

Innovating in Management Education from a Sociomaterial Approach: The Connective, Sensitive and Generative Effects

Summary

In the field of management education, few studies focus on explaining and understanding what educational innovation is. The aim of this article is to explain the effects of innovation in management education, from a sociomaterial approach. From a multiple case study in 5 Brazilian educational institutions, we focus on categorising sociomaterial effects of educational innovations. These effects were analysed and generated three major categories: connective, sensitive and generative effects. It is a new look at spaces, architecture, technology and objects/artifacts, but without forgetting the interactions and connections they establish with each other and with the living actors of Education. The discovery about the effects of sociomateriality contributes to the existing theories by impacting the integrated functioning of the person in his thinking, feeling, perceiving and behaving.

Keywords: management education, educational innovation, sociomateriality, innovation effects.

Knowledge and Learning Track (Track 15)

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Introduction

When Educational Innovation (EI) is at the centre of management education (ME) research, typologies are discussed and EI strategies are presented. Despite this, there is little research focused on the development and validation of EI concept. Why proposes these innovations? How best are they proposed? This lack of positioning and debate has given way to a veiled consensus that educational innovations (EIs) involve the whole process of change or improvement in education (Cordeiro and Pozzo, 2015; Gimenez *et al.*, 2020) or phenomena that alter educational processes and practices their traditional offerings (Severo *et al.*, 2013). Certainly, in the field of ME there is still a gap to be filled, which strengthens the demand for this debate.

On the other hand, sociomateriality is not substantially considered in ME. In fact, there is a limited view on the role of materiality as a 'means' for education and almost no understanding of its social issues (Bezerra and Davel, 2021). We considered here the definition of sociomateriality which focuses on the intrinsic physicality of life and social relations, involving an inseparable compression of material spheres as inseparable from social ones (Fenwick, 2011). This approach reveals a relational ontology inherent to the concept of sociomateriality (Acton, 2018) and would explain, for example, how an auditorium which facilitates a traditional lecture where all in attendance focus on one subject in fact inhibits interaction between the others present, restricting the potential for collaborative work among students (Boys, 2011). Thus, sociomateriality tends to see all things together, whether they are human or non-human, hybrids or parts, as well as the effects of their connections and activities (Fenwick, 2011). Such relationships bring particular realities to practice and learning, highlighting the opportunities and entry points for change (Fenwick, 2015). Sociomateriality in education seeks to trace how these relationships work, that is, how human and non-human forces act on each other, transforming their characteristics and activities, stabilizing them or enhancing them (Fenwick, 2015).

The aim of this paper is to explain the effects of innovation in ME using a sociomaterial approach. From a multiple case study in 5 Brazilian educational institutions, this paper focuses on categorising the sociomaterial effects of EIs. All sources of information came from the educational institutions and also from materials we found in journals, official websites and from interview participants (professors, students and technicians). Utilising interviews, documents, images, videos and observations for data collection, we carried out a thematic analysis, structured in 3 steps.

The analysis and identification of the connective, sensitive and generative effects, through a sociomaterial approach, represents an advanced development for research in ME by bringing intentionality to EIs involving the materiality of education. If the teaching and learning process deals with problematic compromises, collisions and unexpected results (Boys, 2011), we perceive the sociomaterial approach as a source of connective, sensitive and generative effects in ME innovations, the learning space is understood as one that welcomes the learning process and, at the same time, articulates what students already know with what they are learning (Boys, 2011). Sociomateriality leads us to understand the spaces of learning and the activities that occur there with partial relationship, in a situated and specific way, where connections, emotions and creativity promote different results for those who occupy and perform in space.

In order to contribute to the development of the field of ME research within the universe of EIs, we consider it relevant to establish that all EI requires a conceptual contribution and an

approach on which it is intended to explain what such innovation is and what its effects are. We propose a sociomaterial approach to innovate in ME. For us, EI occurs when we stop looking at education only from the perspective of the human agency and investigate the agency of non-human elements and the effects of intentional choice on its presence.

To discuss and present the effects of the sociomateriality and the whole point of EI in ME, this paper was structured with this introduction and more 4 sections: Section 1. EI and Sociomateriality in Management Education to explain what we found on the literature, the gaps and our contribution to ME; Section 2. Method to describe the methodology, the source of information and shows and organise some data from our empirical cases; Section 3. Innovation Effects on Management Education: A Sociomaterial Approach to present our finds and to explain the effects of sociomateriality approach; At the end of this paper, section 4, to discuss our research results.

You might be asking: why study the effects of a sociomaterial approach? We argue this is important because we believe that by understanding the effect of the sociomateriality on the educational process, we will be able to innovate new theorisations of teaching within the context of debate itself on sociomateriality in ME. From this perspective, we will also be able to innovate in new teaching pedagogies. These innovations would be explained and represented from a space intentionally designed under these paradigms which can themselves stimulate new practices, methodologies, techniques, resources and educational instruments as yet not even imagined.

1. Educational Innovation and Sociomateriality in Management Education

What does literature tell us about Educational Innovation and Sociomateriality in Management Education? In this first section we will present our finds and show the importance to choose sociomateriality as an approach to light and propose EI strategies.

