

## The Elements From the Learning Process: A Study About Online Education in the State of Mato Grosso/Brazil

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**Abstract**—The learning process exists when you have interaction, interactivity and mediation. This paper proposes to identify the relationship between such elements, when you have mediation by Digital Technologies of Information and Communication; in fact, it connotes learning. Based on research done on Virtual Learning Environments, we sought to analyze if these elements are present on the learning pathways of students, and if it affects their permanence on the courses. As a result, we verified if there would be a consolidation of interaction, interactivity and mediation in the triad subject-environment-subject, enabling the learning process. This is a qualitative research case-study. The collection of data focused on the Virtual Learning Environment, Moodle, with teachers, students, and tutors as subjects and its source as the undergraduate courses from the Brazilian Open University of the Federal University of Mato Grosso. The conclusion of this research allows for the identification of elements that are part of the learning process, as mentioned, consolidated on Moodle, and points to the learning process and its dynamics, that goes beyond the relationship established in these environments, inducing effective learning pathways.

**Keywords**-virtual learning environment; interaction; interactivity; mediation; Moodle; learning pathway.

### I. INTRODUCTION – FIRST APPROXIMATION

Technologies are part of a dynamic process that occurs at a quick pace in our society, encompassing different social, economic, political, ethical, aesthetic, cognitive, methodological and educational factors.

The increase of these technologies, and their massive presence in our lives, are the result of the intensified use of Digital Information and Communication Technology (DICT) [1] that permeate almost all areas of our lives; this eventually altered the way we perform most of our everyday activities. The use of DICT became a fundamental and significant part in the process of human development. When it comes to education, there has been an adoption of Virtual Learning Environments (VLE's) as technologies that can mediate the educational process.

We must underline that the intense use of DICT and VLE's in the educational process is connected with the experience of online education. This has limited the field of discussion; however, recently we observed the extensive use of these technologies, including in the classroom. The context of education with the use of these technologies has caught our attention because it enables, through technical

outcomes, to see the relationship between pedagogical and technological mediation.

In a socio-interactive perspective [2], that considers interaction, interactivity and mediation as a basis for the consolidation of learning, we are interested in investigating if these elements have been properly identified on their learning pathways in VLE.

Based on this premise it would be possible to detect if the learning elements are noticed by the subjects, since VLE's allow us to create teaching and learning situations, like mediated activities that constitute in sharing actions. Hence the question: How have interaction, interactivity and mediation been conceived and experienced by the subjects that share a VLE?

It is understood that these technologies support different teaching and learning organizations, allowing for flexible routes and pathways in their courses. It can also, simultaneously, contain different pedagogical models and student profiles. Furthermore it is possible to work in this “area”, creating, updating, storing, recovering, distributing and instantly sharing information in many formats and types of media [3].

To deal with the answers of the previously mentioned question, we start from the principle that these technologies have transformed into cultural artefacts, and as such they constitute symbolic instruments that represent the relationship between the subjects and the social and educational practices [2][4][5].

In order to work with the proposed objective, this work has been divided, besides the introduction, into three sections. Section II is dedicated to the theoretical foundations that support this analysis. Section III discusses the methodology, the subjects and the locus of this research. The last section, Section IV, will demonstrate the evidence that has been gathered during this investigation and it will conclude the paper. The most relevant result of this study is the identification of the occurrence of interaction, interactivity and mediation during the educational process with an intense use of VLE's. This highlights the importance of such elements in the learning process.

### II. THEORETICAL CONTRIBUTIONS OF THE STUDY AND CONCEPTS ABOUT THE ELEMENTS OF LEARNING

In general, the literature that deals with the topic of VLE's has been dedicated mainly to the promotion of

interaction, interactivity and expansion of the educational mediation process in these environments.

Through a systematic survey and a literary review, we identified that there is research dealing with the following topics: a) the insertion of artificial intelligence mechanisms as conversational agents and intelligent agents in virtual environments [6]-[11]; b) the mapping of Information and Communication Technology (ICT) for learning in collaborative works [12]-[16]; c) the development and evaluation of an interactive learning virtual object [17]-[20]; d) the use of immersive 3D virtual environments to simulate the feeling of a real classroom [21]-[24].

