

ADOLESCENCIA, INTELIGENCIA ARTIFICIAL Y SU INTEGRACIÓN EN LOS CENTROS EDUCATIVOS: REVISIÓN BIBLIOGRÁFICA.

TEENAGERS, ARTIFICIAL INTELLIGENCE, AND ITS INTEGRATION INTO EDUCATION CENTERS: A LITERATURE REVIEW.

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Resumen

La Inteligencia Artificial (IA) ha emergido con fuerza en la última década. En el presente artículo se ha realizado una búsqueda bibliográfica del impacto de la IA en la adolescencia, y casos de integración de esta tecnología en los centros

educativos. Se debe juzgar esta herramienta de una forma objetiva reconociendo tanto sus beneficios como sus perjuicios. En el adolescente puede contribuir en su desarrollo al facilitar técnicas de comunicación, apoyar estrategias de bienestar y ofrecer oportunidades de aprendizaje, pero conlleva riesgos al disminuir las relaciones sociales, fomentar conductas peligrosas o reducir el pensamiento crítico. La integración de la IA en contextos educativos puede ayudar a la personalización del aprendizaje, el fomento de la autonomía, desarrollo de competencias técnicas de escritura o mejora de las habilidades sociales y emocionales del estudiantado. Su integración en los centros requiere un marco ético, una supervisión adecuada y una alfabetización digital del profesorado. El avance de la IA es inevitable, no podemos renegar de su uso en nuestra vida cotidiana ni en el sistema educativo, por ello, es necesario actualizar los métodos de enseñanza, con el objetivo de integrar esta herramienta, y aumentar los estudios sobre el efecto de la IA en los adolescentes.

Palabras clave: *Inteligencia Artificial, Educación, Procesos Cognitivos, Métodos Educativos.*

Abstract

Artificial intelligence (AI) has emerged strongly in the last decade. This article conducts a literature review of the impact of AI on adolescents and explores cases of the integration of this technology in education centers. This tool must be evaluated objectively, recognizing both its benefits and drawbacks. In adolescents, it can contribute to their development by facilitating communication techniques, supporting well-being strategies, and offering learning opportunities, but it carries risks by diminishing social relationships, encouraging dangerous behaviors, or reducing critical thinking. The integration of AI in educational contexts can help personalize learning, foster autonomy, develop technical writing skills, or improve students' social and emotional skills. Its integration in schools requires an ethical framework, adequate supervision, and digital literacy among teachers. The advancement of AI is inevitable; we cannot deny its use in our daily lives or in the

educational system. Therefore, it is necessary to update teaching methods with the aim of integrating this tool and to increase research on the impact of AI on adolescents.

Keywords: *Artificial Intelligence, Education, Cognitive Processes, Education Methods.*

1. INTRODUCTION

Adolescence is defined as the transitional period between childhood and adulthood (Berger, 2007) and involves physical, intellectual, psychological, and social changes (Alsinet et al., 2003). It is a sensitive stage during which the adolescent learns to define their own identity (Motrico et al., 2001) and where support networks are essential for healthy personal development and well-being (Oliveira et al., 2025). Essentially, three main support networks can be identified: friendships, family, and school, all of which have a direct impact on an adolescent's future expectations and self-concept (A. O. Delgado, 2015). Furthermore, historical circumstances, together with technological advances, shape the context surrounding adolescents, influencing the way they interact with their support networks.

In this regard, adolescents have undergone significant changes in how they relate to their support networks as a result of technological advances. The emergence of social media platforms has brought about a shift in peer relationships (Vanderhoven et al., 2014), with mobile phones becoming a means of remaining permanently connected to these networks.

New technologies have forced us to adapt to them at a rapid pace, as they have now become essential elements in the daily lives of most people. Within this context of continuous change and adaptation to technology, a new technological advancement has emerged—one that promises to be revolutionary and to permanently transform the way adolescents learn, and educational institutions teach: artificial intelligence (AI). However, it is necessary to examine whether AI will indeed have such a significant impact, as well as the potential consequences its use may have on adolescents.

