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ARTIFICIAL INTELLIGENCE AND SOCIAL-EMOTIONAL LEARNING: WHAT RELATIONSHIP?

"*Hoc volo, sic iubeo, sit pro ratione voluntas*"

Iuvenal, Satire VI, 23.

Abstract

Artificial Intelligence (AI) and Social-Emotional Learning (SEL) are two seemingly distinct fields, but in recent years they have begun to converge in interesting and potentially transformative ways, especially in the educational context. Artificial intelligence can play a key role in teaching social-emotional skills, helping students develop skills such as empathy, self-management, social awareness, and effective interpersonal relationships. AI platforms can create simulated or interactive scenarios that allow students to practise managing complex social situations. One of the strengths of AI is its ability to customise learning according to individual needs and progress. In the context of SEL, this means that AI can analyse data on students (such as their responses to emotional awareness exercises or the results of simulated social interactions) and offer customised learning paths to develop specific skills, such as emotional regulation or stress management.

Keywords: *education, artificial intelligence, social emotional learning, robotics, sell skills*

Thinking about education through AI

The use of social robots in education is becoming more and more widespread, as they support students in learning and acquiring better knowledge and skills, especially thanks to interactive functions that make teaching more engaging and motivating. Some of these robots are even able to recognise the age and gender of those in front of them, picking up on emotions and planning responses based on the situation and stimuli. In fact, educational robotics is a didactic tool that, in addition to its purely formative value, i.e. the support it can offer the teacher, also has a direct learning function. If, on the one hand, the robot 'teaches' through a transmissive didactics, on the other, students and teachers become protagonists in the teaching-learning process through a creative, laboratory, constructive didactics insofar as they are able to study the multiple functions of these devices (software, algorithm, physical components, etc.) and apply them in everyday life (Panciroli, Rivoltella, 2023). It is precisely robots that combine doing with thinking, e.g. coding is a method, a practice for experimenting with different opportunities, facilitating teamwork, teaming up and promoting the inclusion of the most fragile (Benevento, 2023, p.127).

A Council of Europe document 'Education for Citizenship in the Digital Age' (Committee of Ministers of Education of the Member States of the Council of Europe 2019) notes the profound impact of new technologies on our lives, society, educational systems, freedom of expression and the possibility of participation, affirming the importance of governing artificial intelligence processes based on fundamental values and principles of fairness, so that all stakeholders involved respect the rule of law and democratic dynamics.

Discussing artificial intelligence education involves: 'accessing AI systems properly and questioning their role and meaning in our lives. Reflecting on how systems are designed and used in an inclusive manner. To concretely project the use of AI systems and devices in school-educational paths that stimulate users' creativity (Panciroli, Rivoltella, 2023, pp. 110-114). Apply forms of critical thinking on everything related to AI, stimulating students not to settle for simplified or superficial explanations and pushing them to investigate and make more conscious choices. Designing, using, reading and interpreting the results of AI systems in an ethical manner that is attentive to the human relationship with the other: asking what we do with the information, why we use the devices, why we leave some tasks to the machines and others not. Demystifying machines, showing what is in them, taking away their infallibility. Use AI systems in a respectful manner for their own and others' well-being, respecting privacy and online security. Make more conscious and informed business choices than the economic models that drive most people. Encouraging users, even as children, to ask where these devices come from, who makes them, why, how to use them or not' (Ferraria, Macauda, Sorianic, Russo, 2020, pp. 81-82). The opportunities offered by these artificial intelligence tools are manifold. In distance learning, based on the use of the Web, teachers can act as builders of new courses and facilitators of learning, guiding the student through new educational experiences, think for example of Learning Management Systems, they can help the teacher to build courses in which personalised learning levels are possible (Limongelli, De Medio, Elsayed, Gasparetti, Sciarrone,Temperini, 2023, pp.73-74). A recent study has shown that the Web is a good source of teaching material compared to the repositories currently available in education (De Medio, Limongelli, Marani &Taibi, 2019, pp. 28-38), let us think of *Wikipedia* as an undisputed

