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Master's Degree Program in
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The influence of a creative school environment on students' motivation

Beatriz Maria Dionísio da Silva Santos

Master Thesis

presented as partial requirement for obtaining a Master's Degree in Data-Driven Marketing

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
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The influence of a creative school environment on students' motivation

by

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Master Thesis presented as partial requirement for obtaining the Master's degree in Data-Driven Marketing, with a specialization in Marketing Intelligence

Supervised by

Prof. Manuela Aparício Ph. D. and Prof. Diego Costa, Ph. D.

November, 2024

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism, any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

[Lisbon, November 2024]

DEDICATION

I would like to dedicate this thesis to João, for his patience, for always believing in me and for being my greatest support.

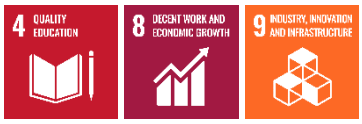
ABSTRACT

As the world becomes more digital and access to information becomes more accessible, there is a great need to value creativity for society to evolve in a balanced way in multiple aspects. Creativity can be applied across many different fields, which makes it a very valuable characteristic in education, as many teachers believe creativity in students is extremely valuable for society in general. Our main goal with this study was to see if a creative academic environment could influence the motivation of higher education students and the research consisted in three parts: We started by researching relevant topics for the thesis, after that we gathered responses from the target audience in the form of a questionnaire, and to conclude we analysed the data collected by turning the 166 valid questionnaire answers into an Excel file that we ran into SmartPLS. To analyse all that data, we used the Partial Least Squares Structural Equation Modelling (PLS-SEM) method, that is a statistical method used to analyse complex relationships between observed and latent variables. Some of the drawn conclusions were that student's motivation and overall performance should be something that universities need to take into consideration and that the overall implications could be worked by having more innovative approaches when building campus spaces, primarily by using technology and combining it with creativity, comfort and accessibility.

KEYWORDS

Campus Learning Environment; Student Learning Motivation; Teaching and Learning Process; Creativity; Education.

Sustainable Development Goals (SDG):



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1. INTRODUCTION

Every day that society changes is a day of updates for the education system, which to date has often been challenged by the evolution of the world as we know it today and which is currently focused on technology. That's why educational institutions have followed the trends, always striving for the best for their students and working to ensure that they perform as well as possible (Schafranski, 2005). In 2022, about 50% of lower secondary schools in the world used internet and technologies in their students education (UNESCO, 2023). As the world becomes more digital and access to information becomes more accessible, there is a great need to value creativity for society to evolve in a balanced way in multiple aspects (Edwards, 2001).

Nowadays we can see that research on campus learning environment and how it may influence students is insufficient, despite being proven that the environment is a particularly important factor that influences students' academic success, their physical and mental health, and even their social development. This factor makes it more than crucial for us to explore which conditions may promote students' academic performance (Cui et al., 2023).

The desire to transform current practices in higher education is becoming the focus of many Higher Education Institutions as students demand lifelong learning opportunities. Due to that, a hybrid approach to education looks the most pleasing one, but for that students need to have flexible and easy access to campus environments and services (Huang, 2012a; Nykvist et al., 2021; Scholl & Gulwadi, 2015)

It is even considered that students' perceptions of campus learning environment, if it's a positive one, tend to impact their choices when choosing their university and lead to an overall improvement in the students' achievements and satisfaction when part of the academic environment, due to their satisfaction towards their university (Huang, 2012a).

Students tend to feel more comfortable studying when they have complete learning facilities at their service on their campus, as it affects the way they achieve good academic performances. Therefore, we can conclude that the role of Higher Education Institutions is crucial for their student's motivation and results (Usman & Rahmawati, 2021).

The impact of a creative school environment on students' motivation is something that has already been studied, but in specific contexts. We already saw studies that shows us the importance of motivation and how it is intrinsic related to creativity (Amabile, 1997) and others that highlighted increased motivation as a product of student relations with each other and with teachers (Chickering & Gamson, 2006; Cunha, 2013) or a product of the physical and pedagogical environment (Jindal-Snape et al., 2013; Suleman, 2014) but a research on all this topics and how they connect with each other in still something that is missing.

This study will therefore attempt to fill this information gap and try to understand how aspects like creativity, students' relations and overall physical and pedagogical environment interconnect with each other and how all together they can build a creative school environment, as well as see how students' motivation is affected by them based on the question: Can a creative school environment influence higher education students' motivation?

This master thesis is divided into five sections, namely: the literature review on how creativity can influence learning (Chapter 2), introduction of the methodology and explanation of the Proposed Conceptual Model (Chapter 3), presentation of the data collection method (Chapter 4), presentation of the results and their discussion (Chapter 5) and presentation of conclusions and future research (Chapter 6).

We concluded that student learning motivation is positively impacted by the campus learning environment, creativity, student achievement and the teaching and learning process and that that the campus learning environment has a connection with creativity and the SALIENT factors. To summarise, we proved that motivation is something that can be promoted through multiple ways, many which are connected and realized how important is for students to have a campus that is stimulating both physical and emotionally.

2. LITERATURE REVIEW

2.1. CREATIVITY IN EDUCATION

"Creativity is simply the production of novel, appropriate ideas in any realm of human activity" (Amabile, 1997). Creativity is indeed a complex characteristic as it involves not just having original or unique ideias, but also ensuring that those ideas are fitting and relevant in the context they were produced.

Creativity can be applied across many different fields, which makes it a very valuable characteristic in education, as many teachers believe creativity in students is extremely valuable for society in general (Rubenstein et al., 2013). These teachers tend to feel capable of fostering creativity in their students, but many times the learning environment where they belong may not assist their will to do so. Creativity in teachers end up impacting creativity in their students, reinforcing that depending on the environment they are in and how the teachers fell, students will have a different learning outcome (Eason et al., 2009).

Students tend to be less creative as they spend more years at school, much probably because as they grow and evolve in the education system, they have fewer opportunities to use their creativity, as it is something that tends to be lost as students' progress through grades (Eason et al., 2009). Due to that teachers need to develop creative focused activities and foster creative thinking in their students, so they can overcome this tendency.

A diverse classroom, with different areas and equipped with a wide range of materials and resources, alongside working in outdoor areas, is what motivates creativity in students (Jindal-Snape et al., 2013). A more gamified approach to teaching is also valued by students, as well as independence in their time management and mutual respect in the learning process.

A couple of features that promote creativity in students, which are: a flexible and diverse physical and learning environment were students have the possibility to have a little control in their activities; possibility for students to work in their own pace, giving them flexible schedules were they can conciliate school and extracurricular activities; an overall positive school culture were students have healthy relationships with their teachers and with their peers, looking forward to work collaboratively (Davies et al., 2013).

Students who were taught by teachers who frequently encouraged their creativity showed significantly greater achievement gains compared to those in less creative environments, highlighting a strong link between creative opportunities and student performance (Jindal-Snape et al., 2013).

2.2. TEACHING AND LEARNING PROCESS AND CAMPUS LEARNING ENVIRONMENT

Positive relationships between parents-students, teachers-students and between students themselves have a big impact not only on their learning process, but also in their overall lives, as these relationships are one the cornerstones of students development as individuals (Cunha, 2013).

