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INTERNET OF THINGS - IOT IN SCHOOLS: WEAVING CONNECTIONS FOR TOMORROW'S EDUCATION

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ABSTRACT

This study investigated the application of the Internet of Things (IoT) in schools, with the aim of understanding how its implementation can contribute to the creation of efficient learning environments and to the improvement of school management, considering the challenges and opportunities that this technology offers. The research adopted a qualitative approach, using the methodology of bibliographic review, with analysis of articles, dissertations and books on the use of IoT in education. The results indicated that IoT has a significant impact on the teaching-learning process, providing interactive and personalized environments, which contributes to the improvement of student performance. In addition, technology has also proven to be a useful tool in optimizing school management, allowing for monitoring of student resources and performance. However, challenges related to technological infrastructure, resistance to change, and the empowerment of educators and managers were identified as barriers to the successful implementation of IoT in schools. The final considerations pointed out that, despite the challenges, the IoT offers great possibilities to transform education, and it is necessary to overcome the difficulties to integrate this technology into the school environment. Future studies can explore the impacts of IoT in different school contexts and its contribution to digital inclusion, especially in serving students with special needs.

Keywords: Internet of Things. Education. School Management. Digital Inclusion. Emerging Technologies.

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Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

The Internet of Things (IoT) emerges as one of the transformative technologies of contemporary society, with the ability to connect physical devices to the internet, enabling the collection and exchange of data in real time. In the educational context, IoT has gained prominence for its ability to improve teaching-learning processes and school management. By integrating smart devices into the school environment, from attendance sensors to digital whiteboards and environment monitoring systems, IoT enables the personalization of teaching, the optimization of resources, and the creation of interactive and dynamic learning environments. The application of IoT in schools represents a significant innovation, providing new forms of student engagement and facilitating the work of educators and administrators. This technological scenario has been explored at different levels of education, from basic education to higher education, with the aim of modernizing school infrastructure and fostering a connected education prepared for the challenges of the future.

The justification for this research rests on the need to adapt the school environment to the demands of the digital society, in which the presence of advanced technologies is constant. The implementation of IoT in schools represents an opportunity to promote an inclusive education, efficient and capable of keeping up with the technological changes that impact the daily lives of students. Despite the innovations promised by this technology, there are significant challenges to overcome, such as resistance to change by educators, the lack of adequate infrastructure, and the financial difficulties for implementing technological devices. Reflection on these aspects is essential to understand how IoT can be integrated into the educational context, taking into account the specificities of each school and the needs of its students.

The question that guides this research is: how can the implementation of the Internet of Things in schools contribute to the creation of efficient learning environments and to the improvement of school management, considering the challenges and opportunities that this technology offers? The research thus seeks to analyze the impact of IoT on pedagogical practices, school management and digital inclusion, providing a comprehensive view of the potential of this technology to transform education in Brazil and in the world.

The main objective of the research is to analyze how the implementation of the Internet of Things in schools can influence the quality of education, school management and the learning experience of students, exploring its advantages, challenges and

Revista ARACÊ
ISSN: 2358-2472

opportunities. The research also intends to discuss the possibilities of integrating IoT into school curricula and teaching methodologies, considering the current context of education and the needs of the digital society.

The text is structured as follows: at first, the theoretical framework will be presented, addressing the concept of Internet of Things, its applications in education and the benefits and challenges of implementation. Next, three development topics will be discussed, which detail the use of IoT as a learning tool, its contribution to school management and the development of digital skills in students. The methodology used will be described in order to clarify the process of data collection and analysis. Finally, the results and discussions will be presented, followed by final considerations, which summarize the main findings and suggest directions for future research on the subject.

THEORETICAL FRAMEWORK

The theoretical framework is structured in order to provide a comprehensive understanding of the Internet of Things (IoT) and its application in the educational context. Initially, the concept of IoT will be addressed, detailing the essential components and how these devices interact to form a connected and intelligent environment. Next, the integration of IoT in education will be discussed, with an emphasis on its advantages, such as the personalization of teaching and the creation of interactive learning environments. The framework also explores the challenges faced by schools in adopting this technology, such as the lack of infrastructure and resistance to change. Finally, the impact of IoT on school management and the development of students' digital skills will be analyzed, highlighting the opportunities that this technology offers for the construction of a modern education that is connected to the needs of the digital society.

