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Remote Assessment in Higher Education: Insights from Southern Europe

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Abstract

This research focuses on remote learning in STEM fields, emphasizing challenges in online education in HEI's, particularly those posed by disruptive technologies, including Generative Artificial Intelligence. Using qualitative methodology, semi-structured interviews with experts in Southern Europe (Spain, Italy, Portugal) will provide insights into regional variations. The research comprehensively examines STEM learning, exploring challenges and adaptations. It extends its focus to the future evaluation of STEM education in remote settings, anticipating long-term impacts. Emphasizing the critical role of understanding teaching assessments in higher education modernization, the project contributes valuable data to inform educational evolution. Additionally, the research addresses gender bias in STEM degrees, fostering diversity and equal participation. By delving into implications for future evaluations and tackling gender bias, the study aims to enrich academic knowledge and improve practical aspects of STEM education, promoting inclusivity and equity in evaluating student performance.

Keywords: *Remote assessment; Technology; future of Higher Education Institutions (HEIs); STEM; gender bias.*

1. Introduction

In the rapidly evolving landscape of higher education, the integration of remote learning, especially in the STEM fields, has become a pivotal area of exploration. This research directs its attention towards the challenges inherent in online education within Higher Education Institutions (HEIs), with a special focus on the disruptive influences of emerging technologies, including Generative Artificial Intelligence. Employing a qualitative methodology, the study conducts semi-structured interviews with experts across Southern Europe, encompassing Spain, Italy, and Portugal, to unravel regional variations in the context of remote STEM learning. The research takes a holistic approach, thoroughly examining challenges and adaptations in STEM education while extending its gaze towards the prospective evaluation of STEM education in

remote settings, anticipating long-term impacts on the educational landscape. Recognizing the paramount importance of understanding teaching assessments in the modernization of higher education, this project aims to contribute valuable data that informs the evolution of educational practices. Furthermore, the research addresses gender bias within STEM degrees, actively promoting diversity and equal participation. By delving into the implications for future evaluations and tackling gender bias, this study seeks to enrich academic knowledge and enhance the practical aspects of STEM education, ultimately fostering inclusivity and equity in the evaluation of student performance.

2. Literature review

The integration of online assessment tools within Higher Education Institutions for STEM subjects brings forth numerous benefits (Jordan, 2023), notably the provision of instant feedback and the enhancement of overall learning outcomes. Various forms of online assessments (Heil & Ifenthaler, 2023), ranging from computer-marked evaluations to peer assessments, have demonstrated significant potential in facilitating and augmenting online learning experiences (Skliarova et al., 2022). The unprecedented challenges posed by the COVID-19 pandemic have further underscored both the advantages and complexities associated with online education and assessment methodologies.

Previous studies offer a comprehensive examination of STEM education, focusing on challenges, adaptations, and future evaluations within remote settings. Beginning with an exploration of key challenges across research, policy, and practical implementation in STEM education (MacDonald et al., 2020) , there is a clear emphasis on the imperative need for effective approaches applicable across various educational levels. Transitioning to the TRAILS 2.0 project, Knowles et al. (2023) highlight its mission to address the educational needs of underserved rural students by implementing an integrated STEM curriculum. This initiative not only emphasizes authentic learning experiences but also establishes a community of practice. Also, Teo (2019) suggest the critical importance of evaluating STEM education in remote settings, concurrently reflecting on the dynamic evolution of STEM education particularly in Singapore.

Gender bias significantly contributes to the gender disparity in STEM fields, affecting various aspects of academia and hiring practices (Moss-Racusin et al., 2012). A study indicates that faculty teaching face-to-face or hybrid classes receive higher scores compared to online instructors, exacerbating gender gaps in STEM disciplines. Disparities in online and traditional STEM learning further reveal that while female students outperform males in traditional courses, they slightly lag behind in online settings (Reuben et al., 2014). STEM hiring practices, influenced by implicit gender bias, show in-group favoritism by male managers, perpetuating gender imbalances. To address these issues, embracing gender-blindness in STEM hiring is proposed as a means to diminish stereotyping and promote inclusivity. Both implicit and explicit

gender biases are acknowledged, emphasizing the need for comprehensive strategies to foster diversity and inclusion in STEM fields and overcome the multifaceted challenges hindering equal representation (Knezz et al., 2022).

3. Method

3.1. Sample

Semi-structured interviews with experts from Higher Education Institutions (HEIs) and assessment were conducted, employing a suitable approach for understanding the perspectives of academics and HEI managers. The qualitative data collection was performed from April 2023 to October 2023, during which a total of 35 interviews were carried out. It is important to note that these interviews were recorded and subsequently transcribed, ensuring accuracy and facilitating a thorough analysis of the gathered information. This additional step enhances the reliability of the data and provides a valuable resource for in-depth examination and interpretation.