It is also worth mentioning the surveys [25]-[31], which seek indications between interaction and learning mediation on VLE's. Having our observations in mind, it is necessary to say that all the work and effort that has been used to foment and understand the process of learning on a VLE (mediated by DICT) is restricted to the investigative bias of these authors, with regard to the search for new and different techniques, methods and/or methodologies to identify and promote learning.

In regards to the incipience of research that works with interaction, interactivity and mediation related to VLE's, it is necessary to advance into analyses that will allow a better understanding of the different dimensions of the educational process, in order to overcome the mechanical and inefficient usage of these environments and their resources.

It has been observed on the national scenario of online courses, that there is a distinct preference for the Modular Object-Oriented Dynamic Learning Environment (Moodle) [32] learning environment by Higher Education Institutions (HEI's); the reason being, it is a solid management system for virtual courses. In regards to costs, there is a bonus, since it is free software that is exempt of license fees for installation and use; this naturally leads public educational institutions, with emphasis on federal institutions, to use it for the development of their courses.

All the investigated courses use virtual environments to specifically manage and develop academic activities.

The potentials offered by VLE's for course management are assigned to the reasonable range of resources available for communication, interaction, and availability of educational materials. In this environment, the availability of resources follows, in theory, the objectives and principle guidelines defined in the pedagogical projects of the courses.

According to Tabora [33]: "the structure of Moodle is based on the socio-constructionist (sic) theory, based on the concept that people learn better when engaged in a social process of knowledge building. [...] The platform enables interaction between all participants, including collaboration, critical reflection, allowing maximum interaction and integration between the virtual community. Moreover, it offers a variety of tools that can enhance the interactivity between the participants of the course".

On the other hand, the conception of education/learning that governs a pedagogical course does not always allow for a dynamic educational process.

During the educational process, the perception of those involved, the attitudes, the behaviors and the monitoring of

the learning pathway reveal established intentions and practices in the process of teaching and learning, using Moodle in the technological mediation.

Thus, it is observed that the pedagogical practices impose dynamics on the VLE, that ultimately define usage modes, ratifying or not, the intentions of its developers. On the VLE, there are resources that teachers rely on, and these above all help them to adapt and mould the didactic and pedagogical objectives imposed.

To fulfil our research we present our contribution to the concept of the learning elements presented.

We seek to highlight the way in which teachers, students and tutors "navigate" on the VLE, in order to interpret pathways that comply with the objectives of the education process, with mediation, interaction and interactivity.

We place ourselves in a position of reflection, on the ways that man has created to connect with the world, individually or collectively, and this is not restricted to biological or social factors. In this evolutionary motion, something that has captivated the attention of so many researchers is connected to the actions that these subjects can develop, be it our relationship with one another, or with one's self, or even with one's surroundings.

According to our perspective, we seek to understand interaction (which plays a key role in the individual and collective educational process), interactivity (recurring in the context and resources of DICT as a promise of a communicational ideal), and mediation (as a means of exchange in an individual and collective educational process, and as a way to capture the world) on VLE's. This view makes us see that we should not only seek to verify the potential of VLE's and their resources, but also, how these environments have been placed symbiotically in our day-to-day lives, each time gaining more strength in educational contexts.

The perspective on interaction should be considered as a model where participants exchange, negotiate and give meaning to the act of communication. In this way, interaction is defined as an "action among the participants of a meeting" [4]. Focus is given to the relationship established between the interacting subjects, disregarding the superiority of an emission pole, since we seek to evaluate the dynamics of the process, where all interlocutors are active in the communication process.

In a sociological perspective, interaction can be understood in two ways: as a process of exchange established between two or more individuals, or as a social activity, which will characterize a reciprocal action between two or more individuals where inter-subjectivity occurs [34]. At its etymological root, the word interaction means "inter-act", "action-relationship between".

This study's proposal, based on the subject-VLE relationship, is that interaction will be understood in the context of interpersonal relationships. Thus, we agree with [35], that says that the relationship in the virtual context, intends to be fully interactive, and it should be developed like the approach to an interpersonal one.

