

Cognitive Communication 2.0 in the Classroom – Resonance of an Experience in Higher Education

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Abstract: The communication in the classroom is often carried out on a one-to-many basis, with the teacher, before an audience of dozens of students, playing a traditional role. In this context, still commonly practiced, it is pertinent to introduce mechanisms of interaction mediated by technology, since research shows a significant correlation between the use of technology, the time spent in social media and the engagement of students. In fact, literature shows that social media has attracted the interest of academics more likely to use technology in education, who thereby seek new ways to motivate their students to a more active learning. The adoption of cognitive communication 2.0 morphology, in traditional contexts such in communication one-to-many, is a challenge to be overcome. We consider so of great importance creating and evaluating resources and pedagogical practices that are aligned with this new paradigm. In this study, we intend to make a contribution to understanding the problematic of the morphology of cognitive communication in the context of the classroom in Higher Education, with the integration of web 2.0 tools. On the approach to the problem, we have explored a PowerPoint presentation with the integration of the micro blogging tool Twitter, as a basis for addressing the characteristics of cognitive communication 2.0. For data collection a questionnaire was designed, based on literature, and intended to evaluate several dimensions of the resource used, namely: i) pedagogical issues, ii) technological aspects, iii) cognitive learning; iv) interactions in the classroom; v) positive behaviour in the classroom; vi) negative behaviour in the classroom. The goals of this study are: i) to validate the instrument for data collection, ii) to assess the perceptions of students regarding the effects of the resource and pedagogical practices used in the classroom dynamics iii) to set in context and to relate the cognitive communication 2.0 in the classroom with other components of the Hybrid Institutional Personal Learning Environment. This is an exploratory type research, since it seeks to provide a greater familiarity with the problem and to identify dimensions and items to be included in the questionnaire. The data collected will be processed under a quantitative perspective. Considering, therefore, the nature of the study we did not seek to establish correlations between variables, but only to identify trends, using descriptive statistics. It is expected that the results obtained will contribute to the articulation of web 2.0 tools with traditional cognitive communication in the classroom, in such a manner that positive impacts will result in pedagogical and technological effectiveness and thus in students learning achievements.

Keywords: classroom; cognitive communication; learning; micro blogging; Twitter; web 2.0

1. Introduction

Information Technologies (IT), specially the “web phenomena”, have contributed to changing the way people work together, share resources, co-produce, co-act and get involved in activities that benefit all (Fuchs et al., 2010). Nowadays, expressions such as “collaborative learning”, “learning communities”, “media in education”, “social media” and other similar ones, are essential in educational investigation. However, research on these topics focuses on online environments or face-to-face groups of limited size. Studies in which these principles are applied to a classroom with dozens of students are rare.

In fact, research shows that the classroom has been losing its historic centrality in favour of new agglutinating poles such as the Personal Learning Environment (PLE) and the Social Learning Network (SLN), usually associated with spaces outside the classroom – Cloud Learning Environment. However, despite the development of on-line learning systems and b-learning, classroom learning is still largely dominant, and the organization of activities continues to have the classroom learning as the nucleus. Hence the importance of designing activities and creating resources that, in conjunction with this new paradigm, promote the exploration of the potential of the new ways of learning that dominate the Cloud Learning Environment.

This article aims to contribute to the study of the issues related with the cognitive communication morphology in classroom lectures, as part of Higher Education, where often the communication is done from one-to-many. To do so we started with a PowerPoint presentation with the integration of micro blogging tool Twitter, as a basis for addressing the characteristics of communication 2.0 in classroom in lectures of a more expository nature.

The methodology of data collection used was a questionnaire built based on literature review, with which we intended to assess various dimensions of the resource used in classroom lectures and to verify if the integration of Twitter in the presentation contributes to the upgrading of a cognitive communication 1.0 (one-way communication, one-to-many, low or non-existent interaction) to cognitive communication 2.0 (many-to-many, interaction between all the participants). The results of this study are preliminary and intended to serve as a preliminary approach to the subject.