The interview structure, in terms of the questions posed, was as follows: 1) How do you imagine the university of the future?; 2) How will the students of the future differ from those of today?; 3) How do you think that online / remote assessment methodologies can affect learning practices differently depending on the gender? … on the studies typology? Will it be different in stem studies from the rest?

3.2. Gioia Method

The qualitative research was conducted using an adapted version of the Gioia Methodology (Gioia et al., 2012), which was essential for ensuring precise interpretive analysis and a comprehensive presentation of the research findings. Following the Gioia methodology, the research process encompassed study design, involving a thorough definition of the research question and a literature review. Subsequent steps included data collection, followed by a shift to data analysis. The analysis involved a series of steps, starting with the initial coding of information extracted from interviews. A nuanced understanding of first-order themes then led to their organization into second-order codes. Finally, the process included assembling terms and linking second-order codes into aggregate dimensions, creating a comprehensive framework for interpreting the research outcomes.

4. Results

In the evolving landscape of education, institutions are becoming more mission-driven, with a focus on tackling global challenges and providing meaningful experiences for students. This shift entails a differentiation from traditional models, with a greater emphasis on

internationalization, multiculturalism, and addressing societal issues. The role of universities in addressing environmental and social challenges is expected to evolve, spurred by the transformation from traditional classroom teaching to digital formats accelerated by the pandemic. A blended approach, incorporating virtual reality and user-friendly software, is becoming increasingly important. Looking ahead, disruptive technologies like artificial intelligence and virtual reality are poised to significantly impact education in the next 20 years. The focus will shift towards upskilling and reskilling competencies, with universities serving as

Table 1. Aggregate dimensions of Question 1: How do you imagine the university of the future?
Source: Own Elaboration

1st Order Concepts	**2nd Order Themes**	**Aggregate Dimensions**
Mission driven; Pursuing global challenges; Meaningful for students; They kept a focus on some specific missions that differentiate this institution from other institutions that existed and disappeared; More international; More focused on solving global/societal problems; More multicultural. The role of universities in addressing environmental and social challenges will evolve.	Mission Driven	Mission-driven institutions
	Global and Social Challenges	
	Multicultural	
Transformation from traditional classroom teaching to digital formats, accelerated by the pandemic. Importance of a blended approach. Virtually reality in education and the need for user-friendly software.Transformations driven by these changes and innovations. In 20 years, disruptive technologies like artificial intelligence, the metaverse, and virtual reality will impact education.	Transformation and Innovation	Technology & Innovation
	Blended Approach	
	Disruptive Technologies	
Focused on upskilling and reskilling competences; it will be a learners' competencies center; expertise in more collaborative environments; will be more focused on the skills and learning outcomes of the students; We will have a lifelong and skills-based higher education. Regarding assessment, he values critical thinking over; Importance of teaching students to discern credible information from falsehoods in the digital age.	Upskilling and Reskilling Competences	Competence Development
	Critical Thinking	
Importance to promote active learning, where students learn how to look for knowledge and how to use that knowledge Universities will begin to explore micro-credentialing institutions.. The activities will be focused on solving real world problems, solving exercises, completing group tasks, teamwork a lot, taking quizzes, executing projects, analyzing scenarios and case studies, and using the specific software's and applications that they will need in the real world; Involve flipped classrooms, gamification, and adaptive learning.	Active Learning	Future teaching methodologies
	Micro-Credentialing	
	Real-World Application	

Table 2: Aggregate dimensions of Question 2: How will the students of the future differ from those of today? Source: Own Elaboration

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Given the more flexible models, there will more variety / diversity of students. Diversity means some students may prefer traditional approaches while others seek flexibility and guidance; future students as a globally diverse and collaborative generation, seeking personalized and engaging learning experiences aligned with their passions.	Flexibility	Diversity and Flexibility
	Diversity, variety	
They are supposed to be more autonomous and more engaged in their learning process (though the research does not back that up); More autonomous, more responsible, more involved in their learning path, more engaged learners; they will be more engaged, since universities will be more engaged environments; they will me more involved in research. They will to asked to think critically.	Student Engagement	Autonomy and Engagement
	Autonomy	
The dimensions of citizenship and civic virtues but also political and social engagement will be part of student's path; Additionally, global citizenship and addressing critical global issues like climate change and human rights will be emphasized in education.	Global Citizenship	Global Citizenship and Social Responsibility
	Social Changes involvement	
Learning materials will shift from traditional books to multimedia information systems. evolving nature of future students who grew up with mobile devices. They excel in quickly gathering and synthesizing information from various sources, but may struggle with sustained deep thinking modern students are skilled at navigating vast online information sources; Critical analysis skills, especially in the face of emerging technologies like artificial intelligence, which can provide results but require careful evaluation.	Technology driven	Technological & Critical thinking
	Critical thinking competence	

centers for lifelong learning. Assessment will prioritize critical thinking and digital literacy skills, preparing students to discern credible information in the digital age. Hybrid and blended models of instruction will continue to grow, with an emphasis on active learning, problem-solving, teamwork, and the integration of emerging technologies like mobile learning and artificial intelligence.