Schools should have teachers-students' relationships as one of the biggest concerns and as a priority in their agendas, due to its importance in students' learning (Scales et al., 2020). When teachers have a more flexible pedagogical approach and can adapt their teaching process to diverse environments, it prepares their students for more dynamic learning processes that they will eventually reach in their lives (Nykvist et al., 2021).

Teachers that empower their students to take an active role in their learning decisions impact positively their students classroom environment and overall learning outcomes (R. Clark & Price, 2002) as students that have some power over this decisions tend to discover better practices for them, that help them reach their learning objectives (Thomas, 2002).

Also, more than expecting from their students, teachers need to provide their classes with simple and open communication, they need to be innovative and create challenging environments and always be prepared to provide their students with the help they need (R. E. Clark & Beck, 2003; Ishak, 2018).

Overall, the teacher's role is viewed as one that fosters an inclusive learning environment, emphasizing co-participation and prioritizing diverse ways to access learning (Craft et al., 2008).

University administrators, faculty and staff often dedicate a considerable amount of time and effort in developing and refining institutional policies and practices aimed on creating a campus environment that support their students learning environment, but often they don't acknowledge their students' opinions. If so they would have a much improved view on those type of practices. (Braxton & Caboni, 2005).

Offering multi-dimensional access to student-nature interactions on campus is highly significant (Scholl & Gulwadi, 2015). This approach is much more than just merely promoting the aesthetic appeal of open spaces for recruitment, it emphasizes the campus landscape as a valuable learning environment and highlights its educational benefits. At the same time it is also very important to ensure uniformity throughout the learning environment, so students don't feel distracted (Cui et al., 2023).

There are seven dimensions regarding behavioural and well-being elements that could be involved into the learning environment, they are: Sound, Air, Light, Image, Ergonomics, Nature, and Tint. The so called SALIENT Checklist by (Dolan et al., 2016). Also, it is also possible to use a Design Thinking methodology to create a new learning space that addressed the interests and needs, not only of students, but also faculty (Victorino & Henriques, 2021).

Is very important to prioritize human interaction and team-based work to create high-quality learning environments for students. These are primarily pedagogical challenges that should take top priority when educational institutions design new learning spaces and experiences (Lysne et al., 2023).

2.3. STUDENT MOTIVATION, ACHIEVEMENT AND EXTRACURRICULAR ACTIVITIES

The complexity and significance of human motivation, and how essential it is to educate people on the several types of motivation and their effects on performance, as they vary on different work environments is something that need to be highlighted. This happens because motivation in a cornerstone of creativity and creativity is what feeds innovation. Also, innovation itself is a cornerstone of any work environment, which has a major impact on individuals (Amabile, 1997).

Regular interaction between students and faculty, both inside and outside the classroom, is the key driver of student motivation and engagement (Chickering & Gamson, 2006). Also, creative environments can lead to higher levels of student motivation and engagement in general (Jindal-Snape et al., 2013). When students feel comfortable in the classroom, they are more focused on the lesson, absorb more information from their teachers, and ultimately achieve higher scores (Suleman, 2014).

The sociological/socioeconomic level interferes in a very profound way with school motivation and with school success, as teachers, parents and classmates are often decisive and influence these variables (Cunha, 2013). In other note, well-equipped classrooms with appropriate physical facilities also have a significant positive impact on the academic performance of students (Suleman, 2014).

There are indications that a creative learning environments positively influence students' academic achievement as it enhance motivation and engagement, boost their confidence and resilience, contribute to improve school attendance and foster the development of social, emotional and cognitive skills (Davies et al., 2013).

It was found that learning environments varied across universities and were linked to students' academic aspirations and overall satisfaction with their institutions. (Huang, 2012b). Due to that academic institutions should be aware that their facilities are crucial to students in learning as well as campus life, as these directly impact their ability to achieve academic excellence (Ramli & Mohd Zain, 2019). Students' achievement emotions are connected to their assessments of motivation, control and value, self-regulation, and overall academic performance (Pekrun et al., 2011).

Extracurricular activities tend to have a positive impact on students, as it was already proven by many. Participation in extracurricular activities promote not only happiness, but also helps students developed themselves personally, socially and intellectually and increase their inner motivation (Albayrak & Şener, 2021; Enăchescu, 2019; Nikki Wilson, 2009).

Students who engage in extracurricular activities have higher scores than non-participants (Albayrak & Şener, 2021; Knifsend & Graham, 2012), as some activities like sports tend to have a positive impact on their self-esteem, make them feel a sense of belonging at school and greater overall satisfaction with their school experience. (Ivaniushina & Aleksandrov, 2015)

Students that had a bigger satisfaction with their overall life were the ones that engaged in extracurricular activities. That happens because when a student develops an interest in an extracurricular activity, they tend to feel more motivated to learn about that topic in an academic way, and with that have better results in class (Toyokawa & Toyokawa, 2002).

Even though the positive outcomes of extracurricular activities for students are proven, there is also proof that the amount and type of activities can impact negatively students when they make them feel overwhelmed, as sometimes the reasons that lead students to be on those activities are more than just self-fulfilment, and other times the way they are supervised in those activities impact their freedom on doing them and that impacts their overall happiness when participating (Cunha, 2013; Enăchescu, 2019).

3. CONCEPTUAL DEVELOPMENT AND HYPOTHESES

Theoretically, according to previous studies, the campus learning environment has a significant effect on student learning motivation. It was already shown than students that feel more comfortable in their classrooms tend to be more attentive, interested and overall motivated (Suleman, 2014) as well as when they collaborate more with their peers during class (Lysne et al., 2023). Overall, when students feel a sense of community in their university campus they tend to feel included and accepted which also highly motivates them (Osterman, 2000). Besides all of this, previous studies showed that the relationship between the campus learning environment and student motivation exists (Usman & Rahmawati, 2021). Hence, it is hypothesized that:

- Hypothesis 1: The campus learning environment has a significant effect on student learning motivation.

Previously in other studies it was shown that incorporating behavioural and wellbeing aspects (sound, air, light, image, ergonomics, nature and tint) in the building process of environments was very positive (Dolan et al., 2016). The impact of the SALIENT factors was also studied on campus facilities, and it was shown that they provided a more useful space for students that really consider their interests and needs (Victorino, G., & Henriques, R., 2021). Past research also showed that it is indeed very important to provide campus spaces with more than just aesthetic décor, but with landscapes that could provide a better learning experience to students (Scholl & Gulwadi, 2015). Hence, it is hypothesized that:

- Hypothesis 1a: Sound has a significant effect on the Campus Learning Environment.
- Hypothesis 1b: Air has a significant effect on the Campus Learning Environment.
- Hypothesis 1c: Light has a significant effect on the Campus Learning Environment.
- Hypothesis 1d: Image has a significant effect on the Campus Learning Environment.
- Hypothesis 1e: Ergonomics has a significant effect on Campus Learning Environment.
- Hypothesis 1f: Nature has a significant effect on the Campus Learning Environment.
- Hypothesis 1g: Tint has a significant effect on the Campus Learning Environment.

According to previous research the teaching and learning process has an impact on students' motivation. It was already shown that positive everyday teaching practices can be more efficient in study motivation, than giving special attention to learning motivation efforts (Davis, 2001). Close to that, (R. Clark & Price, 2002) concluded that allowing students to choose some of their learning methods and assessments tools, had a powerful impact on their motivation and overall class environment. Also, (Sass, 1989) listed some characteristics that impacted motivation in students, being the top 3: Teachers Enthusiasm, Level of relevance and organization of classes. All these characteristics being important factors of the teaching and learning process. Overall, motivation has an very important and active role in the teaching and learning process, as students very hardly master their learning journey when their

motivation is low, but when motivation in high that impact greatly and positively students learning experience (Usman & Rahmawati, 2021). Hence, it is hypothesized that:

- Hypothesis 2: The teaching and learning process has a significant effect on student learning motivation.