2. Related work: Change challenges and pedagogical innovation in institutions of higher education through technology

New ways of communicating and interacting in a society immersed in technology are intrinsically linked to the imposition of new ways of teaching and learning, which results in the redefinition of political and pedagogical models. Social and economic factors call for the use of technology as pedagogical support. Mark Prensky (2001) was the first to use the term "digital natives", which is associated with expressions such as "residents", "Generation Y" or "Net Generation". These students grow up in environments immersed in technology and have different preferences and skills in key areas related to education, particularly in making use of the immense potential of web 2.0 (Castañeda & Soto, 2010; Kennedy et al., 2009), especially social software tools (blogs, micro blogs, sites of video sharing, social media, wikis or podcasts), which facilitate not only the emergence of communities of users, but also the involvement in social media.

Despite the characteristics of this new generation of students, we cannot assume that all who reach higher education already possess the necessary skills to use web 2.0 technologies such as learning tools (Castañeda & Soto, 2010). On the other hand, it is also observed that the Higher Education Institutions (HEIs) are still inadequately prepared to work with students who have completely different technical skills and learning preferences (Bennett, Maton, & Kevin, 2008).

To address this complex situation, the HEIs must create programmes and define methodologies that enhance the use of the enormous educational potential of web 2.0. Thus, it is expected that students will develop learning skills in this context and increase their motivation and, as a result, will increase the chances of achieving good academic results.

In the current scenario, it matters that HEIs reconcile their conception of the educational process with new ways of learning and student expectations. The HEIs should not overlook the fact that IT offers the students the opportunity to control and manage their own learning beyond the institutional vision. The globalization of the sources of knowledge, that brings the world to the school and the growing importance of social media and collaborative work of smart mobs (Tapscott & Williams, 2008) emphasize the value of the Social Learning Network (SLN), which creates the need for the HEIs to evolve to a Hybrid Institutional Personal Learning Environment (HIPLE) architecture, as a bridge between the vision of the institution and the Personal Learning Environment (PLE) of the student.

The introduction of technology in the facilitation of cognitive function in education means a challenge for applied research with very complex and slow progress. Among the changes that have been introduced in training models under e-learning, b-learning and face-to-face, it is in the latter where the pace of change is slower. A. D. Figueiredo (2009) states that the HEIs' face-to-face model is also the most traditional one and, in essence, it is based on four functions: i) transmission of content provided by lectures, often masterful, ii) application of concepts, iii) group work and iv) evaluation. These functions are shown in table 1.

Therefore, the classroom continues to be a place of excellence in the communication of knowledge that includes multiple educational concepts. In particular, there is, above all, the transmission of information from one-to-many, dialogue, teamwork and role-playing. When technology is used it is explored in the context of the laboratory. Personal computers, tablet PCs or smart phones are poorly explored. In this context, highly practiced, it is pertinent to introduce mechanisms of interaction mediated by technology, since research shows a significant correlation between the use of technology

and time spent with social media and students engagement (Chen P., 2010; Junco, Heiberger, & Loken, 2010).

Table 1: Pedagogical face-to-face dominant model in the HEIs (Figueiredo, 2009)

Pedagogical face-to-face model	
Transmission of content	Lectures
Application of concepts	Lectures Lectures and practical lessons
Group work	Practical lessons Laboratories Projects
Evaluation	Tests/exams Projects Essays and Presentations

In fact, it has been observed that the social media – a collection of Internet web sites, services and practices that support collaboration, community building, participation and sharing – has attracted the interest of academics more likely to use technology in education and who seek new ways to motivate their students to a more active way of learning (Junco, et al., 2010).

In this study we focus on the context of the lectures, where teachers are faced with numerous students and have the need to activate mechanisms of direct instruction, either to save time, or because this is the teaching model that they are comfortable with. Electronic presentations as a way to transmit knowledge are a means commonly used in these classes (James, Burke, & Hutchins, 2006). This is a reusable resource, a facilitator of discourse organization and an integrator of multiple media which can serve different learning styles, as well as becoming a stepping stone of motivation and it is also conducive to note taking by students.

These presentations are massively materialized on technologies such as PowerPoint and Prezi which have mechanisms to support text, video, image, flash animation and sound, but they also have the ability to interact with the so-called web 2.0 systems, such as the micro blogs. A PowerPoint or a Prezi presentation can therefore be linked with the micro blogging application Twitter, allowing the teacher the opportunity to speak to his students.

