

The Interdisciplinary Development of Digital Authorial Educational Materials by Undergraduates and Its Relationship With Teaching

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Abstract: The research aims to analyze how undergraduate students enrolled in the Technoteaching discipline use the Material Autoral Digital Educacional (MADEs) (Digital Authorial Educational Material). The Case Study is used as a methodology to investigate a contemporary phenomenon, observing how two interdisciplinary groups carried out a hypothetical classroom situation. The research was divided into three (3) stages: planning, data collection, and analysis. It was observed that a group used the MADE developed in an instructional manner. Both groups opted for delivering multidisciplinary classes centered on the role of the teacher in which most of the time was dedicated to present the content. However, the MADEs were created with an interdisciplinary approach.

Key words: interdisciplinarity, digital technology, teaching, undergraduate

1. Introduction

The history of the relationship between Teaching and Digital Technologies of Information and Communication (TDICs) started in the mid-1950s when the first computers were commercialized. In this context, according to Valente (2001), the computer appeared like a machine capable of storing information that could be passed on to students, through a transmission process. In this sense, it is observed that although the technological boom promoted changes in how information and knowledge are produced and shared, the relationship between Teaching and TDICs was perpetuated in everyday practices, dating back about sixty (60) years ago.

Kenski (2007) emphasizes that TDICs promote the restructuring of human consciousness and memory, in such a way that the ways of understanding and acting on the world are altered. In this context, work, leisure, social organization, learning, teaching are marked by other aspects. With new dynamics involving teaching, it is necessary to be “[...] in a permanent state of learning and adapting to the new” (Kenski, 2007, p. 60).

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It is noticed that Teaching and TDICs demand changes that do not seem to be consistent with the current scenario, considering the insistence on an approach based on the transmission of absolute knowledge, guided by the logic of knowledge fragmentation. Therefore, according to Santos (2002), it is necessary to rethink and redefine the curricular practices. In this context, a “new model of knowledge” emerges, guided no longer by the idea of learning what traditionally was transmitted, but by the search for the unknown (Japiassu, 2006, p. 48).

Santos (2002) affirms that this fragmented knowledge is not consistent with the “network” society present in contemporary times. In this area, the interdisciplinary approach appears as a possibility considered significant by different theorists, such as Santos (2002) and Japiassu (2006), while it is based on “[...] intentional experiences of interaction between disciplines with exchanges, mutual enrichments and collective production of knowledge.” (Santos 2002, p. 390).

According to Almeida (2008), it is understood that given the existing possibilities in TDICs which expand the spaces of interaction, enhance affective exchanges and encourage the collaborative creation of knowledge, it is necessary that the teacher in training critically appropriate these technologies, analyzing and using them, in addition to the pre-established model.

In the constructionism perspective, the student assumes the center of the process, producing something of his interest, being mobilized to build knowledge. In this perspective, the teacher appears as a mediator, having as the main challenge to promote imbalances that encourage the development of the discovery by the student (Papert, 2008). Based on this perspective, it is observed that teaching goes beyond the logic of transmission, being permeated by construction, recognizing the interactive, reflective, and flexible potential that permeates it (Tardif & Lessard, 2011). Veiga (2006) points out that Teaching is a social construction so that it is not or should not be watertight as it has historically been presented.

Based on the constructionism perspective, the production of Material Autoral Digital Educacional (MADEs) [Digital Authorial Educational Material] can be one of the integrating possibilities between Teaching and TDICs. These materials are developed by teachers and/or students using digital equipment with “creation, planning, execution, reflection and evaluation carried out by the apprentice himself”, recognizing himself as an apprentice both teachers and students (Lima & Loureiro 2016, p. 630). This proposal for the production of MADEs is used in the discipline Technoteaching, offered by UFC, in which the undergraduate students are challenged to produce such digital materials, and must integrate them into the process of planning, executing, and evaluating hypothetical classroom situations aimed at high school students from a public school.

Because of this, it is considered pertinent to ask: How the undergraduates enrolled in the Technoteaching discipline, offered by the Federal University of Ceará (UFC), use Digital Authorial Educational Material (MADEs), in a hypothetical classroom situation?

