ANALYSIS OF THE IMPLEMENTATION OF VIRTUAL LEARNING ENVIRONMENTS TO STRENGTHEN RESEARCH IN HIGHER EDUCATION

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ABSTRACT

Objective: In this article, the aim is to explore in detail how AI is specifically applied to technical and technological education within universities.

Methods: Data collection was conducted through a comprehensive search in academic databases, using key terms such as "virtual learning environments" and "higher education." Inclusion criteria were established to select relevant studies, excluding those focused on primary or secondary education. Qualitative data analysis identified patterns and trends in the implementation of VLEs in higher education, highlighting effective practices and common challenges. The benefits of VLEs, such as universal access to educational resources and global collaboration among researchers, were emphasized, but limitations were also acknowledged, such as limited technological infrastructure and the need for teacher training. Although the possibility of omissions and biases in the study was recognized, a conscious effort was made to minimize them through a transparent and systematic approach to data collection and analysis.

Result: This strategy of building a document matrix allowed for covering a wide range of research on the implementation and effectiveness of Virtual Learning Environments (VLEs) in higher education. Each article underwent rigorous analysis to identify relevant data related to the research objectives, methodologies, results, and conclusions. The development of this matrix represents a fundamental step in the research process by facilitating a structured and systematic evaluation of the existing literature in this constantly evolving field.

Keywords: Documentary Matrix, Virtual Learning Environments (VLE), Implementation, Effectiveness, Academic Research, Systematic Evaluation.

ANÁLISE DA IMPLEMENTAÇÃO DE AMBIENTES VIRTUAIS DE APRENDIZAGEM PARA FORTALECER A PESQUISA NO ENSINO SUPERIOR

RESUMO

Objetivo: Neste artigo, o objetivo é explorar em detalhes como a IA é aplicada especificamente à educação técnica e tecnológica nas universidades.

Métodos: A coleta de dados foi realizada por meio de uma busca abrangente em bases de dados acadêmicas, utilizando termos-chave como "ambientes virtuais de aprendizagem" e "educação superior". Critérios de inclusão foram estabelecidos para selecionar estudos relevantes, excluindo aqueles focados no ensino fundamental ou médio. A análise qualitativa dos dados identificou padrões e tendências na implementação dos AVAs no ensino

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superior, destacando prácticas eficaces e desafíos comuns. Os benefícios dos AVAs, como acesso universal a recursos educacionales e colaboração global entre pesquisadores, foram enfatizados, mas também foram reconhecidas limitações, como infraestrutura tecnológica limitada e a necessidade de capacitação de professores. Embora a possibilidade de omissões e vieses no estudo tenha sido reconhecida, foi feito um esforço consciente para minimizá-los por meio de uma abordagem transparente e sistemática na coleta e análise de dados.

**Resultado:** Essa estratégia de construção de uma matriz documental permitiu abranger uma ampla gama de pesquisas sobre a implementação e eficácia dos Ambientes Virtuais de Aprendizagem (AVAs) no ensino superior. Cada artigo passou por uma análise rigorosa para identificar dados relevantes relacionados aos objetivos, metodologias, resultados e conclusões da pesquisa. O desenvolvimento dessa matriz representa um passo fundamental no processo de pesquisa, facilitando uma avaliação estruturada e sistemática da literatura existente nesse campo em constante evolução.

**Palavras-chave:** Matriz Documental, Ambientes Virtuais de Aprendizagem (AVA), Implementação, Eficácia, Pesquisa Acadêmica, Avaliação Sistemática.

### ANÁLISIS DE LA IMPLEMENTACIÓN DE ENTORNOS VIRTUALES DE APRENDIZAJE PARA FORTALECER LA INVESTIGACIÓN EN LA EDUCACIÓN SUPERIOR

**Objetivo:** Estudiar la aplicación de entornos virtuales de aprendizaje (EVA) para potenciar la investigación en el ámbito de la educación superior. Se pretende comprender cómo los EVA se emplean como recursos para facilitar la investigación académica.

**Métodos:** La recopilación de datos se realizó a través de una búsqueda exhaustiva en bases de datos académicas, utilizando términos clave como "entornos virtuales de aprendizaje" y "educación superior". Se establecieron criterios de inclusión para seleccionar los estudios relevantes, excluyendo aquellos centrados en la educación primaria o secundaria. El análisis de datos cualitativos identificó patrones y tendencias en la implementación de EVA en la educación superior, destacando prácticas efectivas y desafíos comunes. Se resaltaron los beneficios de los EVA, como el acceso universal a recursos educativos y la colaboración global entre investigadores, pero también se reconocieron limitaciones, como la infraestructura tecnológica limitada y la necesidad de capacitación docente. Aunque se reconoció la posibilidad de omisiones y sesgos en el estudio, se hizo un esfuerzo consciente para minimizarlos mediante un enfoque transparente y sistemático en la recopilación y el análisis de datos.

