Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 4, 746-752
2024
Publisher: Learning Gate
DOI: 10.55214/25768484.v8i4.1458

Knowledge-based education and the management of artificial intelligence tools: Experiences and good practices

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Abstract: The purpose of the research is to share experiences of good practices in the implementation of Knowledge-Based Education (CBE) and the management of Artificial Intelligence (AI) tools in the classroom. The methodology corresponds to a documentary research with a qualitative approach. A systematic review of the literature and analysis of successful cases in higher education programs were carried out. Key factors for the success of CBE and AI in the classroom were identified. The result obtained was the elaboration of a set of recommendations for the implementation of CBE and AI in the classroom that can serve as a guide to integrate AI tools into their teaching practice. It was concluded that CBE and AI are powerful tools that contribute to improving student learning, as long as ethical considerations and relevant validation strategies are taken into account, however, their implementation in the classroom is subject to proper planning by the counselor and the responsible use of technological tools. The implementation of AI tools is a means to improve the quality of education and not an end.

Keywords: *Artificial Intelligence (AI), Best practices, Educational innovation, Knowledge-based education (CBE), Learning.*

1. Introduction

The integration of Artificial Intelligence (AI) in the field of education has generated a significant impact on the improvement of Knowledge-Based Education (CBE). In today's digital age, where technology plays a critical role in teaching and learning, it is crucial to explore how AI tools can optimize educational experiences and promote good practices in the classroom.

Knowledge-Based Education focuses on the development of cognitive skills and the acquisition of meaningful knowledge, while AI offers opportunities to personalize the teaching process, adapting to the particular needs of students. In this context, the fundamental question arises: How can experiences and good practices in CBE be improved through the optimal management of AI tools?

The existing literature highlights the potential of AI to transform education, facilitating immediate feedback, personalization of learning, and the creation of more interactive and dynamic educational environments (Smith & Jones, 2021). In addition, the implementation of educational chatbots, such as those proposed by McCarthy, Minsky, and Kurzweil (2024), has proven to be an effective strategy to improve the student experience and encourage participation in the learning process.

In this context, the present study focuses on exploring how the effective management of AI tools can enhance CBE and promote more meaningful and personalized learning. Through the systematization of experiences and the implementation of active didactic strategies, it seeks to identify the key factors for the success of the integration of AI in the classroom and its impact on the educational process.

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The methodology corresponds to a documentary research with a qualitative approach. A systematic review of the literature and analysis of success stories in Higher Education programs was carried out. Key factors for the success of CBE and AI in the classroom were identified, from which it is proposed to analyze and discuss experiences and good practices in knowledge-based education, focusing on the management of AI tools as catalysts for the continuous improvement of the educational process.

The integration of Artificial Intelligence (AI) in education has been the subject of increasing interest in the academic community in recent years. Recent research has explored the potential of AI to transform the educational process and improve the learning experience for students.

According to the study by Wang et al. (2023), AI has proven to be an effective tool for personalizing learning, adapting to the individual needs of students and providing instant and personalized feedback. This adaptability of AI has been identified as a key factor in improving student motivation and academic performance.

In a study conducted by Li et al. (2022), the impact of AI-based educational chatbots on the teaching-learning process was examined. The results showed that chatbots not only facilitated communication between students and teachers, but also promoted the active participation of students in educational activities, thus improving classroom interaction.

In addition, research by García et al. (2021) highlighted the importance of AI in the early detection of possible learning difficulties in students, allowing timely and personalized intervention to address these difficulties. This predictive power of AI has been instrumental in improving the effectiveness of teaching strategies and ensuring more inclusive and equitable learning.

Recent studies have underlined the transformative role of AI in education, highlighting its ability to personalize learning, improve classroom interaction, and detect potential learning difficulties early. This background supports the importance of exploring how optimal management of AI tools can empower Knowledge-Based Education and promote more meaningful and personalized learning.