Firstly, to understand what have been researched about EI, a literature review was necessary. The academic productions were mapped from the following databases: SPELL, SciELO, Sage Publications, Routledge, Periódicos CAPES, Library of Congress, Emerald, Jstor, EBSCO, Academy of Management. We used as keywords the terms 'educational innovation' and their correlates in the Portuguese language, since the search for combined expressions. We concluded that research on EI in ME tends to be summarized in discussions on new theorisations of teaching in research that proposes new themes, new subjects and new concepts (Cabral, Lebioda and Lemos, 2020; Severo *et al.*, 2013; Granitz and Pitt, 2011; Albers-Miller, Straughan and Prenshaw, 2001; Hoveskog *et al.* 2015), as well as discussions on new teaching pedagogies, to highlight the use of methodologies, techniques, resources and educational instruments, student and/or teaching practices (Bicheno, 1995; Bosch, 1995; Wells *et al.*, 1998; Bollen, Janssen and Gijsselaers, 2002; Bastiaans *et al.* , 2002; Kerr and Lloyd, 2008; Camargo and Daros, 2018; Fini, 2018; Costa, 2015; Zhu and Engels, 2014; Curcio, 2000; Haaken and Christensen, 2002; Bronfman, 2004 ; Radbourne, 2004; Leal and Albertin, 2015; Granitz and Pitt, 2011; Charteris, Smardon and Nelson, 2016; Peschl and Fundneider, 2012; Alves and Iizuka, 2016; Iizuka, 2019). We also found works related to innovation in new organisational structures that bring discussions about improvements or creation of new elements in the context of the institutional structure that may involve curricular innovations (Gijsselaers *et al.* 1995; Bosch, 1995; Hocking, 1995; DeMichiell *et al.* 1995; Bastiaans and Paul, 2000; Perotti, 2000; Bollen, Janssen and Gijsselaers, 2002; Bastiaans *et al.* 2002; Humbert, 2004; Charteris, Smardon and Nelson, 2016; Zhu and Engels, 2014; Lamb and Pozzo, 2015). For this purpose,

we also identified a research group that deals with EI from an interinstitutional perspective (Cavalcante, Melo, and Nobrega, 2012; Alves and Iizuka, 2016; Iizuka, 2019).

About the sociomaterial approach, as a path to innovation ME, sociomateriality is not substantially considered in ME. In fact, there is a limited view on the role of materiality as a 'means' for education and almost no understanding of its social issues (Bezerra and Davel, 2021), so little its effects.

Despite this lack of research in ME, it is possible to identify a few studies that address materiality as vehicles of the human agency and that give us clues about the possible effects of a sociomaterial approach. In terms of concept, materiality is clearly addressed in contexts that relate it to spaces where learning takes place, including physical environments, *layouts*, temperature, air quality in the room, etc. (Taylor and Statler, 2013). Materiality in the educational context would also involve the texts that legitimize scientific authority for discussion (Kolb and Kolb, 2005.) These studies also recognize that the materials have their own language with their own resources, associations and built-in restrictions (Kolb and Kolb, 2005; Taylor and Statler, 2013). The more important and relevant studies that we found can be organised into 2 types of perceptions about materialities, social approach and its effects: (a) implicit perceptions (Barry and Meisiek, 2015; Charteris, Smardon and Nelson, 2016; Kolb and Kolb, 2010; Silva *et al*, 2021) and (b) explicit perceptions (Chim-miki, Campos and Albuquerque de Melo, 2019; Peschl and Fundneider, 2012; Taylor and Statler, 2013; Kolb and Kolb, 2005; Taylor and Ladkin, 2009; Fenwick, 2016; Bezerra and Davel, 2021).

(a) Research involving implicit perceptions of sociomateriality approach and its effects:

Barry and Meisiek (2015) investigate 25 studio models as an educational space for holding classes in order to propose 4 studio guidelines for ME. The authors also highlight the importance of the involvement of design and architecture professionals in the design of these spaces so that there is a more technical intentionality in the choice of materials. In terms of effects, the authors point out the transformations experienced by students in terms of more relaxed clothing and behaviours, but do not point to effects in terms of the results of these observations in the educational dynamics. As the authors themselves point out, the study also lacks a combined analysis of the elements for modelling proposition. We add as part of the gap that we investigated and one the sociomaterial approach from a more autonomous perspective in terms of the agency's analysis of non-human elements within this process.

Charteris, Smardon and Nelson (2016) address in their work how leaders can be intermediaries on the implementation of innovative learning environments. It is a theoretical investigation on learning leadership involving relational trust and risk taking. The research provides an analysis of pedagogical, instructional and learning leadership discourses extracted from qualitative data in research involving 165 school professionals from New Zealand. The authors highlight the importance of innovative learning spaces and the role of educational leaders in this process, the work ends up using the stimuli and a sociomaterial approach in a tangential and superficial way.