Previously in other studies it was shown that creativity has an impact on the teaching and learning process, as teachers believe in the power of creativity in society, admitting that they recognize they are creative and capable of fostering creativity in their students, making them more creative in general (Eason et al., 2009b; Rubenstein et al., 2013). It was also showed by (Lin, 2011) in his research that educators believe that favourable environments created by adults nurtures creativity in students. Overall, it is proven that the way students and teachers perceive the importance of creativity greatly impacts their educational experience (Lin, 2011) as well as internal school staff and students interactions with each other have important roles in students learning process, were creativity is one important cornerstone (Craft et al., 2008). Hence, it is hypothesized that:

- Hypothesis 3: Creativity has a significant effect on the teaching and learning process.

According to previous research creativity has an impact on the campus learning environment. (Jindal-Snape et al., 2013) in their research suggested that the structuring of the physical environment has an impact on learners, both indoor and outdoor, as well as (Davies et al., 2013) that highlights physical environment, availability of resources/materials and the use of the outdoor environment as factors that effectively promote creativity in young people. It was also already shown by (Amabile, 1997) that creativity feeds innovation, which is the cornerstone of any work environment. Hence, it is hypothesized that:

- Hypothesis 4: Creativity has a significant effect on the campus learning environment.

Previously in other studies it was shown that creativity has an impact on student learning motivation. (Amabile, 1997) concluded that maintaining our creativity at work is what maintains our intrinsic motivation, as well as (Craft et al., 2008) that showed that's students tend to be more motivated if they use creativity in their school work. (Davies et al., 2013) also suggested that student's motivation, engagement and confidence are impacted by their own creativity. Overall, there's evidence that high levels of motivation on students arise from them being a part of a creative environment (Jindal-Snape et al., 2013). Hence, it is hypothesized that:

- Hypothesis 5: Creativity has a significant effect on student learning motivation.

According to previous research extracurricular activities have impact on student learning motivation. (Deci & Ryan, 2000) present self-determined activities as facilitators of intrinsic motivation, as in many cases extracurricular activities are. It was already concluded by (Albayrak & Şener, 2021) that students that take part in extracurricular activities have a higher

level of inner motivation when studying languages. (Nikki Wilson, 2009) also suggested that one of the main elements of extracurricular activities is promoting intrinsic motivation. Hence, it is hypothesized that:

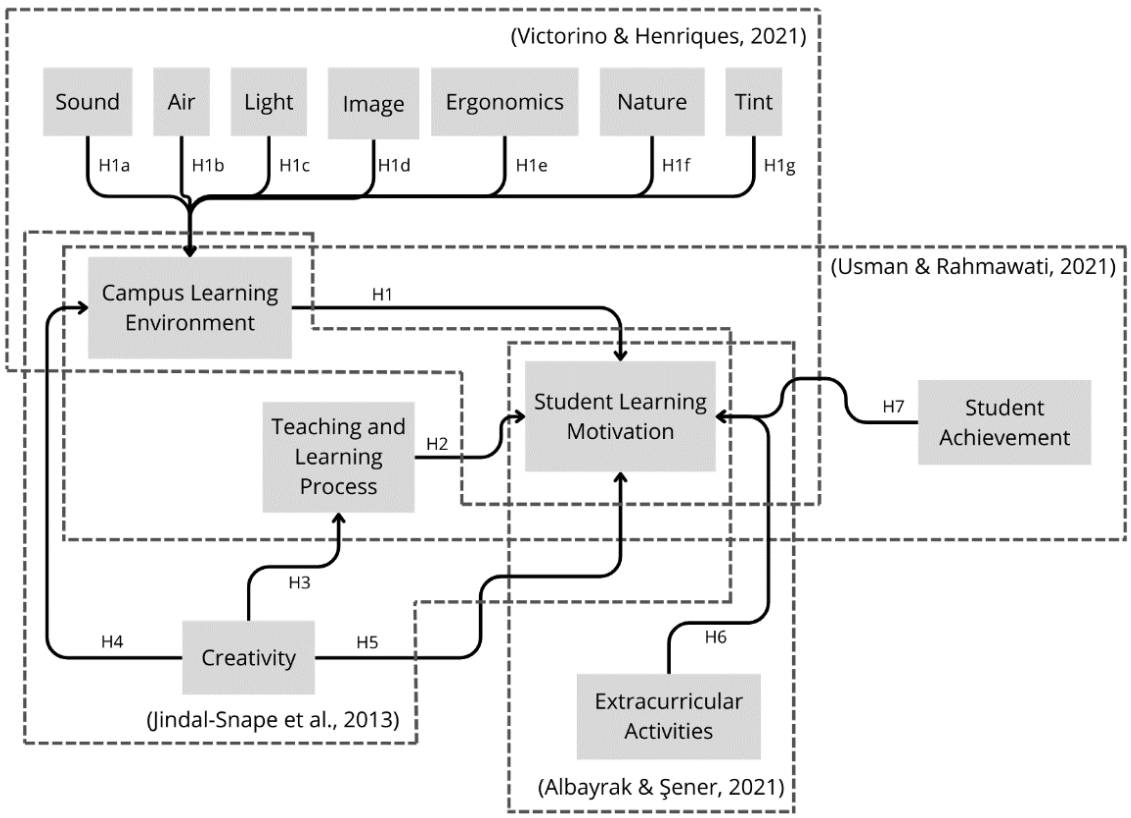
- Hypothesis 6: Extracurricular activities have a significant effect on student learning motivation.

Previously in other studies it was shown that student achievement is related to student learning motivation., as (Usman & Rahmawati, 2021) that concluded that learning motivation has a significant effect on student achievement. Some late findings also suggest that students' achievement emotions are linked to their motivation and overall academic performance (Pekrun et al., 2011). (Suleman, 2014) also concluded that the classroom physical environment has a great effect on academic achievement as more well-equipped classrooms influence positively students' academic success. Hence, it is hypothesized that:

- Hypothesis 7: Student achievement has a significant effect on student learning motivation.

As mentioned above, the conceptual model was developed using the literature review and the conclusions that it brought, with the aim of assessing the impact that the constructs may or may not have in each other and considering all the provided hypothesis:

Figure 1 –" Impact on Student Learning Motivation" Model



4. EMPIRICAL STUDY

This research was based on Quantitative Research and consisted in three parts: The first one was research relevant topics to the thesis, after that we had to gather responses from the target audience in question and to conclude we analysed the data collected and draw conclusions.

Using this methodology the main goal of this research is to understand how creativity can influence learning, based on the question: Can a creative academic environment influence the motivation of higher education students?

To answer this question, we started by researching papers and other documents on this topic which allowed us to understand more the concepts of our research, and what conclusions had already been taken. With all the information gathered we developed a conceptual model that contained all our constructs and hypothesis, for further data analysis.