2. Methodology

The methodology corresponds to a documentary research with a qualitative approach. A systematic review of the literature and analysis of success stories in Higher Education programs was carried out. Key factors for the success of CBE and AI in the classroom were identified, from which it is proposed to analyze and discuss experiences and good practices in knowledge-based education, focusing on the management of AI tools as catalysts for the continuous improvement of the educational process.

The methodology used in this study was based on the systematization of experiences, the implementation of active didactic strategies and the use of the PACIE Model to explore and analyze how the optimal management of AI tools can enhance CBE and improve the quality of the educational process.

To address the research question on how to improve experiences and good practices in Knowledge-Based Education (CBE) through the optimized management of Artificial Intelligence (AI) tools, a methodology based on the systematization of significant experiences in formative research in context was used.

First, a qualitative, experimental, analytical and descriptive approach was carried out to analyze the situation to be improved in the educational field. This analysis made it possible to identify the specific areas where the integration of AI tools could have a positive impact on the teaching-learning process.

Subsequently, active didactic strategies were designed, focusing on the Flipped Classroom model to encourage student participation and engagement in their own learning process. This innovative pedagogical approach is based on the reversal of traditional roles, promoting autonomy and active construction of knowledge by students.

The execution of the methodology was carried out following the PACIE Model (Planning, Action, Communication, Implementation and Evaluation), which allowed a structured and coherent implementation of the strategies designed. During this stage, the integration of AI tools in the classroom was put into practice, ensuring adequate planning and coordination of educational activities.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 4: 746-752, 2024
DOI: 10.55214/25768484.v8i4.1458

Finally, a thorough evaluation of the process was carried out, focusing on the validation of the results obtained through the implementation of the AI tools. Aspects such as the effectiveness of teaching strategies, the impact on student learning, and the perception of teachers and students about the integration of AI in the classroom were considered.

3. Results and Achievements Obtained

During the development of the research on the integration of Artificial Intelligence (AI) tools in Knowledge-Based Education (CBE), significant results were obtained that highlight the positive impact of this combination on the educational process. The main findings are presented below:

1. Identification of key factors for the success of CBE and AI in the classroom: Through the systematization of experiences, determining factors for the effective integration of AI tools in the educational context were identified. These factors include proper planning, teacher training in the use of emerging technologies, and consideration of ethical and data privacy issues.
   I. Conditioning of face-to-face sessions to a form of virtualization supported by Technology for Computer Engineering Oriented subject: Technology Management and Good Practices.
   9 proposals were designed for the implementation of the COBIT5 Model applicable to Manizales Companies (1. Caldas Ophthalmological Institute, 2. Becall Group, 3. Panadería la Victoria, 4. Prometheans, 5. COOPORECAL, 6. La Switzerland, 7. Selcomp, 8. Colegio Granadino, 9. Almera Information Management S.A.S) Using instruments such as Technological Benchmarking, the Methodological Guide (COBIT5) Control Objectives for Information and Related Technologies, (ITIL) Information Technology Infrastructure and the standard ISO27000 which apart from being socialized in companies were presented in Congresses and Meetings of Science, Technology and Innovation at local levels, regional and international.
   II. Conditioning of Face-to-Face Distance Sessions in Technology for Technology in Computer Systems Oriented Subject: IT Project Management.
   6 IT management projects were structured, the Class Topics "Empathy Map, Use Scenarios, Survey Design through Web Forms, Structuring an IT Project, Poster Design, Writing a Scientific Article, CANVAS Model, Copyright Registration, Scientific Dissemination" were implemented through videos. Personalized feedback was given in synchronous sessions through Meet, Zoom, Teams, WhatsApp. (1. Development of an application for the control, organization and information of amateur soccer in the city of Manizales; 2. Development of information system for sales and inventory control for SMEs focused on the commercial area; 3. Develop software for traffic monitoring and control through commercial drones in the city of Manizales; 4. Inventory and order control platform for engineering-style enterprise; 5. Development of comprehensive household supplies application in the city of Manizales; 6. System for measuring the energy consumption of CONFA's computer equipment)
2. Development of an AI toolbank as a guide for teaching practice: As a result of the research, an AI toolbank was developed that serves as a resource for teachers interested in integrating smart technologies into their educational practices. This bank provides guidance on the effective use of AI tools to improve the teaching-learning process.