In Kolb and Kolb (2010) the focus is on relating experiential learning to learning spaces called as creative spaces or playful spaces. Also in an implicit mode, the article learns important effects of sociomateriality, but is not dedicated to investigating or explaining them in terms of materialities. The focus of Kolb and Kolb (2010) is to observe educational experiences that involves games and games, but the effects are treated as consequences of the game more from the perspective of human interaction than from a material perspective.

The work of Silva, Santiago, Anjos Júnior and Bradaschia (2021) is one research that seeks to contribute to the agenda of sociomateriality in ME and presents to us what its authors define by Multidimensional Learning Environments, based on a systematic literature review involving 338 international articles. It is a systematic literature review and, therefore, does not refer to any empirical studies that investigate materiality and its deeds. Despite debating the dimensions that involve spaces for adult learning, there is no precise investigation into modelling proposals or effects of a sociomaterial approach.

(b) Research involving explicit perceptions of sociomateriality approach and its effects:

Chim-miki, Campos and Albuquerque de Melo (2019) sought to identify what are the elements and forms that integrate a desired educational space. Its pillars are supported by the perspective of value co-creation, creative spaces of education and educational innovation. Exploratory and qualitative in nature, the researchers perform a process of co-creation of value, using the Focus Group technique with an intentional sampling of teachers, students, servers and management in a Brazilian university. The work concludes that knowledge is built through the creativity of each person and add that improving creative potential over time should be an objective in the educational system. They bring creativity as a cause and effect, that is, creative spaces generate creative people. They propose the definition and modelling of what they define by creative space. Despite pointing out a generative effect of the proposed space, the research does not bother to explain the agency of the elements that integrate it, nor are they based on the theory of sociomateriality. Their propositions are born from the instinctive choice of the interviewees, which repeats the idea that intentionality in material choices in ME are not scientifically tested.

In Peschl and Fundneider (2012) we find research that demonstrates the facilitating effect that materialities can offer for the educational process. From a theoretical debate associated with the case study at the university, the authors argue that the space has an enabling perspective when seeking a training focused on innovation. The enabling space is seen by them as the one that supports, enables and facilitates the processes of innovation and knowledge creation, where their structures reflect the need for specific environments/contexts for different types of cognitive processes and knowledge work that occurs during innovation processes. The effects in this investigation are addressed as qualities of space, whose emphasis is placed on the concern to offer an environment of protection, which can harbour power and, at the same time, cultivate epistemological and social fragility, leading to the free flow of knowledge, silence, 'non-error' (in the sense that at such stage there is no 'right' or 'wrong'), opening. Finally, they present some classroom modelling such as seminar rooms, *co-working spaces* and project spaces. The work lacks further depth about materialities in terms of agency, since the propositions are made based on what students identify as university needs and not on the intentionality in the choice of material elements and how they would be able to provoke the desired effects.

Taylor and Statler (2013) treat in their research on the sensitive effect of materiality, when relating the effects to emotional aspects. Although they do not justify this effect from a sociomaterial perspective, the authors use a series of materials (clay, paper and LEGO) to investigate how these materialities affect emotions and facilitate learning. They present and their work with a set of practical ideas about how management educators can become more abilities in designing and facilitating learning processes that effectively engage students' emotions through the use of materials. The work brings clues, but does not deal with other

effects of sociomateriality, such as those investigated by us. The research does not explain the material aspects inherent to the predating spaces related, for example, to architectural, design, or the use of communication technologies, although they recognize materiality as aspects that are beyond the use of materials as teaching resources.

In Kolb and Kolb's research (2005) we find a better understanding of the concept of learning space where the authors present it as a structure to understand the interface between students' learning styles and the institutional learning environment. The article illustrates the use of the structure of the learning space in three case studies of longitudinal institutional development. For the authors, the valorisation of experiential learning in higher education can be achieved through the creation of learning spaces that promote growth by producing experiences for learners, an idea that demonstrates signs of sensitive and generative effects.

Taylor and Ladkin (2009) address materiality in an investigation that deals with arts-based teaching methods. The research is based on sociomaterial issues, but are not treated with emphasis on this approach, although the aesthetic aspects are in the central debate. In terms of effects, the research approaches that the process of doing in learning through art generates greater connection between those involved and the content addressed. This connection would come from the deep learning experience promoted by artistic experience. As the authors themselves criticize, the research does not advance in the debate on the effects of different materialities on the experience of artistic learning and even questions whether the results would be different if other materialities were managed.

Fenwick (2016) is the only identified paper that really cares about explaining the importance of a sociomaterial approach in the context of ME. The author explains that in education, studies based on these guidelines explore ways in which human and non-human materialities combine to accomplish specific purposes, agencies, and effects on education. In terms of effects, the author suggests that students can learn not only to interrupt and actively resist the perpetuation of material inequalities through human-non-human intra-actions, but also to adjust to the surprising possibilities that arise for creativity, sustainable ecology and hope. To Fenwick (2016), the question is not about of what works best, but it is about how certain students are induced to engage with particular materials, issues and opportunities. It is a work that points out paths, causes reflections but does not deliver actual test modelling.