Table 1 - Constructs and Description

Construct	Construct definition	Reference
Image	*We are stimulated by certain imagery and affected by clutter.*	(Victorino & Henriques, 2021)
Light	*Our behaviour is influenced by the source and brightness of light.*	
Sound	*Our attention is drawn to unpredictable and attention seeking sounds.*	
Air	*We are affected by air flow, temperature, source, and scents.*	
Ergonomics	*We do not adapt well to poorly designed furniture and equipment.*	
Nature	*We are affected in positive ways by exposure to natural elements.*	
Tint	*Our behaviour is affected by the presence of distinct colours.*	
Student Achievement	*It can be concluded that learning achievement is evidence of learning outcomes conducted during the learning process inside and outside the classroom.*	(Usman & Rahmawati, 2021)
Extracurricular Activities	*Extracurricular activities usually refer to those activities that complement the normal teaching-learning hours.*	(Enăchescu, 2019)
Creativity	*Creativity is understood as a process, which produces something new as well as useful.*	(Jindal-Snape et al., 2013)
Campus Learning Environment	*It can be concluded that the campus environment is a condition around the campus that can affect student behaviour in obtaining learning achievement.*	(Sharma, 2011)
Teaching and Learning Process	*It can be concluded that the learning process is the process of interaction between lecturers and students to achieve learning objectives and ends with a learning evaluation process within a certain period.*	(Usman & Rahmawati, 2021)
Student Learning Motivation	*It can be concluded that learning motivation is something that can encourage a person's enthusiasm to conduct learning activities both from within and outside influences.*	

4.1. MEASUREMENT INSTRUMENT

The chosen measurement instrument for this study was a questionnaire since it is a large-scale data collection method that provides standardized responses, all anonymous and confidential and easy to analyse. A questionnaire is usually a method that is flexible, cost-effective, accessible and time efficient (Lindemann, 2023).

All the questions were chosen after in-depth research among existing literature on Student Learning Motivation, Campus Learning Environment, Creativity and all the other variables in question. It was indeed a crucial step in the research as it helped us understand where there could be a potential gap for our research to focus on. Taking all this into consideration the questionnaire was composed of 7 main topics, which were the variables of the model (plus demographics questions):

Extracurricular Activities (Enăchescu, 2019): This section had five questions and the goal with them was to understand if the participants had or not an extracurricular activity. If they did not have one, they were questioned on the reasons for that to happen, and if they did have one or more extracurricular activity, they were asked what kind of activities they practiced, how many times per week and the reasons for them to participate in them.

Teaching and Learning Process (Usman & Rahmawati, 2021): This section had four questions and the objective with them was to understand if students have struggles during their learning process, and if some of them may be prevenient from the teaching process of their educators.

Creativity (Jindal-Snape et al., 2013): This section had four questions and the goal with these questions was to understand if the students believe that their school is open to creativity thinking, and if they believe that is important.

Student Achievement (Usman & Rahmawati, 2021): This section had three questions and the objective with them was to analyse if the students value their academic success and if they care about their achievements at university.

Student Learning Motivation (Usman & Rahmawati, 2021): This section had four questions and the goal with these questions was to see if students are motivated at school and are content with their learning.

Campus Learning Environment (Sharma, 2011): This section has four questions regarding different aspects of the campus learning environment that may impact students' relationship with their universities.

SALIENT (Victorino & Henriques, 2021): This section had fourteen questions regarding some physical aspects of their classroom and the goal was for students to say how important those physical aspects are to them.

It is possible to investigate in more detail the measurement items in Appendix A.

All the questions, except the demographics and the ones about extracurricular activities, were answered using a scale from 1 to 7 where one was “Strongly Disagree” and 7 was “Strongly Agree”, so it was possible to measure the level of agreement of students with those topics. Also, on the questions about Campus Learning Environment, the scale was a little different, as it measured the importance and not the level of agreement, so they were from 1 to 7, 1 being “Very unimportant” and seven being “Very important”.

Since there were many questions and they were all mandatory, the respondents could follow a progress bar to prevent them from leaving the questionnaire unfinished. It should also be noted that at the beginning of the questionnaire the data privacy information (anonymity, consent and data protection) as well as the objectives of the research were presented so every participant could be aware of it before starting to answer it.

To make sure that every answer would be as valuable as possible, we conducted a questionnaire pilot test using Qualtrics XM, which was shared with twenty close friends who were part of the target of the study. This test was indispensable, as it showed that some questions needed improvement so they could be fully understood and answered sincerely. All typing mistakes were corrected, and multiple questions were reformulated so they could be more simplified. The pilot also proved that the constructs could indeed be used to evaluate the model of the research in question.

The final questionnaire was also designed on Qualtrics XM to be answered in 6-8 minutes, and was available in Portuguese and English, due to the target of the study, which were higher education students currently studying in Portugal, above 18 years of age.

From April 23rd to May 27th, the study was open for answers and was shared through social media platforms, more precisely WhatsApp, Instagram, Facebook, LinkedIn and Email. On Instagram, Facebook and LinkedIn a link to the questionnaire as shared in the public feed several times, with some basic information about it. On WhatsApp, the link was shared directly with contacts that we already knew were a part of our sample or could know someone that did. On Email several emails were sent to Portuguese Universities, using their public contacts, asking them to share the link to the questionnaire with their students, as well as to some University professors which we were in contact, so they could share the questionnaire with their students.

The questionnaire helped us collect 232 answers, of which only 166 were valid ones, due to multiple incomplete answers. The answers from the pilot were not considered as the questionnaire suffered changes and the answers in question were no longer complete and accurate to the questions. All the data collected was organized in Microsoft Excel and after imported into SmartPLS, which was the software that allowed us to analyse the data collected using the Structural equation modelling (SEM) method.

4.2. SAMPLE

In what concerns demographics of the participants the average age were approximately 23 years old with a mean of 22.98 and standard deviation of 5.57. 66.87% of the participants were females, 30.72% were males and 2.41% were nonbinary. Most participants are Portuguese, around 96.99%, as the remaining five participants are from 3 other nationalities, Brazilians, Romanians and Peruvians. Regarding their educational level, more than half of the participants are under graduates, about 60.24%. The remaining participants are either postgraduates (4.22%), masters (14.46%) or only have high school diploma (21.08%). The field of study of the participants were the topic with more variation, having between 10 to 20 participants selection one of the options provided, mas almost half of them selected "other" (45.78%), which showed a lot of diversity in this question.

Table 2 - Demographic information of questionnaire respondents

		Number	Percentage
Age	-	166	100%
Gender	Female	111	66.87%
	Male	51	30.72%
	Non binary	4	2.41%
Nationality	Portuguese	161	96.99%
	Brazilian	3	1.81%
	Romanian	1	0.6%
	Peruvian	1	0.6%
Education Level	High School	35	21.08%
	Undergraduate	100	60.24%
	Post-Graduate	7	4.22%
	Master	24	14.46%
	Ph.D.	0	0%
	Post-Doc	0	0%
Registered Faculty	Engineering	19	11.45%
	Economics & Administrative Sciences	17	10.24%
	Fine Arts	14	8.43%
	Science and Letters	24	14.46%
	Law	13	7.83%
	Medicine	3	1.81%
	Other	76	45.78%

4.3. ASSESSMENT OF THE MEASUREMENT MODEL

As mentioned in Data Collection, to understand the data that we collected, the results of the questionnaire were turned into an Excel file and ran into SmartPLS. There we selected each one of the constructs and organized them like the model that we designed at the beginning of the research. To analyse all the data, we used the Partial Least Squares Structural Equation

Modelling (PLS-SEM) method. PLS-SEM is a variance-based statistical method used to analyse complex relationships between observed and latent variables, often used in exploratory research and predictive modelling (Hair et al., 2017, 2019; Sarstedt et al., 2017). The software used was Smart PLS version 4.1.0.0 for statistical calculations.