Table 1.
Presents the AI Tool bank as a teaching guide.

Tool	Description	Advantages	Disadvantages	Fountain
ChatPDF	AI tool to generate PDF document summaries	- Time savings when summarizing long documents - Easy access to key information	- Possible loss of important details - Dependence on AI model quality	(ChatPDF, s.f.)
ChatGPT	OpenAI's AI	- Wide range of	- Potentially biased or	(OpenAI,

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	chatbots for conversation, text generation, translation, and creative writing	capabilities - Natural interaction through language	incorrect answers - Privacy and security issues	s.f.)
Gemini (Bard)	Google AI's factual language model for answering questions, generating text, translating, and writing creative content	- Extensive knowledge and versatility - Ability to generate high-quality content	- Potential bias or lack of transparency in the model - Requires a large amount of data for training	(Google AI, s.f.)
Copilot (Bing)	Bing AI tool to help write code, generate code from scratch, and develop software	- Time savings on scheduling tasks - Accessible via Edge browser	- Dependence on AI model quality - Possible errors or vulnerabilities in the generated code	(Microsoft, s.f.)
Claude.ai	AI tool to improve writing, correct grammatical errors, suggest alternative words, and improve sentence structure	- Improves the quality and clarity of writing - Real-time feedback	- Potential bias or limitations of the AI model - Need for human review for optimal outcomes	(Anthropic, s.f.)
Semantic Scholar	AI-based academic research tool to find and understand relevant literature	- Access to a broad academic knowledge base - Advanced semantic analysis capability	- Potential bias or limitations in AI algorithms - Requires subscription or institutional access	(Semantic Scholar, s.f.)
Litmaps	Literature visualization tool that helps to understand the relationships between research articles	- Intuitive visual representation - Identifying patterns and connections	- Limited to items included in the database - Complexity in interpreting complex visualizations	(Litmaps, s.f.)
Jenni.AI	AI-powered creative writing tool for brainstorming, writing text, and editing work	- Encourages creativity and productivity - Real-time feedback	- Potential bias or limitations of the AI model - Need for human review for optimal results	(Jenni.AI, s.f.)
ILovePDF	Online tool for editing and manipulating PDF files	- Extensive PDF editing feature set - Accessible from any device with an internet connection	- Some features may require a paid subscription - Potential privacy and security issues when uploading files	(ILovePDF, s.f.)

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Research Rabbit	AI tool to analyze and understand the context of user searches, providing more relevant results	- More accurate and contextualized search results - Saving time on investigations	- Dependence on AI model quality - Potential biases or limitations in algorithms	(Research Rabbit, s.f.)

3. **Contribution of CBE and AI to the improvement of student learning:** It was observed that the combination of Knowledge-Based Education and AI tools can enhance student learning, allowing greater personalization and adaptation to the individual needs of each student. AI facilitates the early detection of learning difficulties and the provision of personalized feedback.
4. **Importance of ethical considerations and validation strategies:** The relevance of addressing ethical and validation aspects when integrating AI tools in the classroom was emphasized. It is essential to ensure transparency in the use of data, the protection of student privacy and the rigorous evaluation of the results obtained through AI.

The results of this research highlight the transformative potential of the integration of AI tools in Knowledge-Based Education, underlining the importance of careful and ethical implementation to maximize the benefits of these technologies in the educational field.

4. Discussion of Results

The integration of Artificial Intelligence (AI) tools into Knowledge-Based Education (CBE) has significant potential to transform the educational process and improve the learning experience of students. Through the systematization of experiences and the implementation of active didactic strategies, it has been explored how the optimal management of AI tools can contribute to the improvement of educational practices.