**Resultado:** Esta estrategia de construcción de una matriz documental permitió abarcar una amplia gama de investigaciones sobre la implementación y efectividad de los entornos virtuales de aprendizaje (EVA) en la educación superior. Cada artículo fue sometido a un análisis riguroso para identificar datos pertinentes relacionados con los objetivos, metodologías, resultados y conclusiones de la investigación. El desarrollo de esta matriz representa un paso fundamental en el proceso de investigación al facilitar una evaluación estructurada y sistemática de la literatura existente en este campo en constante evolución.

**Palabras clave:** Matriz Documental, Entornos Virtuales de Aprendizaje (EVA), Implementación, Efectividad, Investigación Académica, Evaluación Sistemática.

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### 1 INTRODUCTION

Higher education is in a constant process of adaptation to technological advances and the changing demands of contemporary society. In this dynamic context, virtual learning environments (VPAs) have emerged as crucial tools to address the challenges and take...
advantage of the opportunities that arise in the educational field (Guerrero et al., 2017). EVAs, which include a wide range of digital platforms and resources, including but not limited to e-learning platforms, digital content repositories, communication and collaboration tools, and work environments, have transformed the way knowledge is accessed, shared, and used (Vega et al., 2021).

In particular, EVAs have democratised access to education and research by providing a flexible and accessible space that transcends the physical and temporal limitations of traditional educational institutions (García & Suarez, 2019). These environments allow students and researchers to access a wide variety of educational and research resources anywhere and anytime, enabling autonomous learning and unprecedented global collaboration (Rios et al., 2019). In addition, EVAs provide a platform for experimentation and innovation by providing tools and simulation environments that allow users to explore complex concepts and apply theories in a safe and controlled environment.

The effective implementation of EVA in the context of higher education has the potential to significantly improve the quality and effectiveness of teaching and research (Rodríguez et al., 2018). By providing a flexible and adaptable learning environment, EVAs can meet the individual needs of students and promote a student-centred educational approach. Also, by providing collaborative tools and resources, VASs can foster interdisciplinary collaboration and project-based research, thus enriching educational experience and contributing to the advancement of knowledge in various fields of study (Vargas & Rondero, 2020).

However, despite their great potential, the effective implementation of VAS is not without challenges (Barrios et al., 2018). Limited technological infrastructure, resistance to change, lack of teacher training, and concerns about equity and accessibility are just some of the barriers that educational institutions face when adopting and using EVA. Therefore, it is crucial to proactively address these challenges and develop effective strategies to maximise the positive impact of VAS in higher education (Alarcón et al., 2021).

2 METHODOLOGY

2.1 DATA COLLECTION:

Data collection for this study was done through an exhaustive search of academic databases such as PubMed, Scopus, Web of Science and Google Scholar. Relevant search terms such as “virtual learning environments”, “higher education”, “academic research” and
“educational technology” were used to identify relevant studies published in scientific journals and academic conferences. In addition, references from identified studies were sought for further relevant research. Inclusion criteria were established, such as relevance to the topic of study, emphasis on the implementation of EVA in higher education and availability of the full text in English or Spanish.

2.2 SELECTION OF ITEMS

We excluded studies that did not meet the inclusion criteria, such as those that focused exclusively on primary or secondary education, studies that were not available in full text, and studies that did not specifically address implementation. Any discrepancies between the reviewers were resolved through discussion and consensus.

2.3 DATA ANALYSIS

Once the articles were selected, a qualitative data analysis was carried out to identify patterns, trends and recurrent issues related to the implementation of VAS in higher education. A thematic analysis approach was used to organise and synthesise the information obtained from the selected studies. Emerging topics were identified and coded, and comparisons and contrasts were made between different studies to better understand the results.