Construct Reliability, Validity

Construct Reliability, Validity Average Variance Extracted (AVE) is a key analysis in Structural Equation Modelling (SEM). It helps determine whether the items assigned to each construct are consistently measuring the same underlying concept. With an AVE value greater than 0.5 for each construct, this indicates a high level of convergent validity, meaning the items are consistently measuring the same underlying concept (dos Santos & Cirillo, 2023). If the AVE is below 0.5, it suggests that the items within the construct may be measuring different concepts, indicating that some questions might not align well with the construct. In such cases, the construct may need to be revised and certain items could be removed, if necessary (Hamid et al., 2017; Ringle et al., 2015).

Along with the AVE, Cronbach's alpha (α) can also be used to further assess the consistency and reliability of the construct in this study. To calculate this measure, the measurement model must be defined, with each item assigned to its respective construct. The resulting value can range from 0 to 1 (Warrens, 2015). Like the AVE, the results assess the construct's reliability and validity. The higher the value, the stronger the construct's reliability and validity (F. Hair Jr et al., 2014).

Table 3 - Construct Reliability and Validity

Construct Reliability and Validity			
	Cronbach's alpha (CA)	Composite reliability (CR)	Average variance extracted (AVE)
Campus Learning Environment	0,72	0,84	0,637
SALIENT	0,452	0,785	0,646
Student Learning Motivation	0,799	0,869	0,625

Discriminant Validity - Cross-Loadings

Discriminant Validity - Cross-Loadings allows us to examine the relationships between constructs and assess if they are distinct and measure or not different concepts. Ideally, we seek constructs that are homogeneous within themselves and heterogeneous between each other. This analysis is used when we want to make sure that separate constructs are not measuring the same thing and when we want to confirm that all the questions in the questionnaire are aligned with their intended concept. Because thus analysis prevents overlaps, it ends up being very helpful when validating discriminant validity. In our proposed

model the values for each question were higher in their in their respective constructs. We also must ensure in this analysis that all loadings are above 0.7, if so, we can validate the construct.

Table 4 - Cross Loadings

Cross Loadings							
	Campus Learning Environment	Creativity	Extracurricular Activities	SALIENT	Student Achievement	Student Learning Motivation	Teaching Learning Process
C3	0,276	**1**	-0,069	0,14	0,216	0,332	0,091
CLE1	**0,807**	0,241	-0,06	0,327	0,042	0,277	0,133
CLE2	**0,815**	0,242	-0,084	0,272	0,211	0,272	0,018
CLE3	**0,771**	0,161	0,045	0,161	0,104	0,239	0,094
ExtActiv	-0,052	-0,069	**1**	-0,081	0,052	-0,023	0,082
SA1	0,148	0,216	0,052	0,008	**1**	0,48	0,277
SALIENT5	0,262	0,003	0,001	**0,797**	-0,007	0,216	0,146
SALIENT9	0,27	0,219	-0,129	**0,81**	0,019	0,077	-0,008
SLM1	0,275	0,305	-0,042	0,165	0,437	**0,855**	0,439
SLM2	0,308	0,295	-0,023	0,129	0,353	**0,836**	0,361
SLM3	0,24	0,206	0,031	0,171	0,391	**0,727**	0,304
SLM4	0,222	0,232	-0,03	0,106	0,331	**0,738**	0,347
TLP2	0,102	0,091	0,082	0,084	0,277	0,462	**1**

Discriminant Validity - Fornell Larker

The Fornell-Larcker analysis is another method used to validate discriminant validity. It assesses if each variable is distinct from the others, making sure they don´t overlap. This indicator is calculated using the square root of the Average Variance Extracted (AVE). After calculating the AVE values, a correlation matrix is generated and it examines all the relationships between the constructs in the proposed model (Hamid et al., 2017).

Want we look for is for the AVE value of each construct to exceed the squared correlation value between the constructs (Hair et al., 2019). Using the data we took from Smart-PLS we need to make sure that the diagonal values are the highest in their respective columns and rows, as we can see on the table below. Since that is correct, we can conclude that the model shows strong discriminant validity (Hair et al., 2011). As we stated above, if the AVE is lower than the squared correlation of any construct, it may indicate a potential issue. In cases like that, the constructs need to be reviewed and, if necessary, removed.

Table 5 - Fornel Larker

Fornel Larker							
	Campus Learning Environment	Creativity	Extra-Curricular Activities	SALIENT	Student Achievement	Student Learning Motivation	Teaching Learning Process
Campus Learning Environment	**0,798**						
Creativity	0,276	**1**					
Extra-Curricular Activities	-0,052	-0,069	**1**				
SALIENT	0,331	0,14	-0,081	**0,804**			
Student Achievement	0,148	0,216	0,052	0,008	**1**		
Student Learning Motivation	0,332	0,332	-0,023	0,181	0,48	**0,791**	
Teaching Learning Process	0,102	0,091	0,082	0,084	0,277	0,462	**1**

Discriminant Validity - HTMT (Heterotrait-Monotrait Ratio of Correlations)

Another way of assessing Discriminant Validity is by calculating HTMT (Heterotrait-Monotrait Ratio of Correlations). This method has a similar purpose to the previous ones, analysing and comparing the correlations between different constructs, as well as the correlation of each construct and itself. (Hair et al., 2011) Stated that we can see strong discriminant validity hen HTMT values are low. In fact, the ideal value for HTMT is below 1 as it indicates that the constructs have good discriminant validity. This happens because the correlation between the different constructs is lower than the correlation of a construct with itself (Henseler et al., 2014).

On the other hand, if the HTMT value equal 1 or is higher than that it may indicate that the construct needs to be reassessed and, in some cases, even eliminated, if necessary. This would happen if constructs were overlapping each other and would mean they were analysing similar concepts. Due to this fact, we usually look for HTMT values lower than 0.9. Alongside other methods, this analysis provides further confirmation of the discriminant validity of the proposed model (Afthanorhan et al., 2021).

Table 6 - HTMT

HTMT							
	Campus Learning Environment	Creativity	Extra-Curricular Activities	SALIENT	Student Achievement	Student Learning Motivation	Teaching Learning Process
Campus Learning Environment							
Creativity	0,316						
Extra-Curricular Activities	0,093	0,069					
SALIENT	0,555	0,206	0,12				
Student Achievement	0,175	0,216	0,052	0,025			
Student Learning Motivation	0,432	0,368	0,045	0,303	0,536		
Teaching Learning Process	0,12	0,091	0,082	0,143	0,277	0,513	

INNER VIF (The Inner Variance Inflation Factor)

Inner VIF (Inner Variance Inflation Factor) is a method used in Partial Least Squares Structural Equation Modelling (PLS-SEM) to analyse multicollinearity between constructs. The primary goal of this analysis is to assess whether are highly correlated with each other. The goal is to find little to no correlation, as strong correlations could be presented as an issue for our proposed model (Wong, 2013). The higher the level of multicollinearity, the higher the value we will obtain, which suggest that similar themes are being studied. Therefore, to goal is for the results from Smart PLS-SEM to be lower than 5, ensuring that multicollinearity is not an issue (Hair et al., 2011). Because none of our values were higher than 5, we can conclude that our proposed model does not suffer from multicollinearity.