Recent research about the use of Twitter in academic work shows that although 85 % of undergraduates have a Facebook account, teachers prefer to integrate Twitter into the process of teaching and learning (Junco, et al., 2010). In the category of micro blogs, Twitter, designed in 2006 by Jack Dorsey, allows users to share messages up to 140 characters. This system also allows sending messages to a direct channel specifically created to exchange information (# hashtags) and the vote for alternative options which are placed under review (by vote tweet @ x key_word).

Individual or business initiatives (Elliot, 2011) have developed ADD-INS for Prezi and PowerPoint, allowing the following dynamics for those who have a Twitter account (teachers and students):

- Creation of a channel (not compulsory) for comments on the presentation that is being made;
- Students can comment directly on Twitter what they see and listen in the classroom as well as what they read from sharing with peers (virtual classroom);
- The teacher may have prepared additional comments for each slide, that hidden in "notes", can be sent to Twitter whenever it is projected;
- The teacher can capture and project in all, or in some of the screens, what is being shared on Twitter;
- The teacher can ask multiple-choice questions that are answered on Twitter, and the percentages of the responses for each option can be projected in a slide.

This model of communication in the classroom will increase the level of participation by: i) providing voice and turn to all the students, ii) facilitating and asking for the participation of more reserved students in oral participation iii) engaging the learning community in discussions about the theme and iv) exploring the acuity of young people to use IT.

3. Evaluation methodology

As a methodological approach to the problematic of the morphology of cognitive communication 2.0 in the context of the classroom, we used a PowerPoint presentation with the integration of Twitter. The exploitation of this resource was made during lectures to several masters classes, at the Portuguese Catholic University – Regional Center of Porto (Catholic – Porto). In table 2 the demographic characteristics of the participants in this study are shown.

Table 2: Demographic aspects of the investigation

Total	122
Gender	Male: 29% Female: 71%
Age Group	20 to 29 years old: 37 % 30 to 39 years old: 26 % 40 to 49 years old: 20 % 50 to 59 years old: 17%
Training Undergone	Marketing: 3 % Services: 3 % Education and Music: 15 % Computing and Education: 3 % Pedagogical Supervision: 22 % Religious Sciences: 4 % Wounds and Tissue Viability: 4 % Infection and Health Care: 8 % School Management and Organization: 15 % Childhood Education and Special Education: 23 %

The way the operationalization of the resource was made is represented, in schematic form, in Figure 1: the integration of Twitter in PowerPoint, with reference to a hashtag #, through which students could ask and answer questions, vote on matters presented and answer multiple choice questions. Thus, the electronic presentation, not only had the traditional function of transmitting information from one to many, but it was also intended to foster interaction content-students, teacher-students, students-students. The integration of Twitter in an electronic presentation, enables, potentially, a paradigm shift in teaching: to the one-way communication teacher-class is added the value of the interaction teacher-student-content. The feedback given by students is an important item because it allows the teacher to suit his speech to the class and answer students' questions and comments that appear in real-time presentation.

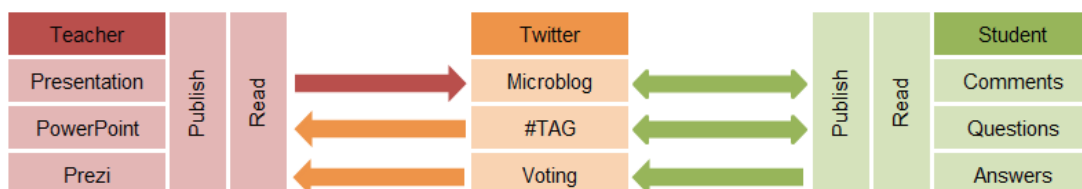


Figure 1: Integrating cognitive technologies in communication

At the end of the sessions, the participants were asked to fill a questionnaire to evaluate the resource. The convenience sampling technique was our choice. Although not representative of the population, this sampling technique had the advantage of being a fast and simple one and, therefore, suitable for preliminary studies, as in this case.