With this in mind, the present article will provide a review of how AI has altered the way adolescents interact with their schools, and the effect it may have on their interpersonal and intrapersonal development.

2. Artificial Intelligence

In 2018, the European Commission of Experts defined artificial intelligence (AI) as systems capable of analysing their environment and taking action accordingly, thereby demonstrating intelligent behaviour (Fernández, 2024). La IA lleva presente desde finales del siglo XX, cuando la tecnología desarrollada por IBM (Deep Blue) logró ganar al campeón mundial de ajedrez Gary Kasparov en 1997. AI has been present since the late 20th century, when IBM's technology *Deep Blue* managed to defeat the world chess champion Garry Kasparov in 1997 (Blikstein, 2018). However, it was the company OpenAI that, in 2022, introduced AI to a wider, non-specialist audience with the launch of the chatbot ChatGPT. This technological revolution has not occurred by chance; it has reached its peak over the past decade, with investment in AI rising from 400 million dollars in 2017 to a projected 20 billion dollars by 2027 (Pham & Sampson, 2022).

Since its launch and positive reception by the public, artificial intelligence (AI) has continued to evolve and expand into an ever-growing range of fields. In addition to AI being used as a chatbot through ChatGPT, there are AI tools that can: generate images from text (DALL-E 2), create videos (Pictory), optimise productivity (Timely), generate voice (MurfAI), simulate conversations (Ada), assist in code generation (Debuild), or produce long-form written content (Copy.ai), among other functions.

Such a powerful tool demands regulation to ensure the privacy and safety of its users. For this reason, the European Union has developed the Regulation of the European Parliament and of the Council establishing harmonised rules on artificial intelligence, amending certain legislative acts of the European Union—commonly known as the “AI Act” (Regulation EU 2024/1689). This legislation seeks to minimise risks, prohibit unacceptable and unethical applications of AI, guarantee transparency in the use and management of data, and define the legislative bodies, sanctions, and responsibilities in cases of non-compliance.

Each individual will make use of the AI tool that best suits their daily tasks: programmers will tend to use tools that allow them to generate or correct code; business professionals will prefer those that optimise processes and productivity; and casual users will turn to tools such as chatbots (e.g., ChatGPT) for conversations, reflections, or everyday questions. Recent research suggests that AI can be a valuable aid to the education sector. Ramos (2025) proposes that teachers use AI to carry out tasks such as planning, assessment, marking, and administrative management. This would save time on repetitive tasks, allowing more time to be devoted to the design of high-value pedagogical activities.

Similarly, Aguilar and García (2025) propose the use of AI by educational inspectors to optimise time through the automation of reports, document summaries, and regulations. They also suggest its use for predicting school failure.

It has been shown that the integration of AI in the education sector involves using it to optimise repetitive tasks, so that more time can be devoted to tasks of greater value and impact. However, we must not forget the other key players in the education system, the students, how can they use AI, and does its use have consequences for their development? How can AI be integrated in the classroom?

3. Effects of AI on adolescents

Ruiz-Ortega and Berrios-Martos., (2023) note that adolescents face numerous challenges that affect them socially, emotionally, and cognitively. Reynaga et al., (2020), attribute many of these difficulties to the inconsistency in the maturation of executive functions, as their development is approaching adult levels but remains incomplete at this stage of growth. This may be the origin of some difficulties in the construction of their identity, in their social interaction and makes mental health in this period particularly sensitive.

In this context, the presence of AI is a factor of great influence today, whose long-term use raises questions about how it can affect human beings at any stage of life, but, due to the evolutionary characteristics of this period, it poses a greater challenge to be faced in adolescence.

