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STEAMING AHEAD

FOSTERING CRITICAL THINKING, PROBLEM-SOLVING AND CREATIVITY

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EDITED BY
JOSÉ ALBERTO LENCASTRE
MARCO BENTO

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Authors

Bilge Has Erdoğan, Carina Silva, Catarina Mendonça, Cecília Costa, Celestino Magalhães, Éder Lima, Elisabete Pires, Fernando Manuel Lourenço Martins, Isabel Dans Álvarez de Sotomayor, Joana Cadima, Joana Soares, José Alberto Lencastre, José Miguel Sacramento, Marco Bento, Maria Altina Ramos, Ornella Auletta, Rita Neves Rodrigues, Sara Cruz, Susi Leo, Vera Lourenço & Yelitza Freitas.

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3

ACTIVE LEARNING CLASSROOMS II

III. The Active Learning Classrooms II

What pedagogical practices should teachers adopt for their activities?

Joana Soares
Crowdhelix, Ltd, Cork, Ireland

José Alberto Lencastre
Research Centre on Education (CIEd), Institute of Education, Braga, Portugal

Introduction

The Covid-19 pandemic closed schools and Higher Education institutions and affected about 90% of the world's students (UNESCO, 2020). In the university context, this situation highlighted the importance of educational institutions and intensified the challenges for teachers, students, and other educational agents. Themes such as digitalization, distance education, and digital literacy, previously present in the evolutionary agenda of education, were prematurely addressed due to the social isolation caused by the Covid-19 outbreak (Pascoal, 2020).

In the long term, the pandemic highlighted the need for renewed educational approaches, models, and solutions. The contextual, technological, scientific, and social changes of recent years pressure institutions and professionals to evolve, highlighting the complexity but also the urgency of changes in teaching and learning practices (Pedro & Matos, 2016).

The world is changing, and education must keep up with these changes in order to develop in students and teachers the necessary competencies for the 21st century. There is evidence that the educational environment influences students' learning attitudes, and the classroom conveys the educational philosophy (Park & Choi, 2014). Some authors even mention that space can promote - or inhibit - different styles of teaching and learning (Donovan et al. 1999; NLII White Paper 2004 cited by Park & Choi, 2014). Over time, learning spaces have evolved, but only with minor adaptations considering the number of participants.

However, in the 21st century, with a society influenced by countless and rapid social and technological changes, the debate about the design of learning spaces has gained visibility and is seen as a challenge for Higher Education, with several institutions seeking to implement innovative approaches. Key themes identified by some authors in this area refer to institutions' reaction to changes, available tools, and the configuration of classrooms to incorporate these transformations (Ibidem). Thus, it is essential to reflect, not only on digital

pedagogical competencies, but also on educational spaces, considering their design, architecture, and technology integration.

In the face of rapid social and technological changes, the design of learning spaces emerges as a critical challenge for Higher Education, with various institutions, including the University of Minho (UMinho), seeking to adopt innovative approaches.

In May 2021, the University inaugurated the André Cruz de Carvalho Active Learning Room (SACC), equipped with innovative technology to promote active learning among students. The flexible space, designed based on Active Learning Classroom models, reflects UMinho's search for innovative educational methods that better prepare its students for the future. This study, part of a larger project supported by UMinho, involves several researchers, and focuses on understanding how teaching in the SACC influences pedagogy and teachers' practices. The project addresses the SACC from various perspectives and dimensions, seeking to explore the impact of this new learning environment on the evolution of teaching in the institution.

Research Question

In this article, we seek to answer the following research question: Do teachers who use the André Cruz de Carvalho Active Learning Room tend to modify their educational practices, leaning more frequently towards active learning models?

Study Objectives

Based on the selected research question, the following four specific objectives were defined:

1. Identify what constitutes an active learning room in the literature.
2. Identify how the recommended pedagogical dynamics integrate and use the technological component, both by teachers and students.
3. Identify the characteristics of teaching and learning activities developed in the André Cruz de Carvalho Active Learning Room (SACC).
4. Analyse to what extent the teaching and learning activities developed in the SACC differ from those carried out in traditional classrooms.

Methodology

The research adopted a qualitative and interpretive approach, as proposed by Creswell (2009), combined with Yin's (2014) Case Study methodology.