Bezerra and Davel (2021) investigate shows that sociomateriality is treated in ME and awakens to possible stimuli of this approach: creativity, innovation, socialization, fun and emotion. The authors conclude that the effects of the sociomaterial approach, sometimes called stimuli, would generate different results. In this research, the stimulus to creativity would have an impact on the cognitive process and the aspects of innovation are tied up in specific contexts of the processes of innovation of products and services. Another effect addressed in this paper is socialization, the result of which would be the ability to provoke increased interaction between the subjects involved in the ME. The fourth effect would be that of fun with its ability to generate learning from the experience of doing. The fifth effect would be linked to the emotion generated in the material interaction, thus exerting a facilitator of learning. Despite presenting an initial proposal based on different studies on the materialities of education, the effects of sociomateriality start from an extricable theoretical investigation and that also does not specifically investigate which materialities generate which types of effects, so little present modelling propositions to exemplify such effects.

Based on these studies, the sociomaterial approach in ME is an interesting and pertinent approach in view of the lack of research in management education that deals with EI from this perspective. The sociomaterial approach brings new perspectives to the 'things' of education (Acton, 2018; Fenwick, 2016), involving potential transformations in the emergence of new learning spaces, in the use and understanding of the potential of artifacts and objects in education, in the performance and role of the subjects of the educational community, in the architecture of educational institutions, in the presence and use of technology for educational purposes, in the modelling of EIs that can be replicated, in the theorisation of EI in administration and in the theorisation on sociomateriality applied to teaching-learning in ME.

In view of these perspectives of EI in the light of sociomateriality, we can investigate the effects of sociomateriality on the aegis of 4 material dimensions arising from the investigation of the above-mentioned works: space, architecture, technology and objects/artefacts. Space is the dimension address a perception of the place where the interaction between living and non-living entities occurs. As architecture dimension we found perceptions involving design and architecture aspects focused on guarantee learning spaces by the logic of creativity, collaboration and interaction. Technology, as a dimension, includes more than Internet and communication resources. It involves everything capable of signifying and expanding the possibilities of interaction as well as the materialities capable of creating learning spaces which didn't exist before. By Objects and Artifacts, as dimension they mean more than just didactic resources or supporting elements in the composition of the spaces, but rather elements that resignify and complement the other dimensions (Bezerra and Davel, 2021).

We have therefore seen that and sociomateriality are investigated in ME but in a little related way, especially in terms of effects. Understanding about the effects contributes to intentionality and scientific support in the choice of materials in ME. Such choices may also give greater support in other deliberations involving the processes inherent to the offer of ME, including budgets, purchases of materials, definitions of menus, curriculum reviews, among others.

2. Methods

In order to explain the effects of an EI in the light of sociomateriality, we carried out exploratory research of qualitative character based on the analyses and the comparison of multiple case studies. To identify the cases, we used the search on the Internet and the indication made by reference researchers in ME. We searched for educational institutions with well-known EI already implemented and that met the requirements of research that involved data availability, access to the researchers and, at least, an EI that could be observed in the light of sociomateriality. At this stage we conducted informal interviews and search for documents in institutional websites and electronic magazines. After this step, we prioritized organisations offering courses in ME or similar courses with theoretical-conceptual basis. We then proceed with data collection from the semi-structure interview action with managers and teachers of the respective organisations and collected documents and audio-visual materials of the respective innovations.

The sources of information for this research came from documents, interviews, images and videos and observations. The Documents were about the educational institution and/or that helped to detail the sociomaterial experience under analysis. They came from magazines, institutional website texts, *social media posts*, articles and academic productions that involve from decision making by sociomaterial experience to the implementation process.

Initially we conducted interviews with teachers and researchers in ME to identify cases. The informal interviews helped us to identify potential cases and occurred through virtual contact by *e-mail or whatsapp*. After the identification and subsequently the selection, we set out for semi-structured interviews with institutional representatives (management, technicians, teachers and students) involved with the experience. The interviews were conducted by *Teams, RNP and Google Meeting* and lasted approximately 45 to 50 minutes. In all cases, at least 2 people and a maximum of 6 were searched, always seeking to dialogue with different professionals and student profiles.

Images and Videos were important Sources of Information. They were analysed and the collected came from the documents, records made by the interviewees or from institutional sites and social networks. The images and videos corresponded to the spaces that EIs were implemented. We also capture and analyse images and videos from the observation process. The observations processes were conducted where physical EIs took place within the organisation. We observed the place and the activities. In the case of EIs that involved experiences beyond the walls of the institution (immersion experiences), it was not possible to observe the respective dynamics.

We used thematic analysis to try to create a flexible approach. After that, categories were created by a deductive interpretation of the data to find resources for validation of theoretical saturation aimed at a multiple case study, since we seek a deep understanding of the selected phenomena (Ayress, 2008). In a thematic analysis, the validity of a concept depends on the usefulness of the device that measured it and the collective judgment of the scientific community that a construct and its measure are valid (Ryan and Bernard, 2003). For this study, the analysis of the selected cases was structured 3 steps.

The first stage of the analysis involved the identification and description of each of the cases in which EI had been implemented. The dynamics of this stage contemplated from the analysis and the documents, images and photos to the interviews and observation of each case. The focus of this stage was to elaborate themes that characterise different types of EI. The result was a set of innovations organised by educational institution as presented in Table 1.