There are few studies that show the consequences of continued use of AI, but we can find small studies that reveal complex results, not all of which are good and not all of which are bad. When judging the impact of AI on the development of individuals, we must include factors such as specific application, characteristics of the tool, data used to train the system and the context of use of these technologies (Health Advisory, 2025).

a. Social scope

Gómez-León (2022) suggests that the appropriate use of this tool could activate social schemas, behaviours, and emotions that contribute to the development of effective communication and conflict resolution skills. Additionally, Kulesa et al. (2025) state that AI can currently provide functions such as real-time monitoring of facial expressions and tone of voice, personalised instructions, reflective exercises, or the creation of synthetic characters that expose students to different perspectives, thereby fostering empathy and cultural awareness.

Despite these benefits, potential negative effects on adolescents' social development have been raised. There is a potential risk that continued use of AI could increase isolation and reduce social interactions. Unlike social media, adolescents may not fully understand what it truly means to use AI or how it impacts their daily lives. Prolonged use has been associated with increased loneliness, dependency, problematic usage, and lower social skills. Furthermore, chatbots, being excessively agreeable, may reinforce absolute beliefs rather than challenge them, and consequently, affirm harmful social behaviours, such as spreading hateful messages or engaging in risky practices (Kulesa et al., 2025).

b. Emotional scope

AI holds significant potential for the early detection of mental health disorders, as it can analyse patterns and health data that provide insights into an adolescent's emotional or cognitive state. Additionally, chatbots can offer guided conversations addressing specific problems, breathing exercises, stress

management tips, or the reframing of negative thoughts—all based on evidence from established mental health techniques.

Nevertheless, its use in this area must be approached with particular caution, as improper application can pose serious risks. According to Henriksen et al., (2025), some of these risks include emotional manipulation, consent issues regarding data access, psychological impact, and cognitive biases.

Moreover, using AI without proper safety measures can reinforce delusional content. Chatbots, being overly flattering, may increase user susceptibility, undermine reality testing, and contribute to the onset or worsening of psychotic symptoms. They could also reinforce and exacerbate suicidal ideation (Morrin et al., 2025).

In this regard, the use of AI systems to seek psychological support and help has increased significantly, often overlooking the risks associated with its use. Users may be misled into believing they are receiving genuine therapeutic services (Henriksen et al., 2025). It is important to understand that AI lacks emotional awareness and a real-world understanding, as it relies entirely on data analysis and is therefore limited in its ability to interpret complex interpersonal nuances (Tuomi, 2022). This tool cannot distinguish prompts expressing delusional beliefs from artistic, spiritual, symbolic, or speculative beliefs (Morrin et al., 2025). Consequently, human judgment in mental health care remains a critical factor that must never be disregarded. Some authors suggest involving clinical teams in the development of a digital plan to ensure the safe use of AI.

c. Cognitive score

Kulesa et al. (2025), highlight the enhancing role of AI in cognition and creativity. This tool can support cognitive components such as memory and information processing by providing strategies for practice in recall, spaced repetition, or alternation. However, it could reduce the level of cognitive effort required to encode and learn information, as it provides immediate answers or summaries. Similarly, AI can support attention by adjusting content in terms of difficulty and format, but it may also prioritise instant gratification and

entertainment. AI can boost motivation through personalised challenges, yet it may hinder the development of adaptability and resilience.

Additionally, this technology can promote metacognition and self-regulation by generating self-reflection guides and tools to calibrate understanding of one's own abilities. Nevertheless, it could reduce the autonomous development of these skills by diminishing practice and confidence in personal performance. Regarding creativity, AI can assist in generating and suggesting ideas, but it may make the task less satisfying and constrain students in the creative process.

As we can see, the use of AI in this domain presents dualities, but many authors emphasise the potential impact on critical thinking. They warn of risks such as excessive dependence and weakened independent thought. Therefore, students must learn how to train AI to provide well-founded responses and critically evaluate the quality and reliability of the results. Even when individuals develop this skill, another negative factor is their perception of technology. If they believe AI possesses capabilities such as intellectual curiosity, open-mindedness, or superior systematisation, they are less likely to exercise their own critical judgment, thereby losing opportunities for learning and reflection (Oliveira et al., 2025).

Ultimately, it is crucial that we ensure that AI is used as a cognitive amplifier and not as a replacement for critical analysis.