source of information for everyone, especially students and teachers. Even in 2005, an in-depth study compared *Wikipedia* with the British encyclopaedia, showing the same percentage of accuracy of information (Limongelli, De Medio, Elsayed, Gasparetti, Sciarrone, Temperini, 2023, p. 76). What is certain is that this enormous wealth of information cannot be unquestionably assumed to be true and could be risky for students who think they can self-learn just by browsing Wikipedia pages. It is different for teachers who can be supported in their educational research by having in mind what the objective of their research is (Ibid.). The web-based system (De Medio, Gasparetti, Limongelli & Sciarrone, 2017) *Wiki Course Builder* allows the user to enter one or more keywords regarding the topic he or she is working on and the search engine returns the most relevant pages to the user based on the keywords entered.

If the computer is used as a tool to transmit knowledge, the main objective is to foster active, collaborative learning, whereby the child must programme the computer and not the other way around, i.e. the computer programmes the child (Papert, 1994). Children learn best if their knowledge is made up of gradual explorations in which on their own and without pre-established schemes they can construct their own projects, try out schemes, manipulate notions and ideas. This knowledge process starts from the concept of 'computational thinking', i.e. the possibility of identifying a specific constructive procedure made up of simple steps that leads to the resolution of complex problems (Benevento, 2023, pp. 126-127). The author of the text *The ex-machine world. Five short lessons in the philosophy of automation* (Accoto, 2019), invites the reader to dwell on the frenetic flow of technological innovation in which we are immersed and reflect on the impact of AI and the technologies it reflects on humans. The future, according to Accoto, 'will be automatic or it will not be' and this means that humanity is faced with a great challenge, namely to realise a world in which automation reflects and sustains human values (Ibid.). The origin and evolution of the human-machine relationship is discussed by the author by paying attention to the philosophical interpretation of the new capabilities that data-based technologies confer on new machines (Agrusti, 2023 p. 26). Artificial intelligence may prove useful when it becomes a valid collaborator of man without being able to replace him in those functions

related to emotion and feeling, which are exclusive characteristics of the person. If artificial intelligence is designed to flank and assist man in various tasks, it must certainly not happen that these take over from the human being and replace him completely. In order to prevent this from happening in the not too distant future, it is certainly necessary to start with the school, which has and will have a central role with structured training in technology with a training plan that can involve students and teachers in order to make them aware of and take advantage of it (Ferraria, Macauda, Sorianic, Russo, 2020, p. 82). In this regard, the philosopher Pessina invites us to 'oversee our own destiny' and this means that there are aspects of the technological revolution that are not directly in our possession because, as users and consumers of technological products, we are not its authors and promoters, but it is also true that 'overseeing our own destiny' also indicates a 'critical' attitude that depends on us, and that concerns the possibility of understanding and evaluating our experience, mediated, filtered, conditioned and enlarged by new technologies (Pessina, 2023; Elliott, 2021).

Artificial intelligence systems and educational robotics

There are more and more research platforms for computational thinking. Most of these, however, are aimed at high school students and none are designed for children under the age of 7. These curricula include *Cognimates, Machine Learning for Kids, Calypso for Cozmo, ReadyAI's AI-in-a-Box, Snap! AI Extensions and Teachable Machine* (Kahn et al., pp.3-6, 2018). They leverage artificial intelligence engines to enable hands-on projects. However, none of these platforms teach young people to use them with awareness, encouraging critical awareness and creativity (Ali, Payne, Williams , Wo Park, Breazeal, 2019, p.1).

In today's society, it is imperative that children understand the proper use of artificial intelligence. For this reason, many scholars have deemed it necessary to include the acquisition of knowledge and skills regarding the use of these devices in the school curriculum, even in university degree courses (Skirpan, Beard, Bhaduri, Fiesler, & Yeh, 2018, pp 940-945).

Students as early as adolescence are ready to grapple with ethics and reasoning (Floridi, 2019; Rasetti, 2018, pp 8-9); in fact, Kohlberg's theory of moral development tells us that children between the ages of 10 and 13 are capable of critical reasoning (Kohlberg & Hersh; 1977; 53-59).