Table 7 - Inner VIF

Inner VIF	
	VIF
Campus Learning Environment -> Student Learning Motivation	1,098
Creativity -> Campus Learnin Environment	1,02
Creativity -> Student Learning Motivation	1,126
Creativity -> Teaching Learning Process	1
Extra-Curricular Activities -> Student Learning Motivation	1,017
SALIENT -> Campus Learnin Environment	1,02
Student Achievement -> Student Learning Motivation	1,137
Teaching Learning Process -> Student Learning Motivation	1,094

4.4. ASSESSMENT OF THE STRUCTURAL MODEL

After validating the measurement model, the structural model was analysed to examine the potential relationships between the constructs. The outcomes of the tests performed on the structural model are presented in Figure 2 and Table 8. A bootstrap resampling technique with 5,000 repetitions was used to assess the significance of the paths within the model. The model explains 43.6% of the variation in Student Learning Motivation, 16.3% of the variance in Campus Learning Environment and 0.8% of the variation in Teaching and Learning Process. Since most of the constructs are explained relatively well, we consider the model substantial.

The model explains 43.6% of the Student Learning Motivation variation. Campus Learning Environment (β=0.004, p<0.010), Teaching and Learning Process (β=0, p<0.001), Creativity (β=0.012, p<0.050) and Student Achievement (β=0, p<0.001) are statistically significant. Hence, H1, H2, H5 and H7 are confirmed. On the other hand, Extra-Curricular Activities (β=0.471, p>0.050) is not statistically significant. Thus, H6 is not confirmed. The model also explains 16.3% of the Campus Learning Environment variance. SALIENT (β=0, p<0.001) and Creativity (β=0.005, p<0.010) are statistically significant. Consequently, H1a-»H1g and H4 are confirmed. Finally, the model explains 0.8% of the Teaching and Learning Process variation. Creativity (β=0.311, p>0.050) is not statistically significant. Hence, H3 is not confirmed.

Figure 2 - Research Structural Model Results

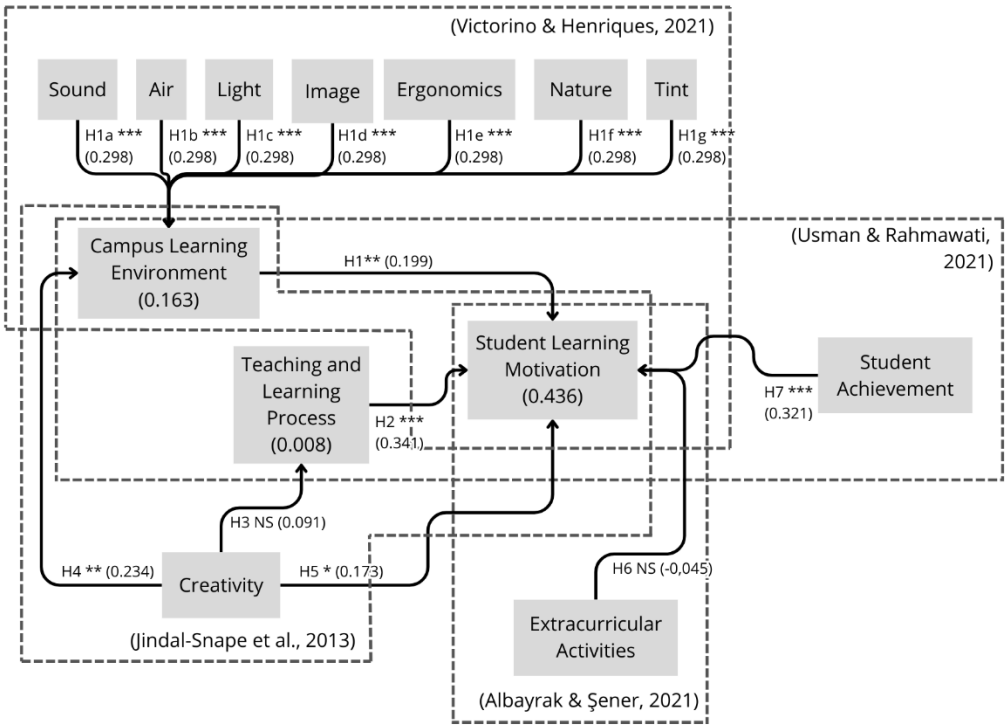


Table 8 - Correlation between constructs and square root of AVEs

H	Hypothesis	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Sign Level
H1	**Campus Learning Environment -> Student Learning Motivation**	0,199	0,199	0,069	2,906	0,004	**
H1a -» H1g	**SALIENT -> Campus Learning Environment**	0,298	0,31	0,082	3,612	0	***
H2	**Teaching Learning Process -> Student Learning Motivation**	0,341	0,342	0,069	4,947	0	***
H3	**Creativity -> Teaching Learning Process**	0,091	0,094	0,09	1,013	0,311	NS
H4	**Creativity -> Campus Learning Environment**	0,234	0,238	0,083	2,814	0,005	**
H5	**Creativity -> Student Learning Motivation**	0,173	0,174	0,069	2,517	0,012	*
H6	**Extra-Curricular Activities -> Student Learning Motivation**	-0,045	-0,047	0,062	0,72	0,471	NS
H7	**Student Achievement -> Student Learning Motivation**	0,321	0,32	0,07	4,605	0	***

5. RESULTS AND DISCUSSION

As it was shown in Table 3, from 8 hypothesis (H1, H1a->H1g, H2, H3, H4, H5, H6 and H7) six had a p-value < 0.01 thus they are empirically supported. On another hand, two of them, H3 and H6, were rejected. Most of the variants' relationships were verified as we can observe:

- **Campus learning environment:**

"Campus Learning Environment" is explained in 16.3% by the constructs "SALIENT" and "Creativity". Due to that, H1a -> H1g and H4 are statistically supported.

SALIENT is directly linked to campus learning environment as it represents seven major components that are considered when building a physical space. In our research light and image were the components that students felt were the most important ones, highlighting adjustable lighting and writable surfaces as valuable in their classroom experience. Even though (Victorino & Henriques, 2021) study was qualitative and ours was quantitative, our conclusions were similar and connect with (Dolan et al., 2016; Scholl & Gulwadi, 2015) findings. Thus, H1a -> H1g is accepted.

This study also showed that the campus learning environment is influenced by creativity as students feel the freedom to explore topics within their school environment. This freedom is deeply connected with creativity, as they can explore in a more innovative and diverse way the resources/materials and facilities that their campus offers. These findings resemble the ones presented by (Amabile, 1997; Davies et al., 2013, 2013). Thus, H4 is accepted.

- **Student Learning Motivation:**

"Student Learning Motivation" is explained in 43.6% by the constructs "Campus Learning Environment", "Creativity", "Student Achievement" and "Teaching and Learning Process". In other hand, "Extracurricular Activities" does not statistically affect "Student Learning Motivation". Due to that, H1, H2, H5 and H7 are statistically supported and H6 is not.

Results of our research showed that students feel confident in their ability to complete their schoolwork, working towards the goals they set for themselves. Also, the main reason for them to work hard is to earn new knowledge and skills as they believe their ambitions for the future impact their learning motivation.