The questionnaire was made based on literature review (Hu, 2011; James, et al., 2006; Kurilovas, 2007; Nesbit, 2007; Nokelainen, 2006) and consisted of 41 items spread across six dimensions: i) pedagogical aspects, ii) technological aspects, iii) cognitive learning iv) interactions in the classroom, v) positive behaviour in the classroom; vi) negative behaviour in the classroom. The six evaluated dimensions include: i) issues that students identify as central in the quality of digital learning resources associated to more direct teaching, ii) the perceived effects by students in the field of learning, behaviour and attitudes. A Likert scale of five points was used.

4. Presentation of results

The overall results of the questionnaire indicate that the respondents recognize the pedagogical and technological potential of the resource in the six assessed dimensions, as well as its positive effects on the quality of learning and type of interaction. In Figure 2 the assessment on pedagogical aspects

is presented. In the seven analyzed items, the large majority of respondents evaluated the pedagogical aspects of the course with level four, "agree" and level 5 "strongly agree." The global average of the seven items corresponds to 55 % of responses at level 4 and 22 % at level 5, and the importance of level 1 and 2 is negligible (0 % and 4 %, respectively).

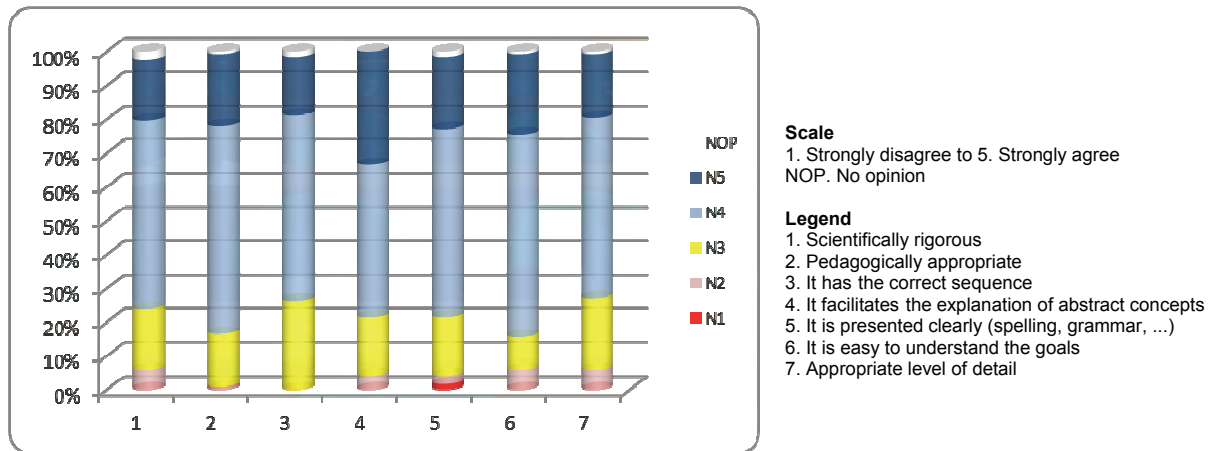


Figure 2: Pedagogical aspects

As far as the "technological aspects" is concerned (Figure 3), the respondents commented on the appropriateness of the use of technology, design, usability, interface, added value compared to printed material, the potential of technology in facilitating learning, building concepts and skills development. The average of the eight items of this dimension indicates that 52 % of students "agree" and 32 % "strongly agree" that the technology used was appropriate and that potentiated learning. Like in the previous dimension, the number of respondents that gave unfavourable levels of answers (levels 1 and 2) is negligible.