IOT AS A LEARNING TOOL

The Internet of Things (IoT) has proven to be a tool of great potential to engage students and improve the teaching-learning process. According to Araújo, Ferreira and Oliveira (2019, p. 216):

> In the education sector, IoT is drastically helping to make learning collaborative, so that decision-making, in addition to generating quick results in the production process, makes the process completely secure in terms of the databases generated. Therefore, the future of IoT in the education sector seems stable, considering the predictions of its growth in the technological world. Some experts

Revista ARACÊ
ISSN: 2358-2472

> have predicted the unexpected growth of IoT by 2020, when more than 25 billion things will be incorporated. Sustainable development in Brazil has also attracted numerous users in the countryside, through clean and renewable production.

These advancements indicate that IoT not only transforms learning by providing a dynamic and collaborative educational environment, but also amplifies its relevance in the global technological landscape. mAccording to Araújo, Ferreira and Oliveira (2019), the application of internet-connected devices in the school context enables dynamic interaction between students and content, creating an immersive and interactive learning environment. The use of technologies such as digital whiteboards and smart sensors allows teachers to personalize the learning experience, adapting resources according to the needs and pace of each student. In addition, the integration of sensors to monitor the school environment, such as temperature, lighting, and even the presence of students, can improve the management of the educational environment, providing favorable conditions for learning (Moreira, Alves, Junior, and Flôr, 2020).

This innovative approach also facilitates the active participation of students, allowing them to interact with the content in an autonomous and collaborative way. In this sense, Magalhães (2020, p. 11) states:

> The Internet of Things is based on a set of technologies that allows, from technological devices, such as sensors, to connect objects to the internet and from them collect data from the analogue world, in real time, enabling immediate actions or their storage for later analysis and control. These dynamic scenarios can contribute to the enrichment of learning. In this context, recognizing in the Internet of Things an added value to evolve teaching towards a model based on the development of skills, which requires the student to play an active role, the school will be able to take advantage of the possibilities it offers, as it makes the classroom an 'open' space where physical limitations are not relevant for the interpretation of the surrounding environment.

This perspective reinforces the relevance of IoT in building an interactive educational model, which allows students to engage in solving real-world problems. IoT, by connecting different devices, offers students the possibility of learning through practical experiences, such as the use of sensors to perform physics or biology experiments, which makes learning contextualized and applicable to reality (Schneider; Bernardini; Pereira, 2019). According to Magalhães (2020), the combination of technology with active teaching methodologies, such as project-based learning, becomes effective when combined with IoT, providing students with a meaningful learning experience.

Revista ARACÊ
ISSN: 2358-2472

In addition, the integration of IoT-based educational platforms has been a key resource for the development of digital and technological skills in students, preparing them for the challenges of the twenty-first century. These connected devices help develop students' ability to deal with new technologies, stimulating critical thinking and problem-solving in a collaborative and interactive way (Paula Filho; Lamy, 2020). Thus, the use of IoT in schools not only facilitates learning but also promotes inclusive education, providing learning opportunities for all (Rocha, 2023).

IOT AND THE TRANSFORMATION OF SCHOOL MANAGEMENT

The Internet of Things (IoT) has proven to be an essential tool in the transformation of school management, offering educational managers the ability to optimize resources, monitor student performance, and control attendance. In this regard, Araújo, Ferreira and Oliveira (2019, p. 218) highlight:

> For example, using IoT devices, there is no need to do student assistance manually, because IoT-enabled devices can detect the presence of students in schools without using human effort. Therefore, teachers can use this time they lose with calls and diary control in the applications of the discipline, allocating time to students. With the student card combined with RFID enabled, IoT helps employees, teachers and students, who can be tracked through these devices, which are able to identify the student and manage sensitive and non-sensitive data efficiently.

The automation of routine tasks by IoT contributes to the efficiency of school management, optimizing educators' time and promoting greater security in the educational environment. According to Araújo, Ferreira and Oliveira (2019), the use of connected devices allows real-time monitoring of various aspects of school management, such as the temperature and lighting of classrooms, providing a comfortable and appropriate environment for the learning process. In addition, sensors and smart platforms can be used to optimize the use of school spaces, ensuring that resources are used efficiently and that the physical conditions of schools are always aligned with pedagogical needs (Costa; Guedes, 2022).