4. AI in schools

Schools are educational institutions aimed at transmitting theoretical knowledge to students from different disciplines. In addition to academic education, they provide social and cultural education. In secondary schools, Royal Decree 217/2022 establishes the organisation and minimum teaching requirements for Compulsory Secondary Education. It is worth noting that it establishes a profile with which pupils should leave this stage, among them, it describes that pupils should be able to critically analyse and take advantage of the opportunities of all kinds offered by today's society, particularly those of culture in the digital era, evaluating their benefits and risks and making an ethical and

responsible use that contributes to the improvement of the quality of personal and collective life. AI undoubtedly falls within this ability. However, as described above, the use of this tool can entail dangers in the development of adolescents, so how can the educational centre teach adolescents to use this tool appropriately?

On one hand, there is a natural resistance among teachers to teaching and applying this tool. In compulsory secondary education, the improper use of AI is a particular concern for educators (Delgado et al., 2024), as it could be used to complete exams, assignments, presentations, and so on. However, other studies, such as the one conducted by Lee et al., (2024) in the United States on the influence of AI on student cheating behaviours, indicate that the advent of AI has not led to a significant increase in illicit actions in secondary education; in other words, there was no notable rise in the number of students cheating before and after the introduction of AI.

On the other hand, compulsory secondary education is also seen as a context in which the application of AI can be very beneficial for the creation of resources and materials (Delgado et al., 2024). Furthermore, teaching AI to adolescents is essential to promote good practices, responsible use, and ethical use. In this way, students can learn to make the most of AI in educational settings and in their daily lives.

One of the main achievements of AI in educational contexts has been its ability to personalise learning and foster student autonomy. In various international projects, such as the use of Khanmigo in the United States or ChatGPT-based platforms in Asia, students have improved their critical thinking and their capacity to plan and evaluate their own learning (Alamäki et al., 2024). These tools provide adaptive tutoring that adjusts the difficulty level according to the student's progress, promoting metacognition and the resolution of complex problems (Daniel et al., 2025).

Schools could incorporate AI tutoring systems in subjects such as Mathematics, Spanish or English, in addition to face-to-face teaching. The controlled use of conversational assistants, together with personal reflection rubrics, would allow students to improve their understanding and self-management of learning without replacing the role of the teacher. In addition, AI could be integrated into Reading Plans and diversity programmes, offering individualised support to students with different learning paces.

Schools in the UK and Canada have demonstrated the success of AI in developing technical writing skills and data analysis. Tools such as *Grammarly*, *Write* and *Improve* or AI editors integrate immediate feedback on grammar, coherence and argument structure. Likewise, the use of AI-enabled virtual labs, such as *Labster* or *PhET*, has boosted scientific skills, allowing students to practice experimental procedures in simulated and safe environments (Daniel et al., 2025; García-Tudela et al., 2023).

It is recommended that these technologies be included in the digital competence programmes for teachers and in the regional education innovation plans. In the classroom, writing assistants could be used for writing projects or for learning English, always under teacher review. In STEM, virtual labs with AI can be integrated into Physics and Chemistry or Biology to reinforce the practical curriculum and compensate for equipment limitations. In addition, AI can be used as a tool to support formative assessment, allowing early diagnosis of student progress.

AI has also shown promising results in improving social and emotional skills. In Nordic and Asian countries, collaborative learning platforms have been developed where intelligent chatbots mediate discussions or group work, helping to improve communication and empathy among peers (Ilieva et al., 2023). These systems promote cooperation, work organisation and ethical reflection on the use of technology.

Mentoring and values education programmes could integrate AI-mediated activities that foster assertive communication, teamwork and critical thinking about algorithms. It is also advisable to include ethical and digital literacy modules in technology and values education curricula, where students learn to use AI responsibly, avoiding bias, misinformation or technological dependence.