Participants included seven teachers from the University of Minho who used the SACC during the 2021/22 academic year, as well as students who attended the room. Various data collection techniques were used, such as document analysis, questionnaire survey, non-participant observation of a class in the SACC, and focus group interviews.

Data analysis included: descriptive statistical analysis using MS Excel, descriptive analysis of observation records, thematic analysis, and frequency and context analysis of themes and sub-themes through NVIVO. This multifaceted approach allowed for a comprehensive understanding of the impact of the SACC on teachers' pedagogical practices and the student learning experience.

Analysis and Conclusions

An essential element in any research is the theoretical foundation that supports it. In this sense, we began the process with a scoping review, a valuable approach to synthesizing research data and often used to map the existing literature in a specific field, exploring its nature, characteristics, and volume. This methodology allowed us to identify the fundamental concepts related to Active Learning Classrooms (ALC), as well as the main sources and types of evidence available.

Regarding the first research objective - identifying the characteristics of an active learning room in the literature - there is an absence of a consensual definition among different authors. However, ALCs share common characteristics, being formal classrooms intended for educational activities, and distinguished from informal spaces. Their architectural and design particularities are deliberately configured to promote active learning, including mobile furniture, various writing surfaces, a polycentric or acentric layout without a defined front, and easy access to infrastructural technologies and digital and analogue tools. The SACC was developed based on these characteristics, inspired by similar international experiences, and incorporates innovative technology in Portugal to promote active student learning. Regarding teachers using ALCs, the analysis of articles indicates a trend towards modifying educational practices and perceptions of the teacher's role, with an inclination to adopt active learning models compared to traditional classrooms. Over time, teachers seem to effectively integrate the special features of ALCs into their teaching, incorporating reconfigurable tables, vertical writing, and ubiquitous digital technology. The studies analysed highlight the importance of teachers' theoretical and practical perceptions, as well as the acceptance and control of technological space in ALCs. This type of room can not only alter teacher-student relationships, influencing the change of the teacher's role to guide/facilitator of learning, but also has the potential to drive a new culture of learning, exerting a transformative power on institutional cultures.

Regarding the second objective of identifying how pedagogical dynamics integrate the technological component, both by teachers and students, the data obtained reveal, at times, a certain disinterest in the available technology. This may occur due to a lack of mastery and difficulty in solving technical problems, resulting, in some situations, in the non-use of technology. Some teachers also report difficulties with internet access and sharing on the PODs, mentioning that in some cases "they do not work". User surveys also reflected this trend, highlighting technology as a point for improvement, with specific references to the internet and PODs. These references align with some previous studies, such as that of Haines and Takerei (2019), which emphasizes that technology can be an initial barrier to the use of active learning rooms by teachers, complicated by the initial prototype nature of the rooms and the ongoing need for problem-solving. We observed a similar trend as pointed out by these authors during the focus group, where some participants expressed frustration with the technology, leading them to resort to the use of what was identified as "low technology", such as manual whiteboards. These participants

also indicated the intention to explore more advanced technological options "as soon as everything worked smoothly" in the future. However, it is important to mention that during the observed class, no incidents with technology occurred, and all PODs were used by both student groups and the teacher. In the class, the use and appropriation of technology by students were evident. These findings, despite apparently contradicting the reports of teachers, may be related to the level of mastery, control, and technological proficiency of both teachers and students, as well as the equipment used, considering that the room adopts a BYOD (Bring Your Own Device) model.

Regarding the third objective of this study, which aims to identify the characteristics of teaching and learning activities in the André Cruz de Carvalho Active Learning Room, the results indicate that activities in this space are characterized as follows: i) A predominance of group activities, driven by the room's layout, where teachers positively highlight the availability of round tables and movable chairs; ii) Greater flexibility of movement and space utilization, both by students and the teacher; iii) Increased use of technology, although some teachers still resort to simpler forms, including panels for vertical writing; iv) Improvements in interaction and communication between teacher and students, as well as among the students themselves, facilitated by the room's design and various resources and technologies available. The data collected points to general user satisfaction (expressed in surveys and focus groups) regarding the experience in the room and its various features. There is also an emphasis on the possibility of greater interactivity in SACC classes and the promotion of group work. Teachers also emphasize that the room layout stimulates, promotes, and facilitates collaborative and cooperative work, providing opportunities for diverse pedagogical choices.