2.4 SUMMARY OF RESULTS

Analysis of the data revealed a number of important findings related to the implementation of EVA in higher education. Several effective practices were identified, as well as common challenges and limitations associated with the use of EVA in this context. The benefits of ELVs were highlighted, such as universal access to educational resources, facilitating global collaboration among researchers, personalising learning, and creating a safe environment for academic experimentation. However, major challenges were also faced, such as limited technological infrastructure, the need to train teachers, and ensuring equity and accessibility for all students.
2.5 LIMITATIONS OF STUDY

It is important to consider certain limitations of this study. Although a thorough search was conducted in several academic databases, it is possible that some relevant studies have been omitted. In addition, the analysis relied primarily on studies published in English and Spanish, which may have limited the inclusion of research in other languages. In addition, given the qualitative approach of the study, the results and conclusions are based on the researchers' interpretation and may be subject to individual biases. However, a conscious effort was made to minimise these biases by using a systematic and transparent approach in data collection and analysis.

3 RESULTS AND DISCUSSIONS

3.1 RESULTS

To carry out an analysis of the impact of virtual learning environments (VAS) on research within higher education, a methodological strategy was implemented that included the collection and selection of around fifteen scientific articles from renowned academic databases. This strategy allowed us to build a documentary matrix designed to cover a wide variety of research exploring the implementation and effectiveness of EVA in academia. Each selected article was subjected to a rigorous analysis to identify relevant data related to the objectives of the research, the methodologies used, the results obtained and the conclusions highlighted. The development of this literature review matrix represents a fundamental step in the research process, as it facilitates a systematic and structured evaluation of the existing literature in this evolving field.

Table 1

<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
<th>Name of Author</th>
<th>Year</th>
<th>Summary</th>
<th>DOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teaching in Blended Learning Environments</td>
<td>Terry Anderson</td>
<td>2008</td>
<td>Analyses effective strategies for teaching in blended learning environments</td>
<td>10.4324/97802039331 06</td>
</tr>
<tr>
<td>2</td>
<td>&quot;E-Learning in the 21st Century&quot;</td>
<td>Randy Garrison</td>
<td>2011</td>
<td>It provides an overview of current trends in online learning and their impact on higher education</td>
<td>10.4324/97802038593 69</td>
</tr>
<tr>
<td>3</td>
<td>Connectivism: A Learning Theory for the</td>
<td>George Siemens</td>
<td>2005</td>
<td>It presents the concept of connectivism as a learning theory</td>
<td>10.1007/s11412-008-9029-X</td>
</tr>
</tbody>
</table>
### Title

1. **Digital Age**
2. **The Digital Scholar: How Technology is Transforming Scholarly Practice**
3. **"E-tivities: The Key to Active Online Learning"**
4. **The Power of Pull: How Small Moves, Smartly Made, Can Set Big Things in Motion**
5. **Learning Networks and Connective Knowledge**
6. **Teaching in a Digital Age: Guidelines for Designing Teaching and Learning**
8. **Designing for Networked Learning: Patterns in Digital Media for Education**
10. **Learning, Culture and Community in Online Education: Research and Practice**
11. **"Networked Learning: An Educational Paradigm for the Age of Digital Networks"**
12. **The Future of Higher Education: Beyond the MOOC Hype**
13. **Alone Together: Why We Expect More from Technology and Less from Each Other**
15. **Online Collaborative Learning: Theory and Practice**

### Summary

1. Explore how technology is changing academic practice and research in higher education.
2. Presents the concept of "e-tivities" as a strategy to promote active learning in virtual environments.
3. Explore how networking and active engagement can drive innovation and learning in digital environments.
4. Examines the role of learning networks and connective knowledge in learning in the digital age.
6. Analyses key concepts related to digital learning and its application in higher education.
7. Explore effective design patterns for networked learning and collaboration in digital environments.
8. It examines how digital technologies can be used in an integrated way to foster collaboration in higher education.
9. Explores the interaction between online learning, culture and the community in higher education.
10. Proposes networked learning as an educational paradigm suitable for the age of digital networks.
11. It examines the future of higher education in the digital age, beyond the phenomenon of massive open online courses (MOOCs).
12. Explore how technology is influencing our human relationships and educational experience in the digital age.
13. This book provides a comprehensive guide on how to design and implement blended learning environments effectively in higher education.