The application of AI in secondary education is not intended to replace teachers, but to enhance their ability to personalise, assess and motivate learning. International experience shows that, when used with a clear ethical framework and adequate teacher supervision, AI can simultaneously strengthen students' cognitive, technical and interpersonal skills. In the Spanish context, its gradual implementation, integrated into digitisation plans and accompanied by specific teacher training, offers an opportunity to move towards a more inclusive and flexible educational model adapted to the challenges of the 21st century.

Finally, as indicated by the researcher Jaya., (2024), critical digital literacy must be fostered to reflect on the impact of technology on society, the community and the individual's life.

5. Conclusions

The world is moving in a direction where resisting change would only lead to isolation and obsolescence, without preventing emerging challenges.

Various studies have shown promising results in integrating AI into educational contexts. Evidence suggests that its use can support personalised learning, foster autonomy, develop technical writing skills, and enhance students' social and emotional abilities.

However, adapting educational institutions to the use of AI presents significant challenges. A solid legislative and ethical framework is essential, along with clear guidelines to direct its implementation. Added to this are the natural resistance among some teachers and concerns over the improper use of this technology.

The integration of AI into schools must be gradual and carefully planned. Strengthening teachers' digital literacy is crucial for achieving this. Only through proper training can students be prepared to be critical, competent, and aware of both the potential and limitations of AI, enabling them to use it responsibly and productively, without diminishing human reasoning.

Teaching students to use this tool ethically and reflectively will help prevent or mitigate potential negative consequences that, like any technological innovation, it may entail.

To date, studies on this topic are limited in number and scope. Understanding the effects of AI use on adolescence requires longitudinal research to observe medium- and long-term impacts. Consequently, future research should focus on developing sustainable pedagogical models that integrate AI as a complementary resource, rather than a substitute for human thought.

REFERENCES

BIBLIOGRAPHICAL REFERENCES

- Aguilar, J. F. Á., & García, M. T. A. (2025). Usos prácticos de la Inteligencia Artificial en la Inspección Educativa. *Supervisión* 21, 77(77). <https://doi.org/10.52149/Sp21/77.5>
- Alamäki, A., Nyberg, C., Kimberley, A., & Salonen, A. O. (2024). Artificial intelligence literacy in sustainable development: A learning experiment in higher education. *Frontiers in Education*, 9. <https://doi.org/10.3389/feduc.2024.1343406>
- Alsinet, C., Pérez, R., & Agullo, M. (2003). Adolescentes y percepciones del riesgo. *Revista de Estudios Sobre Juventud*, 18, 90–101.
- Berger, K. S. (2007). *Psicología del Desarrollo. Infancia y adolescencia*. Ed. Médica Panamericana.
- Blikstein, P. (2018). Time to make hard choices for AI in education. *Keynote Talk at the 2018 International Conference on Artificial Intelligence in Education (AIED 2018)*.
- Daniel, K., Msambwa, M. M., & Wen, Z. (2025). Can Generative AI Revolutionise Academic Skills Development in Higher Education? A Systematic Literature Review. *European Journal of Education*, 60(1), e70036. <https://doi.org/10.1111/ejed.70036>
- Delgado, A. O. (2015). Los activos para la promoción del desarrollo positivo adolescente. *Revista Metamorfosis: Revista del Centro Reina Sofía sobre Adolescencia y Juventud*, 3, 32–47.
- Delgado, N., Carrasco, L. C., de la Maza, M. S., & Etxabe-Urbieta, J. M. (2024). Aplicación de la Inteligencia Artificial (IA) en Educación: Los beneficios y limitaciones de la IA percibidos por el profesorado de educación primaria,

educación secundaria y educación superior. *Revista Electrónica Interuniversitaria de Formación Del Profesorado*, 27(1), 207–224.