Finally, regarding the fourth and last objective, which proposes to analyse the extent to which teaching and learning activities carried out in the SACC differ from those conducted in traditional classrooms, we sought to systematize the distinctive characteristics in the table below.

Table 3. Comparison Between Traditional Classrooms and the SACC (Active Learning Classroom André Cruz de Carvalho).

Activities	Traditional Classrooms	SACC (i.e., non-traditional)
Teacher Positioning	Front of the room, centre of attention	Undefined positioning, circulation is privileged
Role of the Teacher	Source of information and transmitter	Facilitate, guide, and support the student in navigating the learning process
Responsibility for the Learning Process	Teacher	Student

Activities	Traditional Classrooms	SACC (i.e., non-traditional)
Control of the Class by the Teacher	High	Reduced
Knowledge	Transmission	Co-construction
Student Engagement	Passive	Active
Personalization and Relationships	Superficial	Deeper
Interactivity and Communication	Bidirectional	Multidirectional
Mobility of Student and Teachers	Difficult or non-existent	Encouraged and enhanced by wheeled chairs and various resources
Collaborative and Cooperative Work	Difficult to implement	Easy to implement and enhanced
Collaboration, Cooperation, Idea Sharing, and Feedback	Difficult to implement	Stimulated and enhanced by layout and technology
Technology and Available Resources	Single screen/board, controlled by the teacher	6 screens with Solstice System, vertical writing boards, infrastructural technology...
Flexibility	Reduced	High

In the SACC, the positioning of the teacher is fluid, favouring their movement around the room. The traditional role of the teacher as a source of information and transmitter of knowledge is transformed in the SACC, where they assume the role of facilitator, guiding and supporting students in navigating the learning process in a technological environment, encouraging active knowledge construction. This change transfers control and responsibility for the learning process from the teacher to the student, who plays an active role in constructing their own knowledge. Knowledge, previously transmitted unidirectionally in traditional classrooms, is now co-constructed collaboratively between students and the teacher. These changes aim to promote greater student engagement and less passivity in the SACC, being implemented gradually so that students understand and

adapt to changes in the room environment, available resources, activities, and dynamics. Unlike traditional classrooms, which may be perceived as more rigid, the SACC provides greater flexibility and mobility for all users, allowing the appropriation of space and the exploration of various available resources. Finally, the SACC demonstrates the complex interconnection between pedagogy, space, and technology, emphasizing the crucial role of technology in exposing students to a rich and stimulating environment. The importance of integrating technology into pedagogical models is also highlighted, not just as a tool but as a structured support for learning.

Final Considerations

At the start of this study, our goal was to understand the impact of teaching in the SACC on teachers' pedagogical practices. The literature review, although a meticulous process, proved enlightening, confirming that the SACC incorporates the distinctive characteristics of ALCs mentioned in the literature, including furniture conducive to group work, walls with glass writing surfaces, multiple electrical outlets, and the absence of a defined front of the room.

These characteristics positively influence teachers, encouraging the adoption of active learning models compared to conventional classrooms. The SACC promotes activities centred on group work, where the teacher plays the role of facilitator who creates opportunities for individual and collaborative learning. The improvement in interaction and communication between teachers and students, as well as among the students themselves, is evident, facilitated by the room's layout and the available technological resources.

Despite some teachers expressing disinterest in technology, we observed that some use it proficiently, highlighting the need for ongoing updates and training to overcome potential barriers. We also conclude that for innovative pedagogy, it is essential to have innovative digital technologies, with the SACC being an environment that challenges and meets students' expectations regarding the use of technology.

Study Limitations and Future Research Perspectives

One of the main limitations of this study is the fact that the SACC is still very recent, and thus, there is still a limited number of users, both teachers and students, who have had contact with it so far. We would like to expand this study to include a larger number of teachers and obtain more comprehensive feedback from students. This would allow the collection of additional data to validate, modify, or even challenge the presented conclusions. The expansion of this study can explore various directions, such as:

- Investigating the perspectives and practices of teachers of different age groups and career stages, addressing not only the use of the SACC but also issues related to their initial and ongoing training, motivations, and values.