The second stage of analysis was repeated for each innovation identified. In all cases, the documents, images and videos previously identified were recorded, alongside interviews and additional observations. The process was summarised by identifying, describing and categorising the effects of EI in ME in the context of sociomateriality. Therefore, the possible human and non-human agencies inherent in the proposed innovation are observed. This process was cyclical and recurrent as the investigation progressed and new cases or new materials emerged (interviews, documents, images, videos, field notes). The codification of this stage was opened and led to the elaboration on various themes or effects of EI in ME (Table 1). Finally, the themes were analysed and grouped, which resulted in the consolidation of 3 central categories: connective effect, sensitive effect and generative effect.

In the third and final stage, the innovation was again analysed to better understand its relationship within the organisational context, which allowed better refinement of the effect categories constructed in the previous phase, as well as the advantages and risks arising from these effects.

Table 1 – Educational innovations in educational organisations

Educational organisation	Educational innovations
OEd#1 (Bahia, Brazil)	IED1A: Mobilized Dimension: Architecture - Presents EI in its location because it was implemented in one of the largest shopping malls in the region thus offering a differentiated infrastructure of parking, cinema, shops and food court.
	IED1B: Mobilized Dimension: Architecture, Space and Object/Artifacts - Presents EI in its layout by inverting the traditional plans of the university, bringing the boardroom to the entrance of the campus in an all-glass environment.
	IED1C: Mobilized Dimension: Architecture, Space and object/Artifacts - Presents EI in your classroom modelling with three whiteboard walls, televisions on all walls, glass wall for hallway, flexible furniture with geometric shaped tables that facilitates mobility and grouping, light chairs and studio lighting.
	IED1D: Mobilized Dimension: Technology - Presents EI in its offer of pre-class and after-class <i>on blackboard</i> platform for student interaction before and after face-to-face classes, repository of micro classes in case the student is unable to attend the classroom class.
OEd#2 (Bahia, Brazil)	IED2A: Mobilized Dimension: Architecture and Object/Artifacts - Presents EI in the classroom with shared tables in "U" format.
	IED2B: Mobilized Dimension: Architecture, Space and Object/Artifacts - Presents EI in a classroom in supermarket format with shelves, products and sales displays.
OEd#3 (Sergipe, Brazil)	IED3A: Mobilized Dimension: Architecture, Space, Technology and Object/Artifacts - Presents EI in a classroom designed in partnership with Google with furniture in differentiated design, round tables, light chairs, shareable rectangular tables, colourful circular puffs, sound system, television installed in flexible tower, team of teacher trainers to work with Google educational resources.
	IED3B: Mobilized Dimension: Architecture - Presents EI in a class building with an emphasis on innovation with separate access, a project involving start-ups and its own team.
	IED3C: Mobilized Dimension: Architecture and Space. Presents EI in auditorium located Innovation Centre in grandstand format without presence of chair ensuring proximity to the speaker.
	IED3D: Mobilized Dimension: Architecture, Space and Object/Artifacts - Presents EI classroom of the Innovation Centre with glass walls, flexible tables grouped in geometric format for grouping, long rectangular tables for sharing, chairs with <i>wheels</i> , <i>puffs</i> , chairs with movable arms and folding tables.
OEd#4 (Pernambuco, Brazil)	IED4A: Mobilized Dimension: Architecture, Space and Object/Artifacts - Presents EI in the classroom through immersion experience where students leave university and experience the class in contact with nature with classes grouped in weekends that take place in the square, hotel, boat and within the sea.
	IED4B: Mobilized Dimension: Space and Object/Artifacts - in the classroom through immersion experience where students leave university and experience living in school for a few days making their meals and sleeping in the classroom, using personal objects such as toys and pillows, such as teaching resources.
	IED4C: Mobilized Dimension: Technology - Presents EI in use of an application developed by the teacher to send daily challenges to students in order to also promote personal development throughout their training.
OEd#5 (São Paulo, Brazil)	IED5A: Mobilized Dimension: Architecture, Space and Object/Artifacts - Presents EI in a discipline offering that includes two immersion experiences in contact with nature with water, fire and silence rituals. The first experience with emphasis on strengthening the group and the second with a didactic focus and specific technical content.
	IED5B: Mobilized Dimension: Architecture, Space and Object/Artifacts - Presents Innovation in the Classroom from the use of classes in circular chairs without table with the presence of plants in the centre, in addition to the use of kraft paper, ink, drawings and yoga mats as a didactic resource.

Source: The authors

3. Innovation Effects on Management Education: A Sociomaterial Approach

Below we will present consolidation of 3 central categories of effects from a sociomaterial approach. They will be associated with the examples already presented (Table 1). To make it easier, we grouped these EIs on Figure 1, Figure 2 and Figure 3. The Figure 1 contains pictures of that illustrate materialities which manifest the connective effect. The Figure 2 is a mosaic of pictures that illustrate EIs related to the sensitive effects. The Figure 3 corresponds to a mosaic of pictures that illustrate EIs where we observed the generative effect.