This connects with campus learning environment as they consider emotional development, university/students' relations and language abilities as the more important factors on their campus. With this it means that students want to feel accepted and esteemed in their universities and will be more motivated to learn if they feel listened and seen as part of the

school community itself. Similar results were also obtained by (Lysne et al., 2023; Osterman, 2000; Suleman, 2014; Usman & Rahmawati, 2021). Thus, H1 is accepted.

The teaching and learning process also connects with student learning motivation as in this research students stated that when faced with difficulties when studying they try to find different solutions, always trying to see the problem from different perspectives. Without motivation students would easily loose interest in studying, giving up on the first difficulty that crossed them. These findings resemble the ones presented by (R. Clark & Price, 2002; Davies et al., 2013; Usman & Rahmawati, 2021). In other hand our findings were not conclusive in what concern the role of the teacher in motivation, drifting from (Sass, 1989) findings. Thus, H2 is accepted.

Like stated before students believe in the power of having freedom to explore their school environment, with creativity being the corner stone that allows them to feel confident having that power. By having the possibility to explore their creativity in their education journey student's motivation will, of course, be impacted. Similar results were also obtained by (Amabile, 1997; Craft et al., 2008; Davies et al., 2013; Jindal-Snape et al., 2013). Thus, H5 is accepted.

Students in this research also state that an important reason why they do their school work is because they want to get better at it and not because they are obliged to do it. This shows how students have ambitions, and as shown before they also believe their ambitions impact their learning motivation. These findings resemble the ones presented by (Pekrun et al., 2011; Usman & Rahmawati, 2021). In other hand our findings were not conclusive in what concern the role of the classroom environment in student achievement, drifting from (Suleman, 2014) findings. Thus, H7 is accepted.

It was surprising to observe that this research showed that Extracurricular activities don't have an impact on student learning motivation, contradicting (Albayrak & Şener, 2021; Deci & Ryan, 2000; Nikki Wilson, 2009) findings. Our findings were more similar to (Cunha, 2013; Enăchescu, 2019) that stated that the type and amount of extracurricular activities can become overwhelming for students and impact them negatively, decreasing their learning motivation. Thus, H6 is not accepted.

- **Teaching and Learning Process:**

"Creativity" does not statistically affect "Teaching and Learning Process". Due to that H3 is not statistically supported.

It was also with surprise that our research showed that the teaching and learning process was not effected by creativity, contradicting (Craft et al., 2008; Eason et al., 2009a; Lin, 2011; Rubenstein et al., 2013) findings. Analysing our data we believe this may happen because students often felt afraid to ask questions or give answers to their teachers, as creative

thinking is nor very well accepted in their universities and teachers don´t usually motivate their students to be creative at all, many times even condemning it. Due to that H3 is not statistically supported.

6. CONCLUSIONS AND FUTURE RESEARCH

6.1. THEORETICAL IMPLICATIONS

The results suggest that student learning motivation is positively impacted by the campus learning environment, creativity, student achievement and the teaching and learning process in almost 44%. With that we can conclude that motivation is something that can be promoted through multiple ways, many which are connected.

We can also conclude that the campus learning environment has a connection with creativity and the SALIENT factors, as both explain 16.3% of variance of the construct. This shows how important is for students to have a campus that is stimulating both physical and emotionally.

In other hand, in our study we didn't find an effect of creativity on the teaching and learning process nor of extracurricular activities on student learning motivation. These findings were not what we expected based on studies on the same topic or similar ones, whose majority find that those constructs have indeed and effect on each other, and in most times, a positive one.

Even so, those findings may be a reflex of how education is evolving with the development of society and how aspects that were once valued, are not anymore.

In 2006 Sir Ken Robinson presented the TED Talk "Do Schools Kill Creativity?" where he talked on how the education system in outdated and does not value Creativity (Robinson, 2006). Some of the topics he presented were that:

- The system inflicts students with the fear of failure, making them be afraid of being wrong and with that enabling them to have creative thinking.
- Students are taught that arts are the least valuable course they have, insisting on only wanting people to know mostly maths and science and not understanding that society needs diverse people that are educated in all courses.
- Teachers need to encourage their students to be creative and innovative, as the future is unknown, but students that develop those characteristics will be more valuable workers and will add more value to society as the actual education system does neither prepare students to be part of the modern workforce, nor for the future society that they may encounter.

This means that even if students' value creativity, the education system in not prepared to accommodate that and kills their will to use it. This reverberates with our findings as the questions of our questionnaire regarding this topic were overall related to how students felt regarding their university's openness to creative thinking.

In what concerns the relation between extracurricular activities and student learning motivation, we did find studies that explained some negative side effects of extracurricular activities as we presented before on this dissertation, but those presented effects were not

evaluated in our research, were we only analysed the participation or not in an extracurricular activity. Our findings may depend on the types of extracurricular activities students were part of, the amount of activities they have and their major, as depending on those factors student's motivation can indeed be negative impacted (Cunha, 2013; Enăchescu, 2019).

6.2. PRACTICAL IMPLICATIONS

The practical implications show that student's motivation and overall performance should be something that universities need to take into consideration, particularly if they are renovating their campus or building a new one.

Students' ambitions for their future and emotional development impact their motivation, as students tend to be more confident in their school abilities and tend to be more persistent in working toward the goals, they set for themselves, as well as to find alternative solutions for their difficulties when studying a subject.

The effort they put in schoolwork is promoted by the goal to gain new knowledges and learn new skills as well as to get better at school, not because they are obligated to it, but because they aim to go further in their academic journey.

Students also value a campus where they feel that they receive freedom to explore the various topics of the school environment and where relations between students and university are well maintained. Campus where students don't have language as a barrier and where classrooms have adjustable lights and writable surfaces are also valued by students.

A university that allows students to participate in Extracurricular Activities, inside or outside campus, will also have more motivated students, as they have the possibility to express themselves in other places outside the classrooms and not related to schoolwork and responsibilities.

Many of these implications could be worked by having more innovative approaches when building campus spaces, primarily by using technology and combining it with creativity, comfort and accessibility. Manly technology can help universities to create spaces where students feel that their needs are satisfied and that also stimulate them in ways that they don't even imagine.

An excellent example can be the development of Co-creation spaces/Labs, where students can interact with their peers, but also with their teachers, in a safe space that provides them with valuable tools. Spaces like theses ones would for sure motivate students that have the will to enrich their academic experience and make them feel more part of the university community.

6.3. LIMITATIONS AND FUTURE RESEARCH

The size of the sample was a limitation in this study, as it is a generalization of all Portuguese student population and may not fully represent the diversity of the study target. This limitation could be resolved by enlarging the range of respondent students, and with that have a bigger sample size to analyse. The other limitation of this study is the fact that it was a cross-sectional study rather than a longitudinal one, as it was carried out over a period and does not follow the evolution of society, and over time students' perceptions may change.

For future research doing a longitudinal study could be very important, as well as to further explore the aspect of extracurricular activities and realise whether the number of activities or even the nature of the activities might have a different influence on the other variables. The same goes for the students' area of study, perhaps depending on the area of study the answers could be different, and it might be interesting to find out more about this.

6.4. CONCLUSIONS

The main objective of this study was to understand the influence of a creative school environment on students' motivation. By going through the proposed model, we were able to prove that creativity indeed influences students' motivation, as well as other constructs are influenced by them and influence each other. For this study, a questionnaire was administered to university students currently studying in Portugal. We successfully gathered 166 complete answers.