- Developing a training action that supports the pedagogical use of the SACC, through an action-research approach involving teachers, enabling practical implementation and the creation of a supportive community of practice.

- Analysing the digital competencies of teachers and evaluating how these competencies influence the pedagogical use of technology in practices in the SACC.

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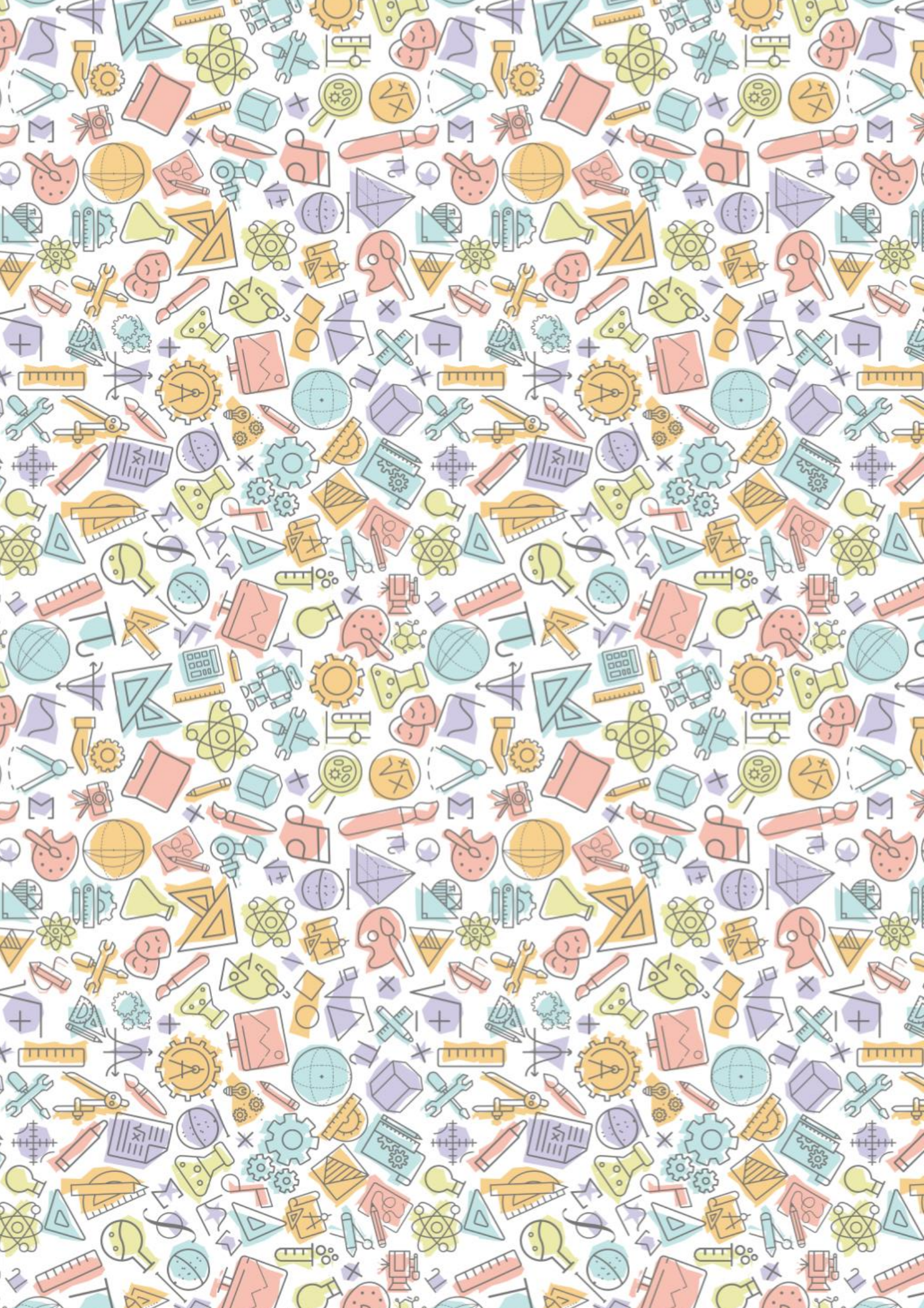
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