3.1 Connective Effect: Sociomateriality in Bounding

Figure 1 - Photo Mosaic of Innovative Educational Experiences - Connective Effect



Source: Institutional websites and social networks of the respective organisations

One of the striking effects of EI in ME we found refers to connectivity issues. From a sociomaterial perspective, for us, connectivity means the bond that is established between humans and non-humans involved in the educational process. That is, after a process of EI, it is observed the possibility of improvement or degradation of the possibilities of connection between people and things (spaces, technologies, objects, artefacts, architecture).

The connective effect can manifest itself through flexible furniture (light chairs and tables with wheels or tables formats that facilitate sharing and conversations) such as those found in the examples IEd1C and IEd3D (Figure 1). Connective effect can also be manifested when the classroom walls are extrapolated and immersion experiences are lived, such as the examples IEd4A (classes at a public place near the beach) and IEd5A (when a class were invited to stay few days next to the nature). In both cases, the connective effect appears when objects take on new meanings and promoted sensation of welcoming, intimacy and facilitated exchanges of kindness.

However, it is important to highlight that in cases such as IEd2A (classroom with long tables in line) and IEd3D, an auditorium, both in the mosaic of Figure 1, the furniture layout may invite participants not to engage with anyone other than those on their right or left. The focus becomes only on the central figure repeating conventional and outdated models. The research also concluded that although the presence of glass walls, like the classroom on IEd1C (Figure

1) can represent an inviting space to enter and engage, they can also illicit sensations of observation and increase a sense of vulnerability.

In view of the examples, we have observed, therefore, that connectivity is an essential element for this integrated functioning of education proposed by the sociomaterial approach. Without connection there is no integration. When there is connectivity, we find a fluid communication between teachers and students, in addition to the consolidation of learning spaces that promote socialization between people and knowledge. To promote connectivity, we must consider that the relationship between space and learning is not just about an adequacy between activities and materials.

However, we need to clarify that talking about connectivity is not only about connection technologies. Connectivity, as reported here, not only deals with this, but also involves information and communication technology. Connectivity deals with how to integrate people, matter, space, management, technologies, decision-making, finance, among others. The connective deals with the interrelationship and the means to establish it. Connectivity deals with the connection between 'things' of education.

3.2 Sensitive Effect: Sociomateriality in Emotionalizing

The sensitive effect of a sociomaterial approach is directly associated with the management of emotions. When positive emotions (such as joy, fun, enthusiastic, appreciation) are manifested and felt, there is a facilitation of learning, while when negative emotions (such as mistrust, vulnerability, insecurity) are felt there is a trend of obstacles in learning. The materialities of education, as active subjects of the educational process, can be used only as an instrument of emotion management or they can also exercise this management autonomously.

Figure 2 - Photo Mosaic of Innovative Educational Experiences - Sensitive Effect



Source: Institutional websites and social networks of the respective organisations

The IEd5A (Figure 2) were immersions of sustainability topics in ME are propose, different feelings are promoted inside the emersion experiences. In this case, staying feel days with the nature, teachers used practices with the class involving rituals of fire and water. The IEd4A on

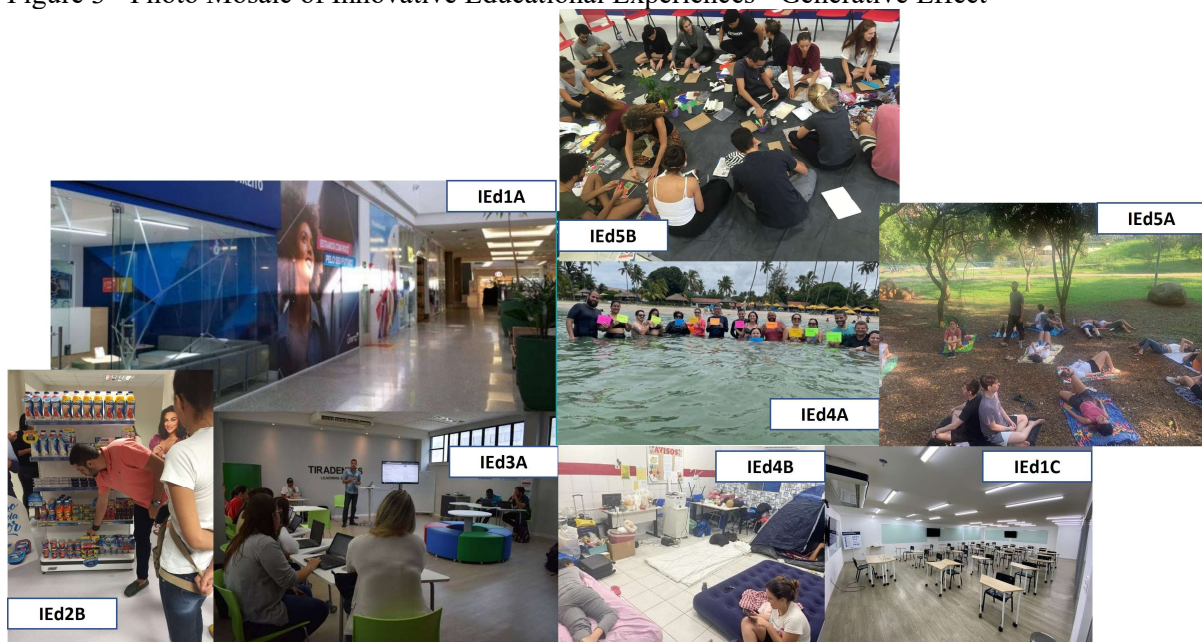
Figure 2 was an immersion involving classes inside the water and during a boat tour. In both cases, we observed that the presence of the fire, the boat, such as the water tended to arouse emotions because they are unusual as their presence in educational classes, but which were intentionally chosen and tested by the teachers who used them. These emotions can awaken enchantment and sensitize to learning, as they can also arouse fears and longings for vulnerability and stop learning.