In computational thinking education, students are constantly engaged in problem solving. This increases the importance of promoting children's ability to think creatively. In 1968, Torrance (pp. 195-199) found that the creativity of students around the world begins to decline around the age of 6 and then plummets further around the age of 9. One of the reasons for the collapse of creativity and imagination in children is precisely the over-structuring of school curricula and the lack of play-based learning activities in educational practices (Oliveira, Arriaga, Paiva & Hoffman, 2017, pp.423-429). Therefore, the goal we should strive for is to help children develop a creative and critical mindset through interaction with a robot. Robots are increasingly being used in education and have proven to be effective guides for effective learning (Belpaeme, Kennedy, Ramachandran, Scassellati & Tanaka, 2018)[1]. Social robots, in particular, have previously been used as learning tools to promote positive behaviours, such as curiosity(Gordon, Breazeal & Engel, 2015, pp. 91-98) growth mindset (Won Park, Kima, Rosenberg, Gordon, & Breazeal, 2017; pp. 137-140). In some of these studies, scholar Park (Ibid.) demonstrated how a robot that exhibits curiosity can lead children to engage in these behaviours in later tasks. It is clear that if a robot exhibits creative thinking, it can help promote creativity as a learning behaviour in young children. AI can create customised learning experiences, adapting to the specific needs of each student. For example, VEX 123 is an interactive, programmable robot that offers an experiential approach to learning. Students can see the content presented in an engaging and relevant way. Working with VEX 123, students learn to communicate with each other, collaborate and use critical thinking. One of the main advantages is that VEX 123 transfers computer science from the screen to reality, actively involving students. For example, students sequence button presses to make the robot move along a drawn path, experiencing both positive and negative emotions during the process. Through trial and error, they eventually reach their goal and experience the satisfaction of such an achievement. Furthermore, VEX 123 incorporates the SEL aspect

into the curriculum, e.g. through 'Act' commands that make the robot act in a way that expresses specific emotions, offering opportunities for discussion of emotional expressions, providing immediate and targeted feedback, helping students to better understand their own emotions and develop emotional awareness.

Artificial intelligence and SEL skills in contemporary society

Attention to non-cognitive skills is a fundamental step in achieving a school that is inclusive and attentive to the needs of each child. Non-cognitive skills can be an effective tool to reduce inequalities and functional illiteracy, but also to achieve the goal of an inclusive and fairer school. Socio-emotional competences must have relevance in school and are important because they have a reciprocal influence on the development of thinking, fostering the formation of a sense of self and identity, as well as having an important communicative function.

Emotionally competent people know how to manage their emotions, including negative ones, developing not only the capacity for empathy, but also resilience and thus being emotionally intelligent (Goleman, 2006, pp. 76-81; Birbes, 2019, pp.89-99).

Developing social-emotional skills means first and foremost recognising one's own and others' emotions, becoming literate and acting rationally rather than reacting impulsively in solving problems. The interconnections between SEL and AI are of great interest in the contemporary landscape of research into interventions that can foster, through the use of educational robots, the development of social-emotional skills. In fact, most students with learning difficulties often also present difficulties in social relationships, particularly in recognising emotions in themselves and others, understanding emotions, recognising emotional pathways, navigating emotions, finding intrinsic motivation, exercising optimism, using sequential thinking, growing empathy, and regulating and managing strong emotions (both positive and negative) (Elias,2004, pp.113-134).

Learning within a classroom derives not only from the teacher-learner relationship, understood as the mere transmission of knowledge, but from the complex emotional and motivational interaction that is created in the group.

Improving group dynamics, supporting pro-social attitudes, not only serves to prevent crisis situations, but also to significantly improve our students' learning. Socio-emotional education stands out, in the face of youth discomfort and disorientation, as one of the fundamental aspects for promoting positive pupils precisely as a preventive measure against behaviour, especially deviant behaviour.