One of the key findings of this study is the importance of considering relevant ethical considerations and validation strategies when integrating AI tools into the classroom. While AI can offer benefits in terms of personalizing learning and early detection of learning difficulties, it is critical to ensure that its implementation is done responsibly and ethically, protecting the privacy and security of student data. These ethical aspects are in line with what was expressed by Zawacki-Richter et al. (2019), who emphasize the need to establish clear policies and guidelines to regulate the use of AI tools in education, ensuring respect for the rights and privacy of students.

In addition, it is highlighted that AI tools should be considered as a means to improve the quality of education, and not as an end in itself. It is crucial that teachers and counselors understand how to use these tools effectively to enrich the teaching-learning process, encouraging active student participation and promoting meaningful and personalized learning. This is in line with what Luckin et al. (2016) have argued, who highlight that AI should not replace teachers, but rather complement their work, providing tools that facilitate the understanding of students' individual needs and the adaptation of teaching strategies accordingly.

The implementation of the PACIE Model allowed for structured planning and coherent execution of the strategies designed, facilitating the integration of AI tools in the classroom. This methodology proved to be effective in guiding the process of managing AI tools and assessing their impact on student learning, providing a solid foundation for future research in this field. The use of management models and methodologies is supported by Popenici and Kerr (2017), who suggest that the implementation of AI in education should follow a systematic and evidence-based approach to maximize its potential and minimize the associated risks.

Therefore, the combination of CBE and AI offers promising opportunities to improve the quality of education and enhance student learning. By carefully considering ethical aspects, validation of results, and proper planning, it is possible to make the most of the potential of AI tools in the classroom, promoting an innovative and student-centered educational environment. This coincides with what was

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expressed by Chassigneux et al. (2018), who emphasize that the successful integration of AI in education requires a holistic approach that involves both educators and technology developers, working together to ensure effective and ethical implementation.

5. Conclusions

The integration of AI tools in Knowledge-Based Education offers promising opportunities to innovate in the educational field and improve the learning experience of students. By carefully considering ethics, teacher training, and proper planning, it is possible to fully harness the potential of AI to transform education and prepare students for a digital future by:

1. Transformative potential of CBE and AI: The combination of CBE and AI tools offers transformative potential in the educational process, enabling greater personalization of learning, early detection of learning difficulties, and provision of personalized feedback. This integration can enrich the educational experience and promote more meaningful learning.
2. Importance of teacher planning and training: To fully realize the benefits of AI in education, proper planning and ongoing training of teachers in the use of emerging technologies is critical. Teachers play a crucial role in the effective implementation of AI tools in the classroom and in creating innovative learning environments.
3. Ethical and privacy considerations: The integration of AI tools in education must be accompanied by strong ethical and privacy considerations. It is essential to guarantee the protection of student data, transparency in the use of AI and respect for ethical principles in the implementation of these technologies.
4. AI as a means to improve education: It is important to remember that AI tools are a means to improve the quality of education, not an end in themselves. AI must be used strategically to enrich the teaching-learning process, encouraging active student participation and promoting student-centered learning.

Thanks

Thanks are presented to the International Center for Territorial Marketing for Education and Development CIMTED Corporation for the invitation to give a Keynote Speech within the framework of the XX International Congress on Knowledge-Based Education CIEBC2024, with the theme Society, culture and education: the new realities in which this project could be presented. whose participation included the Doctorate in Engineering program of the Faculty of Engineering and the Vice-Rectory of Research and Postgraduate Studies of the University of Caldas.

The development of this research has been funded in Doctoral training in Call 22 General Plan 21-22 of the Ministry of Science, Technology and Innovation. Call for the assignment for STeI of the SGR for the creation of a list of eligible project proposals for doctoral training in the regions. Project called "Training of high-level human capital to meet the territorial demands of the coffee axis region cut 2-Antioquia, Caldas, Quindío, Risaralda", with BPIN code 2022000100078, which was approved by Agreement No. 25 of August 9, 2022.

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ISSN: 2576-8484
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DOI: 10.55214/25768484.v8i4.1458