The objective of the research is, therefore, to analyze how the undergraduates, participants of the Technoteaching discipline use Digital Authorial Educational Material (MADEs) when thinking about planning an interdisciplinary class. A Case Study was developed, in which it was observed, spontaneously, how two interdisciplinary groups used MADEs in hypothetical classroom situations, through the use of field diaries, reports, and methodological triangulation with three focuses of analysis: centralization of teaching action; a fundamental perspective of the use of TDICs; and interdisciplinarity.

2. Theoretical Reference

The idea of working with technology in the educational context is possible when technology is understood as a product to be developed by students and teachers (Ricardo, 2009). The great challenge in integrating technology into the educational context is to overcome the privileged view that technology presents concerning the social conception of science. In teacher training, it is necessary to enable scientific and technological literacy through the reorientation of the knowledge taught and overcoming the difficulties of teachers in abstracting their experiences.

When working in the context of TDICs, this objective is achieved when resources that allow exploration, investigation, and discovery are made available. However, the mediation of the teacher in this process is fundamental. From the dialogue established between the teacher and the apprentice can emerge new ideas that would make it possible to solve a problem. The understanding of this mediation, however, does not arise from simple practice or simple theoretical understanding, but the integration between both. Therefore, it is understood that the use of digital technology in the context of teacher training must include the knowledge of the technique, the technology, and its different uses, whether scientific or pedagogical inserted in the curricular context (Almeida, 2008).

In research developed by Feitosa (2010), when observing the pedagogical dynamics of the subjects of Supervised Internship in Elementary School II and Supervised Internship in High School offered to graduates of Biological Sciences in the 5th and 8th semesters, respectively, to understand the contributions of these disciplines for the training of the biology teacher, it is clear that TDICs are not yet incorporated into the teacher training curriculum. The obstacles perceived by the graduates in Biological Sciences are mainly about the repetition of the pedagogical contents worked in the five disciplines aimed at instrumentalization of the teacher, making them discouraging for the undergraduate students who attend them; the intense theorizing of the curriculum with little emphasis on teaching practice; and, the lack of the presentation of progressive pedagogical content, which discourages them from participating in the disciplines.

Viseu and Ponte (2012), when studying the influence of TDICs on the development of didactic knowledge of Mathematics undergraduate students and their reflective capacity in the internship phase, they realize that TDICs enable the development of a self-assessment on the practice and the expansion of this knowledge when comparing their teaching actions with that of their peers. Despite using only e-mail and the forum as digital tools for discussion and exchange of experiences, the results were satisfactory. E-mail helped the individuals to develop their reflective capacity, allowing them to think before writing, differently from what is done in a face-to-face discussion, in addition to confronting their opinions with those of their peers. The forum was considered more than a meeting point between peers and tutors, but mainly a point of confrontation of ideas, which allowed discussions based on readings and guided by the experiences of teaching practice. According to the undergraduate students, to rethink during virtual discussions develops the ability to question.

The favorable results achieved in the teacher training undergraduate courses are also observed in research carried out having academic teachers from different areas of knowledge as individuals. In research with academic teachers of English language from public and private institutions on the use of TDICs in teaching, Melo (2012) infers that there is an appreciation of digital technologies as tools for daily tasks inside and outside the classroom, in face-to-face or virtual teaching. In general, teachers use computational tools in different ways, according to their objectives to support their work. The activities seek to promote the practice of reading and conversation skills and discussions in chats about content and articles covered during the face-to-face lessons.

To overcome the fragmentation of knowledge in teacher training, it is necessary to integrate thinking and action based on the theoretical and practical understanding of the different highlighted knowledge: specific content, pedagogical (curriculum and teaching-learning), and TDICs (Lima, 2014).

3. Methodology

This research utilizes a Case Study as a methodology. This choice is justified by the fact of a contemporary phenomenon be investigated considering the non-requirement of control over behavioral events. In this modality, there is no clarity regarding the existing limits between the phenomena and the context studied (Yin, 2010). The guiding questions in the Case Study are of the type how and/or why focusing on describing and/or analyzing the phenomena investigated.