- Fernández, A. M. D. M. (2024). Una doble historia de la inteligencia artificial: Avance tecnológico y proceso de regulación en Europa. *Revista de Privacidad y Derecho Digital*, 9(34), 26–89.
- García-Tudela, P. A., Prendes-Espinosa, M. P., & Solano-Fernández, I. M. (2023). *Aulas del Futuro en España: Un análisis desde la perspectiva docente*.
- Gómez-León, M. I. (2022). Development of empathy through social emotional artificial intelligence. *Papeles Del Psicólogo*, 43(3), 218–224.
- Henriksen, D., Creely, E., Gruber, N., & Leahy, S. (2025). Social-emotional learning and generative AI: A critical literature review and framework for teacher education. *Journal of Teacher Education*, 76(3), 312–328.
- Ilieva, G., Yankova, T., Klisarova-Belcheva, S., Dimitrov, A., Bratkov, M., & Angelov, D. (2023). Effects of Generative Chatbots in Higher Education. *Information*, 14(9), 492. <https://doi.org/10.3390/info14090492>
- Jaya, L. G. C. (2024). Efectos de la Inteligencia Artificial en el Desarrollo Socioemocional de Adolescentes. *Ciencia Latina Revista Científica Multidisciplinar*, 8(3), 3423–3440. https://doi.org/10.37811/cl_rcm.v8i3.11565
- Kulesa, A. C., Mission, M., Croft, M., & Wells, M. K. (2025). *Productive Struggle: How Artificial Intelligence Is Changing Learning, Effort, and Youth Development in Education*. Bellwether. <https://eric.ed.gov/?id=ED674230>
- Lee, V. R., Pope, D., Miles, S., & Zárate, R. C. (2024). Cheating in the age of generative AI: A high school survey study of cheating behaviors before and after the release of ChatGPT. *Computers and Education: Artificial Intelligence*, 7, 100253. <https://doi.org/10.1016/j.caeai.2024.100253>

-
- Morrin, H., Nicholls, L., Levin, M., Yiend, J., Iyengar, U., DelGuidice, F., Bhattacharyya, S., MacCabe, J., Tognin, S., Twumasi, R., & others. (2025). *Delusions by design? How everyday AIs might be fuelling psychosis (and what can be done about it)*. OSF.
 - Motrico, E., Fuentes, M. J., Bersabé, R., & others. (2001). Discrepancias en la percepción de los conflictos entre padres e hijos/as a lo largo de la adolescencia. *Anales de Psicología/Annals of Psychology*, 17(1), 1–13.
 - Oliveira, L., Tavares, C., Strzelecki, A., & Silva, M. (2025). Prompting Minds: Evaluating How Students Perceive Generative AI's Critical Thinking Dispositions. *Electronic Journal of E-Learning*, 23(1), 1–18.
 - Pham, S. T. H., & Sampson, P. M. (2022). The development of artificial intelligence in education: A review in context. *Journal of Computer Assisted Learning*, 38(5), 1408–1421. <https://doi.org/10.1111/jcal.12687>
 - Ramos, S. C. (2025). Aplicación de la inteligencia artificial para la optimización temporal en tareas docentes: Un análisis del potencial de mejora en educación primaria y secundaria. *Supervisión* 21, 77(77). <https://doi.org/10.52149/Sp21/77.4>
 - Reynaga, L. Q., Aldana, G. G., Bonilla, J., & Barajas, B. V. R. (2020). Relationship between executive functions and impulsive behavior in adolescents: Comparative study. *Salud Mental*, 43(4), 175–180.
 - Ruiz-Ortega, A. M., Berrios-Martos, M. P., Ruiz-Ortega, A. M., & Berrios-Martos, M. P. (2023). Revisión sistemática sobre inteligencia emocional y bienestar en adolescentes: Evidencias y retos. *Escritos de Psicología (Internet)*, 16(1), 15–32. <https://doi.org/10.24310/espsiescpsi.v16i1.16060>
 - Tuomi, I. (2022). Artificial intelligence, 21st century competences, and socio-emotional learning in education: More than high-risk? *European Journal of Education*, 57(4), 601–619. <https://doi.org/10.1111/ejed.12531>

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- Vanderhoven, E., Schellens, T., & Valcke, M. (2014). Educating teens about the risks on social network sites. An intervention study in Secondary Education. *Comunicar*, 22(43), 123–132. <https://doi.org/10.3916/C43-2014-12>