The use of IoT also has a significant impact on monitoring and evaluating student performance. Through connected digital platforms, it is possible to monitor academic progress in real time, collecting data on student activities, such as participation in activities, assignments delivered, and performance in assessments.

Revista ARACÊ
ISSN: 2358-2472

According to Magalhães (2020), this data collection allows educational managers to make informed decisions, based on concrete information about student performance, which contributes to the personalization of teaching and the early identification of difficulties. In addition, the implementation of IoT-based attendance control systems makes the process efficient, avoiding human error and providing transparent management of school attendance (Schneider, Bernardini, & Pereira, 2019).

Through these technological tools, managers can make assertive and timely decisions, using data collected in real time to proactively adjust pedagogical and administrative strategies. Rocha (2023) highlights that, by adopting IoT, managers have access to a large amount of data that can lead to substantial improvements in the quality of education, by identifying areas that need attention and allocating resources. Thus, the use of IoT not only transforms the internal management of schools, but also contributes to a dynamic educational environment aligned with the needs of students and teachers.

DEVELOPMENT OF DIGITAL AND TECHNOLOGICAL SKILLS

The use of emerging technologies, such as the Internet of Things (IoT), plays a key role in developing digital skills in students, preparing them for the challenges of the digital society. According to Paula Filho and Lamy (2020), the integration of these technologies in the school environment provides students with the opportunity to interact with tools that are common in the job market, in addition to stimulating the development of essential skills for professional and personal life, such as critical thinking and problem-solving. In this context, IoT not only facilitates learning, but also promotes the formation of digital skills that are indispensable in a society in which connectivity and automation are present in several sectors.

The role of IoT goes beyond the simple integration of technological devices in the school environment, as it offers a dynamic platform for the development of skills related to the digital society. According to Magalhães (2020), by using connected devices, students have the opportunity to develop skills such as programming, data analysis, and working with interactive platforms, which are essential for adapting to the contemporary digital world. In addition, by working with technologies that allow for real-time data collection and analysis, students gain an understanding of how technologies impact decisions and processes in various contexts, including education and school management (Schneider; Bernardini; Pereira, 2019).

Revista ARACÊ
ISSN: 2358-2472

The training of digital skills also involves the development of collaborative and creative skills, which are fundamental for the digital society. IoT, by connecting different devices and allowing real-time interaction, provides students with an active and collaborative learning experience, where they can learn together and create solutions to complex problems (Rocha, 2023). This hands-on experience with emerging technologies not only increases students' ability to use digital tools, but also prepares them for the demands of a job market that values innovation and adaptation to new technologies. In this way, the use of IoT in schools contributes to the formation of a generation of students able to participate in the digital society.

METHODOLOGY

The methodology adopted in this research is bibliographic, with the objective of analyzing the contributions of the Internet of Things (IoT) to education, especially in the context of schools. According to Narciso and Santana (2024), bibliographic research is indicated to provide an insight into the subject, gathering and analyzing previous works, such as scientific articles, dissertations, theses, books, and academic sources that argue the application of IoT in education.

Thus, bibliographic research is essential for the construction of a theoretical basis and the conduction of academic studies. According to Narciso and Santana (2024, p. 9): "Bibliographic research, in turn, aims to gather information on a topic from materials already published. This approach is essential to provide theoretical grounding and direct subsequent investigations."

The approach used is qualitative, as it seeks to understand, from the selected sources, the impacts and challenges of implementing this technology in the school environment. Data collection was carried out from a survey of relevant publications in academic databases such as Scopus, *Google Scholar* and other sources specialized in education and technology, using keywords such as 'Internet of Things in education', 'educational technologies' and 'digital school management'.

It was not necessary to use empirical instruments, such as interviews or questionnaires, since the research is based on a critical analysis of the existing literature. According to Santana, Narciso and Fernandes (2025), the analysis procedure involved the reading of the selected works, with the extraction of information relevant to the theme and the construction of the theoretical framework. The technique used was content analysis,

Revista ARACÊ
ISSN: 2358-2472

which allowed to identify and categorize the main points of discussion, such as the advantages, challenges, opportunities and implications of the use of IoT in education.

