention was paid to the use of tools, open systems by teachers and their opinions on risks and positive impacts in daily life, circular economy, environmental ecology, so-called digital preconceptions;
3. section C: teachers' opinion about the impact of AI on education and didactic is recorded. The ability of AI to favor (or hinder) the personalization of learning, delivery and strategies of teaching, etc.

3. Results and discussion

The majority of the teachers who participated in the survey have a degree (equal to 78.3% teachers) with a higher incidence of humanities (62.7% teachers). More than half of the participants said they did not have a qualification attesting to skills in the technological field (57.8% teachers). As regards the grade of school in which the subjects serve, the largest segment of the sample is engaged in primary school (34.9%) and upper secondary school (33.7%) (Figure 1).

Training area	% of the sample
Bachelor degree	78.3%
Degree in humanities	62.7%
Technological skills	57.8%
Service at the school of the first cycle of education (kindergarten, primary, lower secondary)	11.9% (kindergarten) + 35.7% (primary) + 19% (lower secondary)
Service at the upper secondary school	33.7%

Figure 1. Descriptive data.

In section B of the questionnaire, attention was paid to tools and systems used by teachers and their opinions on risks and positive impacts in daily life, circular economy, environmental ecology. In our sample, 43.4% of teachers said they use Alexa followed with 34.9% from the use of Siri. There is no doubt that Siri and Alexa have represented a revolution in our daily lives, becoming indispensable tools for our needs. However, today the role and the interest in chatbots becomes central, which seem to flank tools such as Siri and Alexa without replacing them, thus offering an alternative based on text communication. From an analysis conducted by the National Observatory in 2023 about the risks of using AI, the most frequent critical issues are the violation of freedoms (Freedom, 19%); the centralization of financial/technological or cultural resources by Big Tech (Trust, 17%); and privacy problems (11%). In continuity with these aspects, our sample stated that the social, cultural, economic and political risks of AI concern the areas of privacy and data security equal to 67.5% of teachers, followed by the manipulation of information, equal to 45.8% and finally loss of jobs equal to 41%. Our sample then stated that AI had a positive impact on ecological industrial automation (59%), followed by personal services and healthcare (49.4%), production and circular economy (45.8%), transport (38.6%), and finally education and research (36.1%) (Figure 2).

AI elements of positive impact	% of the sample
Ecological industrial automation	59.0%
Personal services and healthcare	49.4%
Production and circular economy	45.8%
Transport	38.6%
Education and research	36.1%

Figure 2. Economic and environmental development: AI impact.

The surveys of the Observatory quoted in fact indicate that the most significant share of the Italian AI market (34%) is inherent in the extraction and analysis of information from data (Intelligent Data Processing). The area of interpretation of language, written or spoken, the so-called Language AI (28%), is also important. In this area there are, for example, Generative AI applications such as ChatGPT or DALL-E2 (https://openai.com/dall-e-2) that are particularly important for potentially inclusive education and equity. About the opinions of our sample, AI is applied in technology and computer science (79.5%), robotics (73.5%), industry (34.9%), medicine (19.3%), services (12%) of teachers. To improve education, in December 2019 in Italy was presented the Italy 2025 Strategy (Italian Ministry for technological innovation and digitalization, 2019), a five-year plan that places digitization and innovation at the center of a process of structural and radical transformation. Among the actions there is also that of supporting the development of digital skills in schools and universities. That said, in section B, regarding the opinion of teachers about the impact of AI specifically on education, 39.8% of our sample is in partial disagreement on the robotization of artificial intelligence in the provision of teaching and evaluation functions and applications. For example, in favor of active and responsible citizenship sensitive to the ecological sustainability of our planet. It is essential to reflect also on the role of teachers and on what skills they should have and on what tools to provide to make them aware of these sustainable innovation processes. Knowing how to orient oneself in a complex reality like today's, means for both teachers and students to be in possession of cognitive, emotional and relational tools, useful for identifying perspectives of action and decision. Finally, compared to the data mentioned above, 54.2% of teachers

claims that AI can support the personalization of educational and didactic programs and therefore favor inclusion processes and equity. The 47% of our sample agree in defining AI as a tool that can allow students to obtain support for study activities (Figure 3). However, about 39.8% of teachers believe that the training and updating paths of teachers in the use of AI in teaching and in the ongoing evaluation of the student's training and profit process are not sufficient to guarantee the best cultural and social opportunities to the new generations. This explains the ambivalent attitude of teachers towards AI summarized in Figure 3.

AI educational and didactic impact	% of the sample
Rrisks of the robotization of AI in the delivery of teaching	39.8%
Risks related to the use of AI by students	43.4%
Support the study activity for students	47%
Support inclusive educational and didactic programs	54.2%

Figure 3. AI education and didactic impact: risks and support.

4. Conclusion

In the current historical-cultural situation, training models for 21st century society cannot fail to deal with the complexity and speed of change, the sustainability of development, the ecological transition. This implies making the ecological transition educationally sustainable through innovation in education, vocational training and higher education systems to address the risk of increasing in social inequalities. Europe must actively contribute to the definition of a model for the development of AI technologies, focusing on human beings and sustainable development (Madhu & WHIG, 2022). The development of AI has become a central theme for the transformation of digital technologies in all industrialized countries, which implies a vision of AI as complementary and functional to human intelligence, rather than as a substitute for it (Al Fararni, Aghoutane, Riffi, Sabri & Yahyaouy, 2020; Kao & Venkatachalam, 2021). Educational robotics and artificial intelligence can be configured as a support to teaching, thus becoming an important contribution to the acquisition of skills in multiple levels of the school system. According to the European Parliament Report on Artificial Intelligence in Education (EP, 2021), AI is radically transforming learning and teaching (Akgun & Greenhow, 2022). Regarding the results relating to the awareness and experience of teachers on the possible uses and applications of digital in educational programming, in particular aimed at sustainable development, it is evident the need to plan training actions so that there is no improper use of AI both by both teachers and students (Luan & Tsai, 2021). The Italian Ministry of Education with the National Recovery and Resilience Plan, Mission 4, has launched a series of initiatives to promote the use of AI in schools (School Plan 4.0), as well as the creation of a National Observatory on Artificial Intelligence in Education. The aim is to promote the research and development of AI technologies for education and the launch of funding calls for research and development projects in this field. In this sense, training in the conscious use of AI is one of the strategic actions for the ecological transition.

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