According to Gil (2010), the Case Study has as main objectives to investigate phenomena that occur in the real context; preserve the unit related to the object under study; describe the context of the investigated phenomenon; create hypotheses and/or theories; describe and analyze the causes that permeate the phenomenon investigated considering its complexity.

The data collection is executed through the observation of teaching practices carried out by two (02) interdisciplinary groups of teacher training undergraduate students in hypothetical classroom situations. These groups are organized by the tutors of the Technoteaching discipline, having in total eleven (11) students. The data related to two (02) students were not analyzed in this research, because the students were enrolled in a Bachelor's course. Thus, the unit of analysis is composed of nine (09) undergraduates, of which 55.56% are in the age group of 21 to 25 years old; 11.11% are in the 26 to 30 age group; 11.11% are between 31 and 35 years old; 11.11% are in the 36 to 40 age group; and, 11.11% belong to the group over 40 years old.

The Technoteaching discipline has an interdisciplinary approach. The individuals come from a variety of undergraduate courses: Language/English; Chemistry; Mathematics; Biological Sciences; History; Pedagogy; Languages/Portuguese/French and Physics. It is noteworthy that each course has a representative, with exception of History that has two participants within the researched context.

The undergraduates are studying in different moments of their undergraduate courses. It was found that 33.33% are enrolled at the beginning of the course, between the 1st and the 3rd semester; and 66.67% are next to the end of their courses, studying the 7th semester onwards. This scenario shows that the majority of individuals studied are close to finishing their studies, which may signal that a theoretical basis was already formed concerning Teaching and its aspects.

The Technoteaching discipline is offered by the Instituto Universidade Virtual [Virtual University Institute] (IUVI) as optional. The subject aims to train students who want to act as teachers in the use of an interdisciplinary methodological proposal integrated to the TDICs based on the theoretical-practical study of Ausubel's Meaningful Learning Theory, Flow Theory, Philosophy of Difference, the concepts of Interdisciplinarity and Constructionism.

The research is developed in three (3) stages: planning, data collection, and analysis. In the first stage, the protocols, the instruments, and the information storage policy are prepared for data collection and analysis, as well as the policy of data storage. According to Yin (2010), the protocol constitutes a necessary element for the development of Case Studies, as it guides the researcher in the process of collecting data.

In stage two, the data is collected and registered in a field diary through spontaneous observation of hypothetical classroom situations developed by the two interdisciplinary groups with high school students.

According to Gil (2010), in this type of observation, the researcher focuses on the phenomenon investigated without interfering. It is important to highlight that the hypothetical classroom situations mentioned above correspond to one of the activities developed in the Technoteaching discipline, in which the interdisciplinary groups, previously organized, execute the lesson plans created throughout the semester. At this specific moment, the interdisciplinary groups simulate the delivery of a class, having as participants high school students from a state school partnered with UFC. The class is fifty (50) minutes long, available for each group using the MADE produced in the previous moment and based on Interdisciplinarity and Constructionism.

Data analysis occurs by using triangulation from three different focuses of the elements observed in the two interdisciplinary groups (Yin, 2010). The center of the teaching activity is the first focus so that it is possible to verify whether the graduates consider the teacher, the student, the content, or another aspect as the center of the process. The second focus is on the use of TDICs, identifying if, what, and how they were used. The third focus of analysis is Interdisciplinarity, being observed based on which epistemological model of knowledge construction the undergraduates used the MADE in the hypothetical situation developed in class.

4. Results and Discussion

In face of the research, the results obtained encourage relevant discussions related to the subject studied: Integration between Teaching and TDICs with the development of MADEs by undergraduates. It should be noted that the results will be presented based on the two groups of individuals studied, utilizing the methodological triangulation.

In this way, the results obtained from the data collected in each group will be described and analyzed, considering the theoretical framework and the focus of analysis on which the research is based.

To facilitate communication and maintain the confidentiality considered necessary to guarantee the aspect of ethics in research, the interdisciplinary groups will be identified using the following nomenclature: G1 and G2.