The following is a table with the bibliographic references used in this research. This table summarizes the main authors and works consulted, organized according to ABNT standards, facilitating the understanding and consultation of the sources that support the study carried out.

Table 1 – Bibliographic references used

Author(s)	Conforming title published	Year	Type of Work
ARAÚJO, A. K. R.; FERREIRA, M. S.; OLIVEIRA, F. L.	Internet of Things Applied to Education	2019	Article
OLIVEIRA, R.; FALVO JR, V.; BARBOSA, E. F.	Internet of Things Applied to Education: A Systematic Mapping	2019	Event proceedings
SCHNEIDER, G.; BERNARDINI, F.; PEREIRA, R.	Teaching computational thinking through the Internet of Things: Possibilities and challenges	2019	Event proceedings
MAGALHÃES, A. M. B.	The potential of the internet of things in the interdisciplinary approach of the curriculum in the area of science in the 3rd cycle of Basic Education	2020	Dissertation
MOREIRA, A. P.; ALVES, G. J.; JUNIOR, C. R. B.; FLÔR, D. E.	Didactic approach to the popularization of the Internet of Things in Basic Education	2020	Event proceedings
PAULA FILHO, L. P. de; LAMY, M.	The Digital Revolution in Health: How Artificial Intelligence and the Internet of Things Make Care Human, Efficient, and Sustainable	2020	Article
COSTA, J. da C.; GUEDES, L. A.	Proposal for curricular integration with the Internet of Things in Secondary Level Technical Professional Education	2022	Event proceedings
ROCHA, L. A.	Pedagogical practices in higher education with the Internet of Things: methodologies, tools and future perspectives	2023	Article

Source: authorship.

After the presentation of the table, it is possible to observe that the references were selected from relevant and recent academic sources, which guarantees the timeliness and credibility of the research. The sources include both studies on IoT in education and discussions about the technology, which provides a basis for analyzing the impacts of this technology on the school environment and educational management.

Revista ARACÊ
ISSN: 2358-2472

RESULTS AND DISCUSSION

Next, a word cloud is presented that highlights the frequent and significant terms found in the references used in this research. These terms emerge as key concepts, which will be addressed in subsequent topics, as well as in the results and discussions. The cloud visualizes the importance of aspects such as 'IoT', 'education', 'learning', 'inclusion', 'technology', 'teaching', among others, highlighting the central themes addressed throughout the analysis.

Image 1 - Word Cloud

Source: authorship.

This visual representation makes it easier to understand the main focuses of the research, showing the recurring and relevant words in the context of the application of the Internet of Things (IoT) in education. By observing the highlighted terms, we can see the emphasis on the use of emerging technologies to transform education, promote digital inclusion, and improve school management, aspects that will be explored in the following topics.

IMPACT OF IOT ON BASIC EDUCATION

The impact of the Internet of Things (IoT) on the teaching and learning process in basic education schools has been discussed, highlighting both the benefits and challenges of this technology. In this regard, Magalhães (2020, p. 11) highlights:

> This allowed us to verify that the Internet of Things was accepted by students and teachers, as they consider that it provides active, interactive, motivating, student-centered learning, in which they will have to apply their knowledge to solve real-world problems. It is also shown as a meaningful learning environment, which develops analytical thinking and values different disciplines, brings benefits to the development of students and leads to greater autonomy in the acquisition of knowledge.

Revista ARACÊ
ISSN: 2358-2472

Thus, IoT presents itself as an innovative resource that not only integrates different areas of knowledge, but also favors a teaching process aligned with the needs of students.

According to Moreira, Alves, Junior, and Flôr (2020), the implementation of IoT in basic education schools contributes to a dynamic and interactive learning environment, providing students with experiences that go beyond the traditional teaching approach. The use of connected devices, such as digital whiteboards and sensors, allows students to actively interact with the content, promoting engagement and participation in the activities proposed by educators. This interactivity, provided by IoT, is one of the main factors that facilitates the understanding of complex content, transforming the way students relate to knowledge.