The findings proved that creativity and motivation are two cornerstones of higher education as they highly influence and are influenced by many aspects of the education journey as campus learning environment, student achievement and teaching and learning process. This finding makes us understand how important is for higher education institutions to take care of their students' needs, prioritizing their wellbeing and comfort above any other goal they may have. If so, they will contribute to an upgrade of the higher education experience.

The objectives were achieved by developing the proposed model based on the literature review and methodology, and then testing it statistically using the PLS-SEM method to examine the cause-and-effect relationships between the constructs. The results indicate that the constructs account for nearly 44% of the variance in the model. This demonstrates the positive impact of the constructs, fulfilling the study's objective and aligning with the findings of previous research by other authors.

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APPENDIX A - MEASUREMENT ITEMS

Constructs	Question	Adapted question based on the source	Reference
Sound	SALIENT1	It's important to me that my university classrooms are soundproof.	(Victorino & Henriques, 2021)
	SALIENT2	It's important to me that my university classrooms have Alexa speakers.	
Air	SALIENT3	It's important to me that my university classrooms have room sensors.	
	SALIENT4	It's important to me that my university classrooms have air conditioning.	
Light	SALIENT5	It's important to me that my university classrooms have adjustable lights.	
	SALIENT6	It's important to me that my university classrooms have sensor-activated smart lighting.	
Image	SALIENT7	It's important to me that my university classrooms have smart boards.	
	SALIENT8	It's important to me that my university classrooms have a projection wall.	
	SALIENT9	It's important to me that my university classrooms have writable surfaces.	
Ergonomics	SALIENT10	It's important to me that my university invests in improving the classroom chairs and tables.	
	SALIENT11	It's important to me that my university classrooms have kitchen-style furniture for individual and small group workspace.	
Nature	SALIENT12	It's important to me that my university classrooms have green walls and natural plants.	
Tint	SALIENT13	It's important to me that my university classrooms have room manifest walls (space for people to write post its with manifests).	
	SALIENT14	It's important to me that my university classrooms have diversity corners (Chairs of different colours to symbolize diversity).	
Student Achievement	SA1	An important reason why I do my work in school is because I want to get better at it (and not because I am obliged to do it).	(Midgley et al., 1998)
	SA2	I like to show my teachers that I stand out positively from the rest of the class.	
	SA3	It's important for me to have better results than my colleagues	
Extracurricular Activities	Exa	Do you participate in any Extracurricular Activities? (options: Yes, one; Yes, more than one; No)	(Knifsend & Graham, 2012)
Creativity	C1	Thinking about topics in unique ways is important.	(Rubenstein et al., 2013)
	C2	My school's priorities do not include teaching students to think creatively.	
	C3	It is possible to give students the freedom to explore topics within my school environment.	
	C4	Teaching creative thinking would be frowned upon in my school.	
Campus Learning Environment	CLE1	Emotional development	(Huang, 2012)
	CLE2	University/student relations	
	CLE3	Language abilities	
	CLE4	Student services (library, academic services…)	
Teaching and Learning Process	TLP1	It is difficult to me to pay attention to the professor during classes.	(Usman & Rahmawati, 2021)
	TLP2	When I face difficulties in studying a subject, I try to find alternative solutions.	

	TLP3	I feel enthusiastic about participating in learning if the facilities of the campus are adequate.	
	TLP4	I feel afraid to give questions and responses to the lecturer during the teaching and learning process.	
Student Learning Motivation	SLM1	I am confident in my ability to complete my schoolwork.	(Scales et al., 2020)
	SLM2	I am good at working toward the goals I set.	
	SLM3	My main reason for working hard in school is to learn new knowledge and skills.	
	SLM4	My ambitions for the future impact my learning motivation.	

APPENDIX B - ETHICS COMMITTEE CERTIFICATE

This is to certify that

Project No.: **DDMKT2024-3-141400**

Project Title: **The influence of a creative school environment on students' motivation**

Principal Researcher: **Beatriz Santos**

according to the regulations of the Ethics Committee of NOVA IMS and MagIC Research Center this project was considered to meet the requirements of the NOVA IMS Internal Review Board, being considered **APPROVED** on 3/14/2024.

It is the Principal Researcher's responsibility to ensure that all researchers and stakeholders associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Ethics Committee, via amendment or progress report, of

- Any significant change to the project and the reason for that change;

- Any unforeseen events or unexpected developments that merit notification;

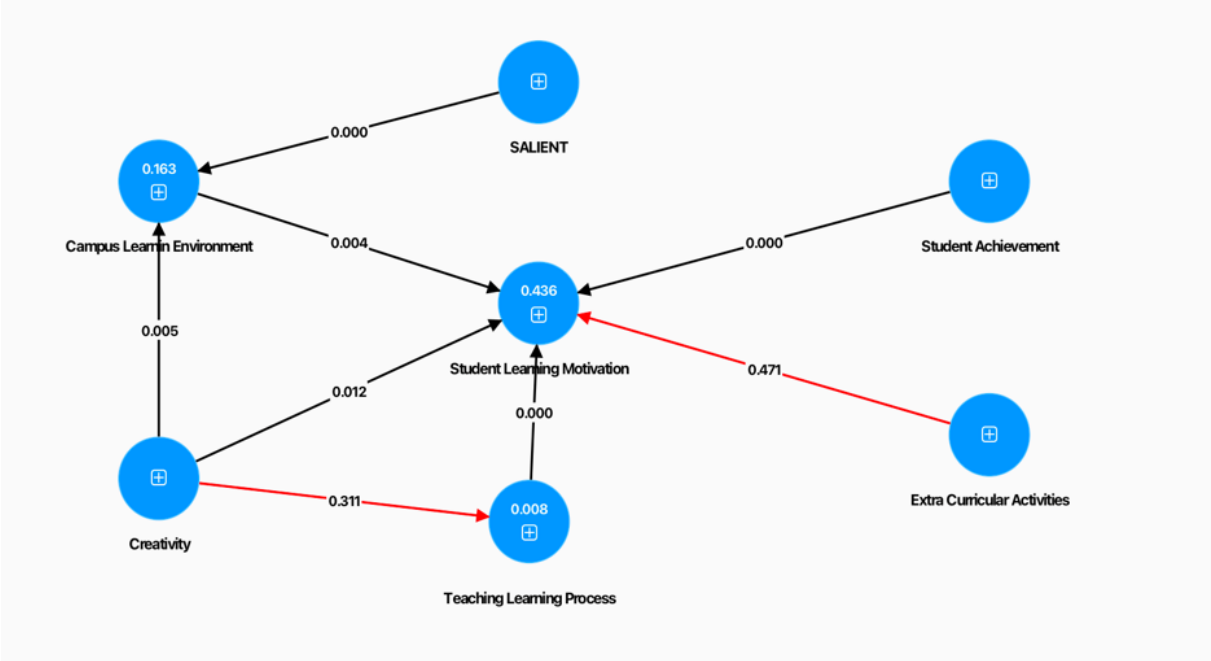
- The inability of the Principal Researcher to continue in that role or any other change in research personnel involved in the project.

Lisbon, 3/14/2024

NOVA IMS Ethics Committee

ethicscommittee@novaims.unl.pt

APPENDIX C – STRUCTURAL MODEL ON SMART PLS



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