

## **ACTION, INTERACTION, INTERFACES: PHYSICAL INTERACTION IN E-LEARNING ENVIRONMENTS**

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### **Abstract**

*The interaction that occurs between students is a significant interaction that is highly investigated by international research. It appears to be extremely different between online courses and traditional ones, mainly because the configuration of the Internet excludes the possibility of physical interaction and it seems that this may have an impact on the learning of at least some students. Natural User Interfaces, making it possible to involve the whole body in human-machine interaction, and the networks of sensors linked to the IoT, being able to detect and make available a wide range of biometric data in real time, represent resources potentially able to fill the above gap.*

**Key words:** *E-learning, body, physical interaction, interaction.*

### **Introduction**

According to Bruner, the interaction with the information mediated by machine is based on a iconic or symbolic knowledge. This perspective explains the difficulty in developing e-learning models in disciplines that involve procedural knowledge. Some types of procedural knowledge are codified in form of motor responses and are related to what Bruner define enactive knowledge. Enactive knowledge is not simply multisensory mediated knowledge, but knowledge stored in form of motor responses and acquired by the act of "doing" (DI TORE; DISCEPOLO; DI TORE, 2013). Natural User Interfaces, making it possible to involve the whole body in human-machine interaction, and the networks of sensors linked to the IoT, being able to detect and make available a wide range of biometric data in real time, represent resources potentially able to fill the above gap. NUIs and IoT represent, in this sense, elements potentially able to extend the courseware-design to the disciplines that have so far had a marginal role in developing e-learning and MooC experiences.

### **Problem and aim**

Natural interfaces (NUI - Natural User Interface) and gesture recognition technologies (Gesture Recognition), reproduce, in the digital environment, the fundamental questions of phenomenology, confirming how the actions incorporated within a digital interface are "fluid and functional crossings between physical and virtual environments" (HANSEN, 2006). The Open Source community NuiGroup, active since 2006 in the creation and sharing of standards and technical innovation for human machine interaction, defines natural interfaces:

Natural User Interface (NUI) is the next metaphysical paradigm shift in man machine interaction (MMI) also known as human computer interaction (HCI). Beginning with the Command Line Interface (CLI) and followed by the Graphical

User Interface (GUI), we are now in the midst of discovering the next phase of a more organic interfaces which are based on more traditional human interaction paradigms such as touch, vision, speech and most importantly creativity (WIGDOR; WIXON, 2011).

Natural interfaces include movements based on input and output, on discretion, on voice, and evolve towards an efficient use of the senses in the interaction with machines.

The analysis of the gesture-based technology potential is developed from the knowledge that the devices that encourage touching, moving and exploring are considered basically interesting for education and training, especially within a vision that aims to enactive knowledge as a process that requires the participation of the brain, body and environment.

In other words, with Harrison, HCI is "appropriating the human body as an input device"(HARRISON; TAN; MORRIS, 2010). With this in mind, it is first necessary to define the type of interaction that takes place in learning contexts.

### **Discussion**

In the literature on research related to interaction, we find the identification of four forms of interaction on which the attention and work of the scientific community is being directed:

- a) student - content,
- b) student - student,
- c) student - teacher
- d) student - technological environment.

Therefore, today it is believed that the didactic and formative interaction can take place mainly in these four ways and situations.

The first three forms of interaction can be found both in didactic situations in presence and in remote activities, therefore they are the most common situations, while the last type, student - technological environment, can be present, little present or totally absent in courses traditional in presence according to whether or not the use of new technologies has been introduced.

Conversely, in remote situations, the first three forms of interaction are present, but less incisive than the fourth, student - technological environment, which is prevalent, and here technology can have a significant impact on the outcome of learning content from part of the students; therefore, when designing Web Based courses, teachers need to consider the impact that technology has on learning, before anything else.

Moore M.G. e Kearsley G. (MOORE; KEARSLEY, 2011) focused more on the first three types of interaction, while Hillman and colleagues (HILLMAN; WILLIS; GUNAWARDENA, 1994) considered the fourth type.

It should be warned that the subdivision of the four types of interaction is functional in the research work, but it is also quite improper and misleading, as it usually occurs in the presence of forms of interactions that occur simultaneously, albeit with different incisiveness.

Moving on to report the results of the research on the four types of interaction, it is felt that they refer mainly to online training, as this is the sector where it is more necessary to understand the presence and ways of interaction, while in activities in presence it is given taken for granted and its constituent aspects are known even in in-depth terms justified by real theories.

#### *Student-student interaction*

The interaction that occurs between students and another form of significant interaction that is highly investigated by international research (BEARD; HARPER, 2002). It appears to be extremely different between an online course and a traditional course, mainly because the configuration of the Internet excludes the possibility of physical interaction and it seems that this may have an impact on the learning of at least some students. It has been noted that student-student interaction can take place in various ways: one by one, one by many or many by many, both in presence and online environments. In order for an interaction to take place in these ways in an online environment, four peer behaviors are necessary: participation, response, provocation of affective reactions and, finally, focus on short reports.

Teamwork or collaborative learning means that students must work together in groups to complete interactive academic tasks. Therefore any group activity should be understood as a situation of strong interaction. Also for this form of interaction, scientific research has highlighted some strengths.

Shared opinion is that this form of student-student interaction promotes the understanding of the contents of a course and stimulates critical thinking. Furthermore, collaborative projects can decrease the sense of isolation and contribute to the promotion of a learning community in Web based courses.