4.1 G1 Results

G1 was composed of (04) undergraduates from the following areas: Language/English; Chemistry; Mathematics and Physics. The theme proposed for the hypothetical classroom situation was Computers, approaching specifically Binary Systems; Oxidoreduction; Capacitors; English Language/Vocabulary.

The MADE used in the class simulation was a blog previously created by the group. In the area of the English content, there was a link to a Quiz, available on the Internet, that had to be answered by the high school students.

The G1 class was one (01) hour-long, of which fifty-one (51) minutes were dedicated to the exposure of the content and only nine (09) minutes for the use of MADEs by students. Thus, it is observed that the teaching action was centered in the role of the teacher, played by the undergraduates, and/or on the TDICs, emphasizing that the blog was used to present content, similar to a slide show.

Regarding the centralization of the teaching activities in the teacher role, Sibia (2012, p. 53) highlights that the Teaching model that prevailed for centuries signs that are waiting for its “death certificate”, as it isn’t coherent to the context that surrounds it and with the actors involved in it. In this sense, the role historically played by the teacher, transmitting knowledge, needs to be reconsidered and rethought, especially in the process of teacher training, enabling the theoretical and practical critical appropriation of the technological boom context and the aspects that mark it in the educational scope (Kenski, 2007).

The second focus of analysis of the research observes whether, how, and on what basis the undergraduates used the TDICs. Group G1 utilized a blog and a Quiz as digital technologies. Regarding the way these technologies were used, it is noteworthy that the group used the blog during the entire class to present the content related to each area of knowledge. The Quiz was used in the last minutes of the class, being the only activity developed by the school students.

It is noteworthy that in both situations the MADE was used in an instructional way, in which digital technologies are the center of the process, being responsible for passing on pre-established instructions (Valente, 2001). In this perspective, the student continues as a spectator who receives and executes the commands given by the teacher and/or the machine, following the operant conditioning logic, with no product built by the apprentice/student (Almeida, 2008).

As for Interdisciplinarity, it was possible to verify that both the hypothetical classroom situation developed by G1 and the MADE used at the time were connected to the multidisciplinary approach, which, according to Santos (2002), is an attempt to articulate knowledge. In such an approach, there is the development of work that requires the participation of different disciplines, but there is no integration between them, presenting only a juxtaposition.

Santos (2002) emphasizes that in multidisciplinary there is no contextualization, therefore the contents covered are presented in a non-significant way to the individuals, as they are disconnected from their realities and experiences.

It is important to infer that the purpose of the activity was that the undergraduate students, organized in heterogeneous groups, developed a class-based, among other aspects, on Interdisciplinarity. Therefore, G1 had difficulties in practicing such an approach, given a historical association between teaching and the fragmentation of knowledge.

4.2 G2 Results

The group G2 was composed of three (03) members from the following areas of knowledge: Biological Sciences; History and Music. The theme chosen for the class was Cinema, having as a specific sub-theme the film “The Physician”. From this, G1 addressed the contents of Epidemiology; Middle Ages; and Musical Analysis.

The group created a channel on YouTube that would host the videos produced by the school students. It should be noted that the G2 had already planned and developed the MADE in question in a previous class, that it would be applied in class with students from the public school.

G2 used thirty-five (35) minutes, within a sixty (60) minutes long class, for the exhibition of contents. Each undergraduate addressed the content related to their specific area of knowledge, having as theme the film “The Physician”. It is noteworthy that at that moment excerpts from the film were presented and, based on them, the dialogued exhibition of the contents was developed.

Therefore, such as with G1, the correlation established by the undergraduate students between Teaching and the exposure of pre-established contents by the teacher is verified. A model that has been in force and perpetuated for centuries that denies the concept of teaching as a social construction (Veiga, 2006) and as a work developed with each other, not from one to the other (Tardif & Lessard, 2011).

Thus, it is reaffirmed in the context of this research, the need for a theoretical and practical rethink of teaching and, therefore, of the process of teacher training to promote the development of other practices and other ways of teaching.