Emotions can also be awakened by the ease and/or difficulty of access to the elements. When EI is treated as a very expensive investment and requires excessive care, the educational organisation may end up hindering access in order to protect the assets. In cases such as IEd2A and IEd3B, on the mosaic of Figure 2, both educational organisations made specific administrative processes to access the learning spaces that are shown in the pictures. All protocol generated feelings of stress and laziness in students and teachers, which can also impact on the way EI is perceived. Probably there are also consequences involving the emotions they carry with them when entering these spaces when the educational action will occur.

The sensitive effect should then be perceived as capable to develop positive and negative sensitivities that cause facilitations or barriers in teaching and learning.

3.3 Generative Effect: Sociomateriality in Creating

Figure 3 - Photo Mosaic of Innovative Educational Experiences - Generative Effect



Source: Institutional websites and social networks of the respective organisations

The generative effect revealed by a sociomaterial approach is directly related to creativity and the generation of creative and innovative results in the teaching and learning process. They both provoke teachers and students to think and act creatively and awaken and enable learning in an unconventional way (which are not easily found or used in other educational organisations).

Innovations about universities' installation in more creative locations, like malls or commercial centres, can facilitate the organisation between personal, professional and academic life, as well as motivate the use of other teaching resources, such as a visit to the cinema to address certain

subjects. The example of IEd1A, on the mosaic of Figure 3, shows one university which decide to install a campus inside a shopping centre. Their students declare how easier were their dynamic of life and how it helped to reduce the faults.

Classrooms with stimuli and multi-directed resources can motivate teachers to give the strategy of counting in excessively exhibition classes and opt for active methodologies, in addition to the possibility of using different simultaneous strategies. These phenomena were identified on IEd1C and IEd3A like showed on the mosaic of Figure 3. In these rooms, the presence of television can also have a generative effect by stimulating the search for other didactic content or an invitation to produce content prepared by the group for later sharing.

We also found an EI at one university which proposed a classroom in supermarket format (IEd2B example on the mosaic of Figure 3) for classes involving marketing, visual merchandising, retail and sales. This is also a strategy that stimulates the development of practical content classes that would have a purely theoretical approach. When students and teachers visualize and handle material resources, more creative responses and more far-fetched projects are elaborated by teachers and students due to sensory and spatial stimulation.

Paper, coloured markers, paints and yoga mats are examples of material elements that have generative effects just because they transpose traditional forms of explanation, evaluation and presentation of resources. They are invitations to new forms of expression of knowledge and development of skills. In the case IEd4B, presented on the mosaic of Figure 3, we can observe an immersion experience where the teacher invited the students to stay feel days at the school (living, eating, sleeping and observing the resources and the spaces). They used their personal belongs as educational resources and discovered unconventional spaces to motivate the group.

Other Immersion experiences showed the positive benefits of them and their generative effects. They represent an invitation to think unconventional didactic approaches and at the same time develop such skills in a future professional performance of those who experience the experience.

IEd4A illustrates a class that happened inside the sea. The teachers' intention was to make the group to think out the box, feeling comfortable and relaxed. The IEd5A illustrates a class at the park and IEd5B shows a class once the professor invited the students to seat on the floor and use colourful markers and draws as educational resources. People who have experienced the rituals report the desire to multiply these practices in their future professional performance. More details of these experiences are on IEd4A, IEd5A e IEd5B as part of the mosaic of Figure 3.

However, care should be taken to propositions innovative random and unintentional, that seem to be able to stimulate curiosity just by escaping the standard. By believing in the agency and in the active interrelations between humans and non-humans, deliberate choices can generate contrary effects and inhibit creativity. Excess material stimuli can cause the search for creativity to lead teachers and teachers to exhaustion. It should also be considered essential that EI projects are associated with training programs to better guarantee the generative effect.

4. Discussion

When reviewing studies on EI, we seek to create an alignment on its concept and purpose, since the theme is still investigated in a consensual, dispersed and with excessive emphasis on pedagogical approaches and discussions on active methodologies. From 4 groups of categories

departing from research in education (New theorisation on teaching (Jesus and Azevedo, 2020; Serdyukov, 2017), New theorisation on teaching (Serdyukov, 2017), New teaching pedagogy (Serdyukov, 2017; Amorim, 2015; Seechaliao, 2017; Tavares, 2019; Jesus and Azevedo, 2020) and New organisational teaching structure (Serdyukov, 2017; Jesus and Azevedo, 2020; Tavares, 2019; Carbonell, 2002) we created an extract on where we can invest more time in research and organise the production on EI existing in ME. In view of this proposition, future research may better situate the EIs proposed.