Many studies have found an accentuated need on the part of students in online courses to interact with their fellow students. Although Web based courses do not allow face-to-face interactions, it is possible to design alternative forms of interaction between students through the Internet that are even more effective. In fact, in some cases the students highlighted interactions in Web based courses that were qualitatively similar, if not even better, than those present in traditional classes.

Some authors have highlighted that the interaction between students in an online course significantly improves learning and that the higher the degree of interaction, the better is the level of learning. Teachers engaged in online courses also share the importance of student-student interaction. Even in many cases the interaction between students is considered by teachers to be the most important even more than that between student and teacher.

From this consideration the student has been given the central role in any learning process and the teachers have the task of guidance.

However, some studies report that despite the availability of interactive components in Web based courses, in many cases students prefer peer interaction in traditional classes to the detriment of online ones. Weaknesses are equally significant. Some data indicate that students engaged in group activities, in online courses, encounter difficulties and dissatisfaction. These researchers found the lack of face-to-face contact with the root cause of dissatisfaction among students engaged in completing team work.

Again it would be interesting to know the more subtle reasons for the needs of the face to face relationship, but so far the research does not seem to have identified them. Conversely, many students believe that their learning is adversely affected by the poor or late participation in online discussions by classmates.

#### *Student-technological environment interaction*

The impact of the technological environment on learning processes has been the subject of wide research (MAHLE, 2007) (MURPHY; WALKER; WEBB, 2013).

In summary, it is agreed that the relationship between student and communication technology should constitute a tandem to promote online learning, in the sense that the two sides must functionally integrate. Here the interaction with technology has a significant impact on the degree and quality of learning content from students.

In carrying out online activities, the prettiest and optimal interaction seems to be achieved where technology stimulates the learning of content and at the same time constitutes reinforcement for students to the desire to follow the course and not already a simple means of effective pill communication.

The student technology interaction must take into account several variables so that it can take place effectively:

- a) experience in using the computer;
- b) students' favorable perception of technology
- c) possibility of accessing technology with the widest availability.

When these conditions are given, it seems that the use of technology in online courses can not only help achieve the course's learning objectives, but can also improve the student's ability to use the technology itself. On the other hand, in many cases technology can represent a barrier both for students' lack of ability to use technologies and for the difficulty in having a connection to the network. The interaction with technology although it may represent a technical problem for its mastery, however it does not always affect the overall satisfaction of the students of the online course. Indeed, in many cases it is verified that students improve their degree of confidence in using the computer, precisely with the realization of the online activities of an online course through which they can acquire greater autonomy in the use of technology.

Some data indicate that the attitudes and the way students of online courses perceived technology directly influenced learning. In this regard, it seems that two types of attitudes can be identified:

- in the case in which the technology is viewed negatively, the times of use dilate and these can represent an obstacle for learning;
- in other cases, where the attitude towards technology is positive, precisely the opportunity to have extended times is considered a strength, as there is the possibility of greater reflection.

All this implies that teachers in online courses should develop a climate where students see the student-technology interaction in a favorable light. Non-secondary aspects of negativity of this type of interaction are found for the availability and access to technology. These technological obstacles seem that in some cases they can provoke reactions of frustration even in students expert in the use of these tools. A fairly widespread case and represented by some students who still do not have a computer or have it but without the hardware and software requirements required to interact with the activities of the online course. Another equally widespread case seems to be the unavailability of a

connection to the network, especially a fast connection. As you can easily understand here we come across issues unrelated to the actual interaction, in how much it cannot occur due to impediments of circumstance. It should be noted that these are obstacles that should be overcome with time.

## Conclusion

As can be seen from the review of the results of the research, results of considerable use emerge for the identification of the concept of interaction in reliable terms and for the rethinking of the training process. It does not seem that the position of the "apocalyptic" can be shared, complaining about the end of the "true, authentic" interaction with the advent of the online, as the face-to-face relationship would be replaced with the remote one, technological, anonymous, cold, nor that of the "integrated", who in the wake of excessive enthusiasm, believe that soon the entire educational action will end up in the electronic hands of machines such as computers or even robots, eliminating the teacher.

In the light of the literature on interaction, it seems that mainly two elements of strength emerge. Firstly, the results of some research on the various forms of interaction in distance learning allow us to indicate in the concept of interaction an important factor for student learning. Secondly, many researches lead to discordant results, many indicate positive outcomes from students taking online courses, others indicate negative outcomes.

This second aspect should make us reflect on the reliability of many researches in that they are the result of a simple a posteriori description of experiences made. It is therefore necessary that, in the near future, research projects are launched according to an experimental or quasi-experimental design that allows researchers to make causal inferences capable of indicating more reliable statements regarding the implications of the interaction, in online courses, on the outcomes of the students.

In this direction, this work assumes the role of a "positio questionis": based on literature related to the design of NUIs (CARLOMAGNO; DI TORE; SIBILIO, 2013), space representation (DI TORE, 2014) and wearable technologies (DI TORE, 2015) that can be used in contexts of learning-oriented human-machine interaction, we asked ourselves first of all which are the research paths that can transform the potentialities described in concrete learning opportunities.

We have identified, in this work, three fundamental guidelines:

1. An exhaustive reflection on enactive knowledge and on how this type of knowledge can actually be embodied in human-machine interaction

2. A reflection on t embodied systems of interaction, involving a redefinition of the "perceptive bubble " of learning subjects
  3. An analysis of the technological tools that allow embodied interaction and a reflection on the measurement and evaluation tools.
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