Lima (2014) infers that the initial teacher training of undergraduate students is based predominantly on theoretical aspects and linked only to teaching, and not to learning. In this same perspective, Lima and Loureiro (2016) emphasize that teacher training is guided by a fragmented approach, which does not connect and balance the theoretical and practical disciplines and is disconnected from the students' context, including concerning the technological aspect.

In the hypothetical situation of the classroom, G2 has opted for the use of slides and video to present the content, using the TDICs based on the instructional perspective. However, when using the MADE, the group was based on the constructionist perspective. Organized in teams, the school students produced parodies related to the contents worked on, with the use of the Audacity software, that was uploaded and shared on the YouTube channel created by G2.

According to Valente (2001), from a constructionist perspective, the student/user teaches the computer, producing something new that is of interest to him, so that the center of the teaching activity is the student, and not the teacher and/or TDICs. In this process, the teacher acts as a mediator, offering the necessary conditions for students to develop their products in a process of description, execution, reflection, and debugging.

However, it is worth mentioning that the activity of producing parodies was not completed by the students, highlighting that most of the class was used to expose the content, leaving little time for the elaboration process. Besides, G2 presented difficulties in using the chosen software, which may demonstrate the lack of knowledge about the software in question.

Regarding the third focus of research analysis, it was found that, like G1, this group developed a multidisciplinary class, in which each undergraduate approached the content related to their area of knowledge in a juxtaposition process, without establishing connections.

However, when using MADE and proposing its production by the students, it was noticed the presence of the interdisciplinary approach, in which there is “the interaction between the disciplines”, in an intentional way, from a guiding theme (Santos, 2002, p. 39). This fact was noticed when the G2 proposed that students, organized in teams, produce parodies in which the contents covered are connected based on themes related to their preferences.

Based on the experience of the G2, it is possible to infer that the theoretical and practical creations, developed in the Technoteaching discipline, may have mobilized the undergraduate students to realize other possibilities of Teaching, even though the teaching action was still centered in the role of the teacher and a multidisciplinary perspective was applied mostly in the class.

5. Final Considerations

This research aimed to analyze how undergraduate students enrolled in the Technoteaching discipline, offered by the Universidade Federal do Ceará (UFC) [Federal University of Ceará], use Material Autoral Digital Educacional (MADEs) [Digital Authorial Educational Material], in a hypothetical classroom situation. With the development of the research, it was possible to identify significant aspects for the analysis of the integration between Teaching and TDICs in the context of teacher training.

Regarding the first focus of analysis, it was found that although the undergraduates were exposed to an interdisciplinary and constructionist methodological proposal, they presented difficulties in understanding Teaching from different perspectives. Teaching was still perceived as a process to transmit knowledge, centered on the role and the action of the teacher.

It is important to highlight that in their hypothetical teaching practices both groups used most of the time to expose the contents related to their areas of study, leaving little time for the production of students as well as for the presentation of their products.

Concerning the use of TDICs, it was noticed that all groups utilized these technologies in an instructive way to present content, such as slide shows, videos, and/or blogs. At the moment the use of MADEs was suggested, only one group remained to base their action on the instructionism. The other opted for a constructionist action, based on the construction of knowledge by the student. However, given the time spent initially with the exposure of contents, the students had difficulties to develop and present their materials.

Regarding the third focus of analysis, it was possible to verify that the two groups opted for delivering multidisciplinary classes. However, they proposed an interdisciplinary way of using MADEs by students, through the integration of disciplines based on a common theme. The results obtained evidenced this approach, making it possible to observe a possible connection between the constructionist and interdisciplinary perspectives.

In this sense, it is considered pertinent to provide teacher training that mobilizes undergraduate students to integrate Teaching and TDICs, understanding theoretically and practically the two perspectives that guide this integration. The access and practice of other ways of doing Teaching are needed to provide the undergraduates with a vast framework of possibilities, deconstructing the conception that associates Teaching only to a certain historically established model.

It is intended to continue this research and further investigate other possible focuses, having the Technoteaching discipline as the scope in the following semesters.

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