In fact, the socio-emotional dimension has always been emphasised in nursery and primary schools, while little attention has been paid to it in secondary schools, in favour of greater development of cognitive skills. But we know very well that in adolescence, by virtue of the supremacy of the limbic system, the adolescent can develop, even in response to normal life events, the phenomenon of 'emotional sequestration' in which the amygdala gets the better of the pre-frontal cortex and the acted over the thought. This can account for the most varied behaviour in adolescents, from tardiness, unjustified absences in school to aggressive or gang-like behaviour that results in bullying, but also in more complex discourses (from reduced development of cognitive and intellectual capacities) that can result in psychopathology as well as in school failure. With this in mind, we believe it is important to teach adolescents to be aware of their emotions, 'mindsight' and educate them to act rather than 're-act' (Siegel, 2014)[2].

The acquisition of SEL skills (Durlak et al., 2011, pp. 405-432) must stimulate in the young person:

- Self-awareness i.e. understanding one's own emotions, strengths and weaknesses, hence the need for the teacher to work on meta-emotions, thought-emotion-behaviour triangulation;
- Social awareness and the ability to relate, teaching to understand diversity, behavioural codes from different cultures and ethnic groups or simply from those who are other than oneself; the school must teach collaboration and listening;
- Managing primary emotions and impulses, for reasons described above, pre-adolescents have less ability to control and process emotions and impulsiveness often prevails over reasoned decision-making (by virtue of an undeveloped pre-frontal cortex); teachers must teach to stop and reason before acting;

- Responsibility in problem solving and decision making, learners need to be taught and honed skills in identifying problems, making responsible decisions with respect to social values and mutual benefit, while developing reflective skills on the moral consequences of decisions made.

The proper development of these areas leads to an overall improvement in learning and relationships between teachers and learners and peers with each other with the effect of improving academic performance, student well-being and ultimately preventing risky behaviour.

Ultimately, we can say that AI can help teachers in their work by facilitating the identification of suitable strategies to foster and develop social-emotional competences in students. It can also help to broaden and achieve that vision suitable for understanding and fostering school inclusion, which is the goal to be achieved (Rivoltella, 2014).

It must also be emphasised that training and refresher courses are needed to use robotics correctly, to assist schools in their choice of aid and to train teachers in the acquisition of skills or teaching practices that make its use effective.

References

Accoto, C. (2019). Il mondo ex-machina. Cinque brevi lezioni di filosofia dell'automazione. Milano: Egea.

Ali, S., Payne, B.H., Williams, R., Wo Park, H., Breazeal, C. (2019). Constructionism, Ethics, and Creativity: Developing Primary and Middle School Artificial Intelligence Education. In MIT Media Lab: Cambridge.

Belpaeme, T., Kennedy, J., Ramachandran, A., Scassellati, B., & Tanaka, F. (2018). Social robots for education: A review. In Science Robotics, 3(21).

Benevento, A. (2023). L'intelligenza artificiale serve alla formazione dei giovani?, in F. Agrusti (ed), Educazione e Intelligenza Artificiale, Educazione e Intelligenza Artificiale. TrE-Press: Roma, pp. 126-127.

Birbes, C. (2019). Ripensare l'educazione in un pianeta che cambia. Sviluppo sostenibile, povertà, resilienza. In Orientamenti pedagogici, 1, pp. 89-99.

De Medio, C., Gasparetti, F., Limongelli, C. & Sciarrone F. (2017). Automatic extraction and sequencing of wikipedia pages for smart course building. In 21st International Conference Information Visualisation, IV.

De Medio, C., Limongelli, C., Marani, A. & Taibi, D. (2019). Retrievalof Educational Resources from the Web: A Comparison Between Google and Online Educational Repositories. Advances in Web-Based Learning – ICWL 2019. 118441 LNCS, Springer, pp. 28-38.

Durlak, J.A. et al. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. In Society Research in Child Development, 82 (1), pp. 405-432.

Elias, M.J. (2004). Strategies to Infuse Social and Emotional Learning into Academics. In JE. Zins, RP. Weissberg, MC. Wang e HJ. Walberg (ed), Building academic success on social and emotional learning: What does the research say? , Teachers College Press, pp.113-134.

Elliott, A. (2021). La cultura dell'intelligenza artificiale. Vita quotidiana e rivoluzione digitale. Torino: Codice Edizioni.

Ferraria, L., Macauda, A., Sorianic, A., Russo, V. (2020). Robotica educativa ed educazione all'IA: quali priorità per la scuola. In Form@re, n. 3, pp. 81-82.