By organising the studies already carried out in ME that address issues of the materialities of education implicitly and explicitly, we seek to integrate all works on the agenda of EI also in the light of sociomateriality. Thus, in addition to identifying how we can contribute for existing investigations, we point ways to the relevance of understanding the effects of sociomateriality in ME. Sociomateriality in ME is still a little explored theme. In ME, we find a limited discussion of materiality with an approach that associates objects with elements that act as 'means' for learning and discussions about the social issues of materiality are practically non-existent. Not discussing the materiality sociomateriality in ME incurs to reduce the potential of the use of material elements in learning.

In more specific terms, the advances in research that associate sociomateriality with ME gives light to deliberate decisions about the choice of materials in the classroom, in understanding the space of learning that also overcomes the barriers of the classroom and that opposes new pedagogical approaches. With this research, we contribute to expand the research agenda on EI in our field of research precisely because we believe that the effects of materiality can help in the development of important qualities for the future manager graduated from the management course.

Through the impression of intentionality in the generation of connective, sensitive and generative effects, we seek to enable the idea where learning is able to face and embrace differences, whether between experts and beginners, ideas and beliefs rooted with unconventional propositions, or even between different experiences of life and values (Kolb and Kolb, 2005, 2010). Worked intentionally and assertively, believing, considering and promoting interactions between the things of education (living and non-living elements), in the connective effect we find fluid communication, integration, engagement, affective encounters and strengthened bonds. In the sensitive effect we find pleasure, fun, well-being, confidence and enthusiasms. In the generative effect we find new modelling of evaluation, new pedagogical practices, critical thinking, new forms of motivation and new leadership profiles.

It is true that humans naturally imprint meaning to things and facts experienced through conversation, but genuine conversations in the traditional classroom can be extremely restricted or even non-existent (Kolb and Kolb, 2005, 2010). But whether learning should be understood as something that involves more than cognition (Taylor and Statler, 2013), the discovery about the effects of sociomateriality contributes to the existing theories by impacting the integrated functioning of the person in his thinking, feeling, perceiving and behaving (Kolb and Kolb, 2005). In this sense, the connective, sensitive and generative effects become essential for such integrated functioning.

Conclusion

This article aimed to explain the effects of innovation in ME from a sociomaterial approach. To this do so, we investigated the academic production on materiality and sociomateriality

treated in ME and pointed out weaknesses in these studies. With this analysis, we start for an empirical investigation of qualitative, exploratory and descriptive character involves a multiple case study with 5 Brazilian universities. The study involved the use of documents, images and videos, interviews and observations as sources of information. We catalogue and classify EIs from 4 dimensions: architecture, space, technology and objects/artifacts. We analysed the results and elaborated 3 categories of effects of a sociomaterial approach in ME: sensitive, connective and generative effect.

In order to contribute to the development of ME research field within the context of EI, we argue that all EI requires a conceptual contribution and an approach which intends to explain the innovations and their effects. We proposed a sociomaterial approach to innovate ME. For us, EI occurs when we stop looking at education only from the perspective of the human agency and investigate the contribution of non-human elements with the effects of intentional choice on its presence. With this kind of conceptual approach, we aim to create new possibilities of classroom models, validate new educational resources, renew universities' budget priorities and concept new pedagogical perceptions of the ways we teach, where we teach and how the students learn from human and non-human agency. We concluded that materials, bodies and knowledge in their interactions promote connection between the things of education awakening to a fluid communication, resulting from a greater engagement between the parties, promoting affective encounters and strengthened bonds. We also concluded that through intra-actions (Fenwick, 2015) emotions are mobilised, acting as facilitators of learning through experience (Kolb and Kolb, 2010) generating a sensitive effect where pleasure, fun, well-being, confidence and enthusiasm are present in educational practice. We also conclude that these differentiated and innovative experiences which connect and thrill, have a generative effect by promoting new creative results which emerge from these experiences.

The sociomaterial approach brings just that. It proposes an integrated look at the 'things of education', making innovations in process, practices and educational spaces flow, breaking paradigms and pointing out paths not even though (Acton, 2018; Fenwick, 2011, 2015, 2016; Boys, 2011). It is a new look at spaces, architecture, technology and objects/artifacts, but without forgetting the interactions and connections they establish with each other and with the living actors of Education.

Finally, we recognize the limitation of this research because we found only one experience specifically in ME, but we emphasise that we seek to guarantee other similarities in terms of profiles of students and professors involved in the process. Even so, we emphasise that this role represents a contribution to the advancement of research that associate sociomateriality with EI in view of the scarcity of investigations on the subject. We envisage that future research can further dissect the effects of sociomateriality, as well as, based on these effects, help to develop models of classrooms that better develop future managers.

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