With regards to the concept of interactivity, we have seen that it has been used in a diffuse and flexible way in an

investigation that unveils interaction in virtual environments. This generalization is an issue that now seems to be irrevocably linked to the resources of DICT, adding resources and computer equipment [5][36]. According to Valle [36], the term "interactivity" emerged in the twentieth century as a neologism in the area of computing.

In the field of digital technologies, interactivity tunes an ideal of communication between humans, directly or indirectly mediated by machine. In relation to this demand, it is recommended to break from communication models propagating the transition mode of communication from "massive" to "interactive" [37].

According to Freitas [38], interactivity is related to the communicational expression that allows users/authors of an online course to participate and actively intervene, so that everyone has the possibility to participate, contribute, and if necessary, modify the developmental process of the course.

Vygotsky [2] states that mediation under a cultural perspective, is the culture that becomes part of human nature in a historical process that shapes the psychological behaviors of man. Since man, in his life has a relationship mediated by instruments, we can say that mediation is central, because in this process it is possible to distinguish basically two types of mediating elements: the instruments - that interpose between man and the world/his surroundings and enlarge the possibilities of transformation of nature; and the linguistic sign – that has language as a way to establish communication. In other words, this means that when we think about a certain object we can imagine it without having to see it, by means of abstractions or mental representations like a materialization of the object in the real world. According to this understanding, mediation would therefore come from a symbolic system, human language, that acts between the subject and the object of knowledge [2].

### III. RESEARCH APPROACH AND LOCUS

Based on the above, the locus of this research was consolidated in the undergraduate online courses that compose the programs of the Brazilian Open University (UAB) and the Federal University of Mato Grosso (UFMT). We opted for this location because UFMT is the first public federal institution of higher education in the state of Mato Grosso (MT), a state that spans the continent, and consequently serves municipalities that are far from its capital, practically isolated from major centers. Online education is making it possible to bring higher education to these places. UFMT, supported by UAB, has been experiencing staggering process development, expansion and externalization on the courses in this area. The selection of the courses was based on several criteria, among them being the requirement of having the courses' workload either in its final stages or completed to a minimum of 60%. Four courses met the criteria, namely: Public Administration 2009, Pedagogy 2009, Brazil/Japan Pedagogy agreement, Natural Sciences and Mathematics 2009.

The criteria of at least 60% of the course load is backed up by records, which show a reduction in the number of participants (withdrawal, dropping out, giving up), before getting to the intermediate phase of the courses. The reasons

vary, such as the failure to establish a rhythm of study, not following up activities or consequently the accumulation of activities and reading material, that ultimately lead to renunciation or abandonment, as found in the courses investigated.

In regards to the organization on Moodle, the investigated courses (Public Administration 2009, Pedagogy 2009 and Natural Sciences and Mathematics 2009) had groups of about 23 students, with the exception of Natural Sciences and Mathematics 2009, that had 20 students. All courses were accompanied by teachers, tutors and pedagogical coordinators.

Another course that is an exception to the rule is Pedagogy, of the Brazil/Japan course, organized on the environment in 15 classes. Each class had an average of 18 students that were accompanied by teachers, tutors and a counselors coordinator. Consider the following summary table.

TABLE I. SUMMARY OF COURSES, CLASSES AND STUDENTS AND RESEARCH LOCUS, OWN SOURCE

<i>Courses</i>	<i>Classes</i>	<i>Students</i>
Public Administration 2009	15	345
Natural Sciences and Mathematics 2009	10	200
Brazil/Japan Pedagogy agreement	15	270
Pedagogy 2009	6	138

The observation of these courses in the virtual environments occurred during the first term of 2013. The data collection on Moodle occurred between the 20th and 29th of May, for all courses, except for Public Administration in 2009, collected June 5th to 8th.

We selected in each course, classes that concentrated the highest record of activities in the Moodle environment. We obtained a total of 4 classes, one for each course.

Although the selection of subjects involved students, teachers and tutors, the main focus of research was aimed at students. Teachers were the ones who worked with the selected classes and courses and they had the greater records of activity in the environment. The data collected suggests that these were teachers who maintained an effective relationship grounded in the elements of learning.

We had a total of 126 subjects, and we choose 6 of them to conclude our analysis.