In the changing landscape of education, the rise of flexible learning models will bring about a more diverse student body. This diversity will encompass varying preferences, with some students leaning towards traditional approaches while others seek personalized, engaging learning experiences aligned with their passions. Future students are expected to be globally diverse and collaborative, though research has yet to fully support assumptions of increased autonomy and engagement. Nevertheless, students will likely take on greater responsibility for their learning paths, engaging in critical thinking and research. Education will also emphasize

citizenship, civic virtues, and global issues like climate change and human rights. Learning materials will shift towards multimedia information systems, reflecting students' adeptness with technology. However, challenges remain in developing critical analysis skills, particularly in evaluating emerging technologies like artificial intelligence.

Table 3: Aggregate dimensions of Question 3: How will online / remote assessment methodologies affect learning practices in STEM, differently depending on…Gender? Studies typology? Source: Own elaboration

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Gender disparities in course choices arise earlier in education. To address these disparities, intervention is needed at the primary school level.	Gender participation	Gender issues
COVID forced rapid adaptability, demonstrating that professionals can adjust to remote teaching. Faculty have learned during the pandemic and can continue to invest in further development.	Lecturers' adaptation	
We will have more girls on STEM studies because with technologies, with our online environments, we could act in three levels that literature find out important: reducing gender bias; creating welcoming environments to promote communication between girls and communication with women that already work at STEM areas; integrating socially relevant projects (which would bring more girls to STEM).	Technological Gender Gap	
The greatest transformation probably will be in non-STEM areas. We'll probably see more emphasis on the digital dimension in non-STEM areas and a greater emphasis on non-digital dimensions or non-technological dimensions in science and technology. Students seek a balance, recognizing the limits of online learning and the need for hands-on experiences.	Early technology introduction	Study typology: STEM application advantage
	Field-specific effectivenes	
The assessment will not be so much dependent on whether teaching and learning is remote or not. When we talk about different forms of assessment as learning and for learning, peers will be a relevant part in assessment as well. Reservations about the effectiveness of online assessment method	Pedagogical relevance	
	Inclusive assessment opportunities	

According to our results, remote assessment methodologies could influence gendered learning differently due to potential disparities in access to technology, participation in online activities, and learning preferences. For example, studies have shown that women may face additional challenges in technological environments due to gender stereotypes and gaps in technological confidence. Educators should consider strategies to foster equitable participation and mitigate any gender bias in online assessments.

It is likely that online assessment methodologies will have a different impact on STEM studies compared to other fields. In STEM, where problem-solving and practical application are fundamental, online assessments can more easily be adapted to assess mastery of technical skills and performance-based problem-solving. However, it may be more challenging to evaluate qualitative or conceptual aspects of learning in STEM, such as deep theoretical understanding. Therefore, online/remote assessment strategies in STEM may focus more on the practical application of concepts and problem-solving, while in other fields, they may emphasize critical reflection and written communication.

5. Discussion and implications

This research sheds light on the challenges and adaptations in remote learning within STEM fields, particularly in higher education institutions (HEIs). By focusing on disruptive technologies, the study delves into the complexities of online education, . Results examines the landscape of STEM learning in remote settings, anticipating long-term impacts on education. A crucial aspect highlighted is the need for a nuanced understanding of teaching assessments, which plays a critical role in the modernization of higher education. Additionally, the project addresses gender bias in STEM degrees, aiming to foster diversity and equal participation. By exploring implications for future evaluations and addressing gender bias, this study contributes to academic knowledge and practical improvements in STEM education. It advocates for inclusivity and equity in evaluating student performance, paving the way for a more inclusive and equitable educational landscape. Looking ahead, it is crucial for universities to become lifelong learning centers, focused on the development of competencies and skills relevant to the constantly evolving job market. Lastly, student assessment should prioritize skills such as critical thinking and digital literacy, preparing them to discern credible information in the digital age. The need for ongoing adaptation and transformation in higher education is underscored to address the evolving demands of society and to equip students for success in an increasingly complex and technologically advanced world

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