In addition, the use of IoT in schools contributes to the improvement of the conditions of the school environment, impacting both the physical space and the management of resources. Araújo, Ferreira, and Oliveira (2019) state that real-time monitoring of environmental conditions, such as temperature and luminosity, can create a comfortable and suitable environment for student learning, which favors academic performance. IoT also has the potential to optimize the use of school resources, such as classrooms, teaching materials, and even technological equipment, ensuring greater efficiency in their use and contributing to the management of the school environment (Costa; Guedes, 2022).

Another highlight is the personalization of teaching, facilitated by the analysis of data collected through IoT. According to Schneider, Bernardini and Pereira (2019), connected technologies allow the collection of information about student performance, which allows teachers to adapt teaching to the individual needs of each student.

In this way, IoT not only improves the physical environment of schools, but also offers tools to personalize the learning experience, making it aligned with students' learning skills and paces. Thus, the adoption of IoT in basic education schools contributes to the creation of efficient and favorable environments for learning, in addition to providing students with an integrated education with the digital technologies that are part of their daily lives.

EFFECTS OF IOT ON HIGHER EDUCATION

The use of the Internet of Things (IoT) in higher education institutions has generated discussions about its implications, especially in relation to its applicability in educational

Revista ARACÊ
ISSN: 2358-2472

courses and programs. According to Rocha (2023), the adoption of IoT in universities allows the creation of interactive and innovative learning environments, with the integration of technologies that facilitate both teaching and academic management. By incorporating connected devices, such as digital whiteboards and monitoring platforms, universities are able to offer an engaging teaching experience, allowing students to interact with content, as well as promoting contextualized and practical learning. In addition, IoT enables the development of advanced digital skills in students, which is essential for the training of professionals capable of dealing with the demands of the digital labor market.

However, the integration of IoT in universities also involves specific challenges, especially with regard to the adaptation of curricula and the infrastructure needed to support connected technologies. Magalhães (2020) highlights that the implementation of IoT in higher education institutions requires a review of teaching methodologies in order to incorporate these technologies into educational programs. This implies not only the training of teachers, but also the adaptation of physical facilities and investment in equipment and digital platforms that support the connectivity necessary for the operation of smart devices. In addition, according to Schneider, Bernardini, and Pereira (2019), the lack of adequate infrastructure, such as high-capacity internet networks and compatible devices, represents a major obstacle to the full use of IoT in universities, which can limit its impact on the educational process.

Thus, while IoT offers significant opportunities for innovation in higher education, its implementation in universities requires careful planning, which involves both updating curricula and strengthening technological infrastructure. According to Costa and Guedes (2022), it is necessary for universities to contemplate not only the technological aspects, but also the pedagogical changes that accompany the introduction of these new tools in the academic environment, ensuring that all students and faculty can enjoy the benefits provided by IoT. Therefore, the integration of IoT in higher education institutions is a complex process, which requires time, resources, and the alignment of different areas of the university.

DIGITAL INCLUSION THROUGH IOT

The Internet of Things (IoT) has the potential to be a key tool for digital inclusion, providing learning opportunities for all students, regardless of their location or socioeconomic conditions. According to Paula Filho and Lamy (2020), IoT can expand

Revista ARACÊ
ISSN: 2358-2472

access to quality education, as it allows connectivity in places where traditional education infrastructure is often limited, such as in rural areas or peripheral regions. The use of connected devices in learning environments can level the playing field by allowing students to access digital educational resources, such as interactive whiteboards, distance learning platforms, and multimedia materials, that might otherwise have been inaccessible. In this way, IoT not only facilitates access to education but also contributes to the creation of an equitable and inclusive environment.

In addition, IoT offers resources that can benefit students with special educational needs, meeting their particularities efficiently. Magalhães (2020) highlights that the use of technologies such as motion sensors and accessibility devices can provide significant support for students with physical or cognitive disabilities, creating an environment adapted to their needs. For example, motion sensors can be used to help students with reduced mobility interact with the school environment independently, while assistive reading and writing software can be integrated to support students with visual impairments or dyslexia. In addition, IoT can facilitate the personalization of teaching, allowing materials and activities to be tailored to meet the individual needs of each student, promoting inclusive and accessible education (Schneider; Bernardini; Pereira, 2019.