Floridi, L. (2019). Consapevolezza per un'etica dell'intelligenza artificiale. In Il Sole 24 ore, 13.01.2019.

Grądzki, W. (2021). Portal edukacyjny szansą rozwoju zdalnej edukacji. In Lukasek A, Fidelus A, eds, Funkcjonowanie dziecka we współczesnym świecie. Współpraca z rodziną. Wyzwania, zagrożenia, perspektywy, 137-150. doi:10.13166/WSGE/Ped/LOWU2257. Wyd. WSGE.

Goleman, D. (2006). The Socially Intelligent Leader. In Educational Leadership, 64, 1, pp. 76-81.

Gordon, G., Breazeal, C., & Engel, S. (2015). Can children catch curiosity from a social robot? In Proceedings of the Tenth Annual ACM/IEEE International Conference on Human-Robot Interaction, pp. 91–98. ACM.

Kahn, K. et al. (2018). AI programming by children using snap! block programming in a developing country. In ECTEL Practitioner Proceedings 2018: 13th European Conference On Technology Enhanced Learning, Leeds, UK, September 3-6.
Kohlberg, L. & Hersh, R.H. (1977). Moral development: A review of the theory. Theory into practice, 16(2):53–59.
Limongelli, C., De Medio, C., Elsayed, O., Gasparetti, F., Sciarrone, F., Temperini, M. (2023). Sistemi intelligenti per l'e-learning. In F. Agrusti (ed), Educazione e Intelligenza Artificiale. TrE-Press: Roma pp. 73-74.
Malavasi, P. (2019). Educare robot? Pedagogia dell'intelligenza artificiale. Milano: Vita e Pensiero.
Oliveira, P.A., Arriaga, P., Paiva,, A. & Hoffman, G. (2017). YOLO, a robot for creativity: A co-design study with children. In Proceedings of the 2017 Conference on Interaction Design and Children, pp. 423–429. ACM.
Panciroli, C., Rivoltella, P.C. (2023). Pedagogia algoritmica. Per una riflessione educativa sull'intelligenza artificiale. Brescia: Morcelliana.
Papert, S. (1994). I bambini e il computer. Nuove idee per i nuovi strumenti dell'educazione. Bologna: Rizzoli.
Paul Torrance, E. (1968). A Longitudinal Examination of the Fourth Grade Slump in Creativity. Published in Gifted Child Quarterly 12(4):195–199.
Pessina, A. (2023). L'essere altrove. L'esperienza umana nell'epoca dell'intelligenza artificiale. Milano: Mimesis.
Rasetti, M. (2018). Tra l'uomo e l'intelligenza artificiale c'è una sola sfida: ed è etica, non tecnologica. In Milano Finanza, 242, pp. 8-9.
Rivoltella, P.C. (2014). (ed). Smart future. Didattica media digitali e inclusione. Milano: Franco Angeli.
Siegel, D.J. (2014). La mente adolescente. Milano: Raffaello Cortina.
Skirpan, M, Beard, N., Bhaduri, S., Fiesler, C. & Yeh, T. (2018). Ethics education in context: A case study of novel ethics activities for the classroom. In Proceedings of the 49th ACM Technical Symposium on Computer Science Education, pp. 940–945. ACM.
Won Park, H., Kima, R.R., Rosenberg, M., Gordon, G. & Breazeal, C. (2017). Growing growth mindset with a social robot peer. In 12th ACM/IEEE International Conference on Human Robot Interaction (HRI), pp. 137–14.

Endnotes

[1] On this issue see also P. Malavasi, *Educare robot? Pedagogy of Artificial Intelligence*, Vita e Pensiero, Milan 2019. In this text, the author forces us to question ourselves on the limits and potential of machines and algorithms and thus on the responsibilities of our choices and their effects, particularly in the field of education. This means that the digital pervasiveness is such in our time that it is unthinkable to interpret its logic without an adequate pedagogical awareness, which can certainly be positive in addressing educational needs and social fragilities, inequalities and poverty.

[2] In this essay, Siegel, an internationally renowned psychiatrist, describes how adolescent behaviour is influenced by intense brain development.