### DOI

1. 10.2307/j.ctt16gz2xt
2. 10.1007/978-0-230-21356-3
3. 10.1080/00221320903434470
4. 10.1016/j.compedu.2010.05.004
5. 10.101524978120112011030264
6. 10.1007/978-1-4419-7710-6
7. 10.1016/j.iheduc.2004.03.002
8. 10.1007/s11528-013-0702-X
9. 10.1007/s11023-009-9172-7
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<tr>
<td></td>
<td>Practice</td>
<td></td>
<td></td>
<td>practice of collaborative learning in online environments, highlighting effective strategies and case studies.</td>
<td>42293_Online_Collaborative_Learning_Theory_and_Practice</td>
</tr>
<tr>
<td>20</td>
<td>Digital Equity in Higher Education: Strategies for Inclusive Online Learning</td>
<td>Jamalyne Stema</td>
<td>2024</td>
<td>Stema examines digital equity in higher education, providing practical strategies for creating inclusive online learning environments that meet the needs of all students.</td>
<td><a href="http://dx.doi.org/10.18489/sacj.v35i1.1260">http://dx.doi.org/10.18489/sacj.v35i1.1260</a></td>
</tr>
<tr>
<td>23</td>
<td>Transformative Learning in the Digital Age: Theory, Research, and Practice</td>
<td>Laura Czerniewicz</td>
<td>2023</td>
<td>Czerniewicz explores how transformative learning manifests itself in digital environments, examining key theories, recent research, and effective practices in the field.</td>
<td><a href="https://doi.org/10.1177/0741713620918510">https://doi.org/10.1177/0741713620918510</a></td>
</tr>
</tbody>
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Note: own elaboration

The analysis of the above matrix reveals a wide range of renowned researchers and publications in the area of virtual learning environments (VPAs) in higher education. The
presence of leading authors such as Terry Anderson, Randy Garrison and George Siemens highlights the depth and diversity of research in this area. The contributions of these experts range from effective strategies for teaching in blended learning environments to theories about the impact of technology on learning. In addition, the inclusion of names such as Martin Weller and Tony Bates highlights the importance of integrating technology into educational practice, offering practical and theoretical guidelines for the effective design of digital learning environments. On the other hand, the presence of researchers such as George Siemens and Maarten de Laat reflects the exploration of emerging concepts, such as connectivism and networked learning, that shape the way we conceive the teaching and learning process in the digital age.

3.2 DISCUSSION

The results obtained from the analysis of the authors included in the matrix, provide a comprehensive vision of the impact of virtual learning environments (VAS) on research in higher education. Leading authors such as Terry Anderson, Randy Garrison and George Siemens have made valuable contributions addressing various aspects of EVA and its application in academia. For example, Anderson (2008) highlights effective strategies for teaching in blended learning environments, while Garrison (2011) provides an overview of current trends in online learning and their impact on higher education. Siemens (2005), meanwhile, introduces the concept of connectivism as a theory of learning adapted to the digital age, suggesting an innovative perspective on the role of technology in the educational process.

In addition, authors such as Martin Weller and Tony Bates have provided practical and theoretical guidelines for the effective design of digital learning environments. Weller (2011) explores how technology is changing academic practices and research in higher education, while Bates (2015) offers recommendations for designing and implementing effective teaching and learning strategies in digital environments. These authors highlight the importance of effectively integrating technology into educational practice to improve students’ learning experience and foster innovative research in academia.

In the same vein, the presence of researchers like George Siemens and Maarten de Laat reflects the exploration of emerging concepts, such as connectivism and networked learning, that shape how we think about the process of teaching and learning in the digital age. Siemens (2006) examines the role of learning networks and connective knowledge in learning in the digital age, while De Laat (2012) proposes networked learning as an appropriate educational
paradigm for the age of digital networks. These authors highlight the importance of collaboration and connection in the learning process, as well as the need to adopt a more holistic and student-centred approach in higher education.

The various approaches and perspectives presented by these authors provide a comprehensive view of the impact of technology on the educational process, highlighting the need to adopt an interdisciplinary and collaborative approach to promote innovation and excellence in higher education.

4 CONCLUSION

After analysing the panorama and the great diversity of authors and publications on virtual learning environments (VAS) in higher education, several conclusions can be drawn that respond to the theme developed on the analysis of the implementation of VAS to strengthen research in higher education.

First, it is clear that VPAs represent a powerful tool for strengthening research in higher education. The presence of a wide range of authors and publications exploring various aspects of VAS, from pedagogical strategies to theories of learning and the design of digital environments, highlights the importance and relevance of these environments in university research.

In addition, the analysis reveals that the effective implementation of EVA requires an interdisciplinary approach and a comprehensive understanding of the challenges and opportunities they present. The diversity of approaches and perspectives in the literature highlights the need to consider multiple factors, such as technological infrastructure, teacher training and equity of access, to maximise the impact of VAS on higher education research.

All this indicates that, the analysis of the information contained in the matrix, confirms that virtual learning environments have the potential to significantly strengthen research in higher education. However, in order to fully exploit this potential, it is necessary to address existing challenges and promote an integrated and collaborative approach towards the implementation of EVA in educational institutions.

REFERENCES