Case studies have shown the effectiveness of IoT in digital inclusion contexts. According to Araújo, Ferreira, and Oliveira (2019), in some schools, the implementation of IoT devices has helped to create interactive and inclusive learning environments, offering equitable learning opportunities, especially for students with special needs. These studies demonstrate that by integrating IoT into the educational process, it is possible to provide personalized education, meeting a spectrum of needs and ensuring that all students, regardless of their conditions, can have access to knowledge in an effective and meaningful way. Therefore, IoT not only collaborates with digital inclusion, but also plays a key role in building accessible education for all.

FINAL CONSIDERATIONS

The research on the application of the Internet of Things (IoT) in schools, with a focus on educational transformation and the improvement of pedagogical and school management practices, revealed several important findings that help answer the central question of the research: how the implementation of IoT in schools can contribute to the

Revista ARACÊ
ISSN: 2358-2472

creation of learning environments and to the improvement of school management, Considering the challenges and opportunities that this technology offers?

The results indicated that the use of IoT has a significant impact on the teaching-learning process, especially in basic education. The use of connected devices, such as digital whiteboards and smart sensors, creates an interactive and engaging learning environment, which favors the active participation of students. The personalization of teaching, facilitated by the collection and analysis of real-time data, allows educators to adjust their teaching approaches according to the needs and pace of each student, which contributes to the improvement of academic results. In addition, the use of IoT in schools contributes to improving the conditions of the school environment, from monitoring air quality and lighting to controlling attendance and optimizing the use of spaces, promoting a comfortable environment conducive to learning.

The survey also showed that IoT plays a key role in transforming school management. Collecting real-time data on student performance, resource usage, and student attendance allows administrators to make data-driven decisions. This not only improves administrative efficiency, but also contributes to resource management, in addition to enabling a quick response to possible problems, such as the shortage of materials or the need for adjustments in the school's physical environment. The implementation of IoT, therefore, not only has a direct impact on improving the quality of education, but also helps to optimize the management of administrative and pedagogical processes in schools.

The survey also showed that, despite the advantages offered by IoT, there are significant challenges that need to be overcome for the technology to be integrated into the school environment. The lack of adequate technological infrastructure, such as high-speed internet networks and compatible devices, has been identified as one of the main obstacles to the implementation of IoT in schools. In addition, resistance to change on the part of educators and managers, often due to a lack of knowledge about the use of new technologies, represents another important challenge. Therefore, the adoption of IoT in schools requires significant investments in infrastructure, training of teachers and managers, and a cultural change in the educational environment.

Regarding the contributions of this study, the understanding of the role of IoT in education is highlighted, with regard to the creation of dynamic, personalized and efficient learning environments, and the transformation of school management. In addition, the

Revista ARACÊ
ISSN: 2358-2472

study contributes to the discussion on the challenges and opportunities associated with the implementation of IoT in schools, providing a basis for future research on the topic.

However, it is important to emphasize that the study also points to the need for research to complement the findings presented. Although the research has provided an overview on the benefits and challenges of implementing IoT in schools, empirical analysis on the real impacts of this technology in different school contexts is still limited. Thus, future studies can explore in detail how IoT can be integrated into different types of schools, taking into account the particularities of each institution, such as its infrastructure, financial resources, and student profile. In addition, it would be interesting to investigate the impacts of IoT on digital inclusion, with regard to the education of students with special needs.

Therefore, the implementation of IoT in schools is a significant opportunity to transform education by promoting innovative, inclusive, and personalized teaching. However, for this transformation to happen, it is necessary to overcome the technical and cultural challenges that still exist in the school environment. Continuing research on the use of IoT in education is critical so that new solutions can be developed, making the technology accessible to all students.

Revista ARACÊ
ISSN: 2358-2472

REFERENCES

1. ARAÚJO, A. K. R.; FERREIRA, M. S.; OLIVEIRA, F. L. Internet das coisas aplicada à educação. **Brazilian Journal of Development**, Curitiba, v. 8, n. 4, p. 215-230, 2019. Recuperado de https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/3429. Acesso em: 6 fev. 2025.