As the focus of research and analysis of the object, we use a qualitative research approach. With this approach, we tried to understand and to give meaning to the facts and identify phenomena as manifested. The definition of the initial criteria to delimit the research scenario (courses – classes – subjects) was established by the observation of the courses' projects that were developed with the help of Moodle. The observation and analysis of the environment, including the resources of information and communication, and the organization of the courses and their projects, resulted in the initial criteria of this research. As a result, to define the procedures and steps of this investigation, we opted for a case study. This qualitative method, utilizes

observation as one of the procedures to understand the dynamic, living and natural processes in research, allowing us to intensely and thoroughly analyze many aspects of a phenomenon, real problem or situation [39][40]. So, therefore, the attributes are what the study details.

In order to improve the reliability of the data collected during this research, we resorted to a process of methodological triangulation. This technique involved the use of different instruments for data collection and analysis, allowing comparisons of the data.

Based on the techniques and tools that the case study enabled us to have (documents, files, interviews, direct observation, participant observation and physical artefacts), there was the possibility to expand and complement them [40][41]. Besides the analysis of the documents, a questionnaires were electronically sent via Moodle, with the objective of identifying events and the perception of the subjects of the learning elements in their learning pathway on the online courses.

Interviews were done via Skype and Google Hangout, in order to tackle specific questions from the questionnaire.

Finally, to analyze the results, it was decided to group them, based on "units of significance" and reports/testimony from the subjects, allowing us to infer knowledge related to the conditions of production/acceptance of these very same messages.

#### IV. EVIDENCE GATHERED FROM THE STUDY

The distribution of valid responses per course, of the 126 respondents, was set as follows: Public Administration in 2009, with 65, that corresponds to 52%; Natural Sciences and Mathematics 2009, with 32, that corresponds to 26%; Pedagogy 2009, with 18, that corresponds to 14%; and the Brazil/Japan Pedagogy agreement, with 11, that corresponds to 8%.

We emphasize that the questions were organized into three major core meanings, that in general, could be understood as: a) identify and analyze the profile of these subjects; b) understand how and where they study and what they think about online courses; and c) gather teacher and tutor perceptions and their relationship to this educational process, as well as unveiling the universe of perceptive learning elements and the motivations for the development of the course.

Even considering, in terms of percentage, that the Pedagogy courses concentrate the highest number of females, this is not a reality that is reflected in the investigated context. The proof is that when we consider the responses of the subjects of the courses of Public Administration and Natural Sciences and Mathematics totaling 78%, we see that these correspond to the 67% female audience and 33% male.

Considering the context of current digital users and new digital users [42][43], we noticed that students who participate in the courses are divided into three groups, namely: a) 20% aged between 26 and 30 years; b) 19% between 31 and 35, and c) 16% between 36 and 40 years. These students are characterized as being workers, because

79% of them work and of this total, 59% do so in the area of their chosen course.

In order to have a good outline of the profile of these students, we aimed to verify whether or not they already had some experience with online courses, and if so, if this was the first undergraduate degree they had taken part in. The data showed that in 68% of cases, this was their first undergraduate degree, and only 43% of this total corresponded to an online course, with prevalence of the use of a VLE.

We also inquired if these students had their own computers and access to the Internet, or if they relied exclusively on other locations, such as, for example, public spaces. It was evidenced that all students had a computer and only 5% lacked access to the Internet.

An interesting fact that caught our attention is the phenomenon of Internet cafés that, in Brazil, and no less in the state of Mato Grosso, were characterized as prime locations for access to the Internet, especially in less advantaged social groups [44]. With regards to Internet access in the municipalities of the state, relatively far from the major centers and the capital, this scenario would suggest poor quality of service and low connectivity, considering the reality of Mato Grosso, a state of large, expansive territory. However, this scenario was not confirmed. About 83% of the investigated public had a broadband connection, although at a high cost for local standards.

When choosing a place to study with Internet access, the residential area predominated (86%) over the working area (9%). It was also noted that the computer lab, on campus, represented only 2% of the preference in this scenario, which led us to infer that these spaces are used by those who do not have an Internet connection in their homes.