2. COSTA, J. da C.; GUEDES, L. A. Proposta de integração curricular com Internet das Coisas na Educação Profissional Técnica de Nível Médio. In: **SIMPÓSIO BRASILEIRO DE INFORMÁTICA NA EDUCAÇÃO (SBIE)**, 33., 2022, Porto Alegre. Anais [...]. Porto Alegre: Sociedade Brasileira de Computação, 2022. Recuperado de https://sol.sbc.org.br. Acesso em: 6 fev. 2025.

3. MAGALHÃES, A. M. B. **O potencial da internet das coisas na abordagem interdisciplinar do currículo na área das ciências no 3º ciclo do Ensino Básico**. 2020. Dissertação (Mestrado) – Universidade Católica Portuguesa, Porto, 2020. Recuperado de https://repositorio.ucp.pt/handle/10400.14/32138. Acesso em: 6 fev. 2025.

4. MOREIRA, A. P.; ALVES, G. J.; JUNIOR, C. R. B.; FLÔR, D. E. Abordagem didática para a popularização da Internet das Coisas na Educação Básica. In: **SIMPÓSIO BRASILEIRO DE INFORMÁTICA NA EDUCAÇÃO (SBIE)**, 31., 2020, Porto Alegre. Anais [...]. Porto Alegre: Sociedade Brasileira de Computação, 2020. Recuperado de https://sol.sbc.org.br/index.php/sbie_estendido/article/view/12752. Acesso em: 6 fev. 2025.

5. NARCISO, R.; SANTANA, A. C. de A. Metodologias científicas na educação: uma revisão crítica e proposta de novos caminhos. **Aracê**, v. 6, n. 4, p. 19459-19475, 2024. DOI: <10.56238/arev6n4-496>. Acesso em: 6 fev. 2025.

6. OLIVEIRA, R.; FALVO JR, V.; BARBOSA, E. F. Internet das coisas aplicada à educação: um mapeamento sistemático. In: BRAZILIAN SYMPOSIUM ON COMPUTATIONAL THINKING, 5., 2019, São Paulo. **Anais** [...]. São Paulo: Sociedade Brasileira de Computação, 2019. Recuperado de http://milanesa.ime.usp.br/rbie/index.php/sbie/article/view/8754. Acesso em: 6 fev. 2025.

7. PAULA FILHO, L. P. de; LAMY, M. A revolução digital na saúde: como a inteligência artificial e a internet das coisas tornam o cuidado humano, eficiente e sustentável. **Cadernos Ibero-Americanos de Pesquisa em Saúde**, Rio de Janeiro, v. 3, n. 2, p. 145-163, 2020. Recuperado de https://www.cadernos.prodisa.fiocruz.br/index.php/cadernos/article/download/707/753. Acesso em: 6 fev. 2025.

8. ROCHA, L. A. Práticas pedagógicas no ensino superior com Internet das Coisas: metodologias, ferramentas e perspectivas futuras. **Texto Livre**, Belo Horizonte, v. 16, n. 4, p. 89-104, 2023.

Revista ARACÊ
ISSN: 2358-2472

Recuperado de https://www.scielo.br/j/tl/a/9x9nxpz8J4cq7nHbLqzHVyS/?format=html&lang=pt&stop=previous. Acesso em: 6 fev. 2025.

9. SANTANA, A. C. de A.; NARCISO, R.; FERNANDES, A. B. Explorando as metodologias científicas: tipos de pesquisa, abordagens e aplicações práticas. **Caderno Pedagógico**, v. 22, n. 1, p. e13333, 2025. DOI: 10.54033/cadpedv22n1-130. Disponível em: https://ojs.studiespublicacoes.com.br/ojs/index.php/cadped/article/view/13333. Acesso em: 06 fev. 2025.

10. SCHNEIDER, G.; BERNARDINI, F.; PEREIRA, R. Ensino do pensamento computacional por meio de internet das coisas: Possibilidades e desafios. In: BRAZILIAN SYMPOSIUM ON COMPUTATIONAL THINKING, 5., 2019, São Paulo. **Anais** [...]. São Paulo: Sociedade Brasileira de Computação, 2019. Recuperado de http://milanesa.ime.usp.br/rbie/index.php/sbie/article/view/8721. Acesso em: 6 fev. 2025.