In the second significant finding, we observed that 68% of the subjects utilize computer resources strictly to study, making the Internet and the virtual environment of the course as a priority "local" for studies. Summed up, of the answers of these subjects totaling 60%, when asked about what were motives that led them to use the Internet, there were two responses: free searches for information on the theme of the course studied and discussion on the VLE and targeted searches, with reference to the bibliography indicated by the course materials. Taken together, these responses totaling 60%.

The preference for studying on the virtual environment prevailed over the other choices. Many pointed out that this "space" favors the realization of activities and interactions with colleagues on the course. We began to see the interactive nature of learning on the learning pathway as much as in the aspect of the virtual environment and course material, and also in relation to each other, characterizing the social dimension of the process.

For 64% of the interviewees, the choice of a distance course, online, is due to the unavailability and flexibility of time that is not possible with face-to-face courses.

In the context of the courses in question, 81% of subjects in the study estimated they studied with Moodle 3 to 5 hours (56%), and 6 to 10 hours (25%), distributed over a week, with almost daily access to the virtual environment. Being

directly responsible for one's studies, it is important that the student has time, and establishes a work routine to dedicate to the course, this being a fundamental part in the conditions for success [45].

The third significant finding, served both to understand the perceptions of teachers and tutors and their relation to the educational process, and to unveil the perceptive universe about the elements of learning and the motivations for the development of the course.

To assume that the mediation process can incorporate interaction between subjects [2], we questioned students about when they interacted with the tutors, and what their reasons were for doing so. In the responses, it was found that the frequency of interaction between students and tutors is linked to educational activities to be undertaken in the course, however, it is not restricted to this. A contingent of 56% of students, in addition to having questions about the content or activities to perform, highlighted the social factor, because, regardless of the activities they must perform, they sought interaction with the tutors.

According to Pallof [45], the relationship established in online courses enables us to maintain spaces conducive and favorable to the educational process. Although the contents of this interaction does not strictly have significant value to those that study, the feeling and strengthening of the learning community still maintains that they, dare we say, adapt themselves in lively and dynamic spaces.

In regards to interaction, subjects value accompaniment on their learning pathway, in this case, the students. It is left for teachers and tutors to deliberate about pedagogical activities and the development of the course, instructing students about the studying procedures.

Among the answers (70%) to the question "how did the interaction between teachers and student occur?", we found that the students interact with the teacher only during face-to-face meetings (40%) and/or when they have questions about the content or activities (30%). With respect to the last answer provided, we saw that the tutor may be filling the role of teacher and also intermediating in the process of clarifying any of the students' doubts. As a final point on interaction, we analyze what happens between classmates. We found that 59% of interactions occur whenever possible, regardless of the demands of the course. Adding up to 35%, the interactive relationship is predicated in the classroom's face-to-face moments and also when there are discussions about the course activities or content. Regarding the motivation to do the course, we got the following answers: the necessity to obtain a degree and the desire for a better job. Both account to 52% of the total responses. In other responses (48%) we found the love of learning, the desire to better themselves and the opportunity to connect and build relationships with others.

For 58% of them, what makes them remain with the course is the fact that they are learning, moved/driven by the relational character and interactive nature established in the VLE.

Based on what has been presented, we identify that interaction gives conditions not only to mediation but also to interactivity. We also caught a glimpse of the necessity of a

better understanding of the perceptions related to interaction with the courses, especially the ones related to the use of Moodle and the materials utilized there.

Secondly, we observed that the interaction on the course is almost entirely (97%), understood as a fundamental and contributing element to the process of learning for the subjects. Equally the Moodle environment and course materials are recognized as interactive allowing learning (93%).

So, the results demonstrate the occurrence of interaction, interactivity and mediation, and they are considered by the subjects as fundamental in their learning pathway and their educational process.

## CONCLUSION

In conclusion, the use of DICT, especially VLE's, requires pedagogical proposals based on interaction, interactivity and mediation to have effective learning processes. Thus, for the success of the teaching processes, it becomes necessary to have these elements which are fundamental to learning and determine the learning pathways of the students during their training on the VLE online courses. With respect to broader generalizations, the idea remains that learning is revealed in the dynamics and the triad of the aforementioned elements.

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