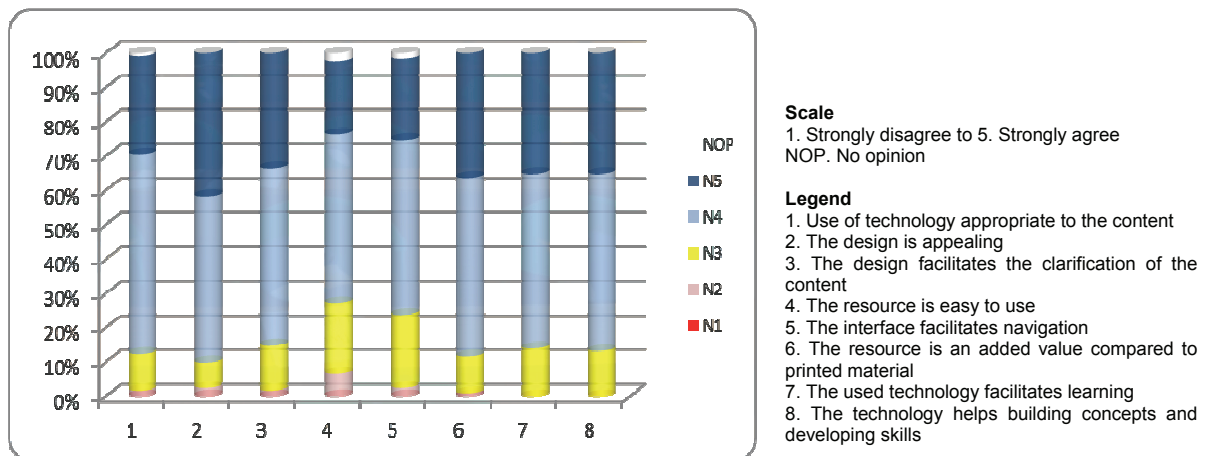


Figure 3: Technological aspects

Regarding "cognitive learning" (Figure 4), if one considers the average of the 11 items on this dimension: 82 % of the respondents said that they "agree" (47 %) or "strongly agree" (35 %) that the resource has positive effects. In the average of the 11 items, the value of the terms "strongly disagree" and disagree" is located at 2 %. However, 7% of the respondents "disagree" and 1 % "strongly disagree" that the resource facilitates taking notes (item 3).

The potential of the evaluated resource in the "interactions in the classroom" are also recognized by the students. The average of the five presented items in Figure 5 indicates that 70 % of respondents "agree" (40 %) or "strongly agree" (30 %) with the positive effects of the resource on this dimension. The item 1 is the one that meets the highest percentage of negative and neutral answers: 2 % "strongly disagree" 11 % "disagree" and 35 % "do not agree nor disagree" that the resource leads to a better knowledge of the classmates in the classroom.

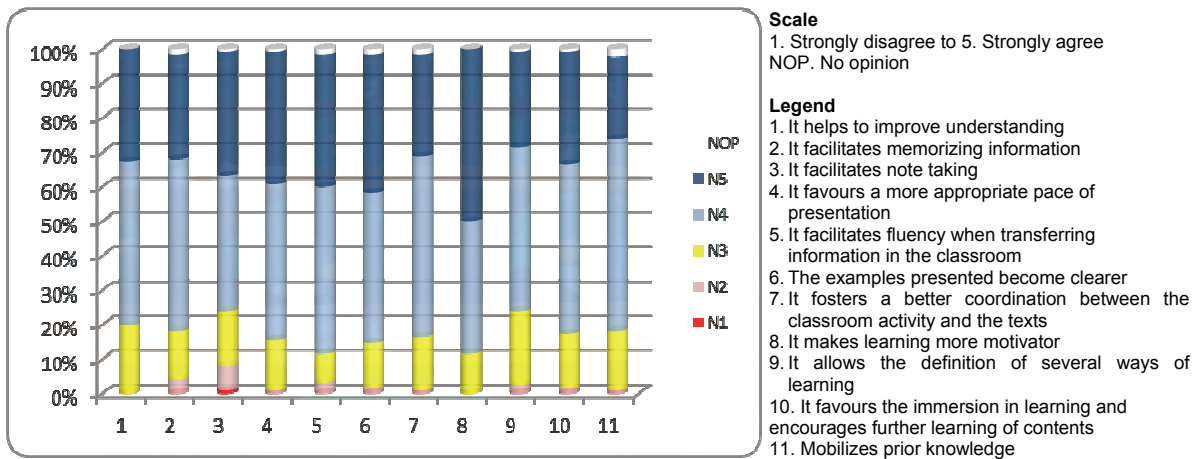


Figure 4: Cognitive learning

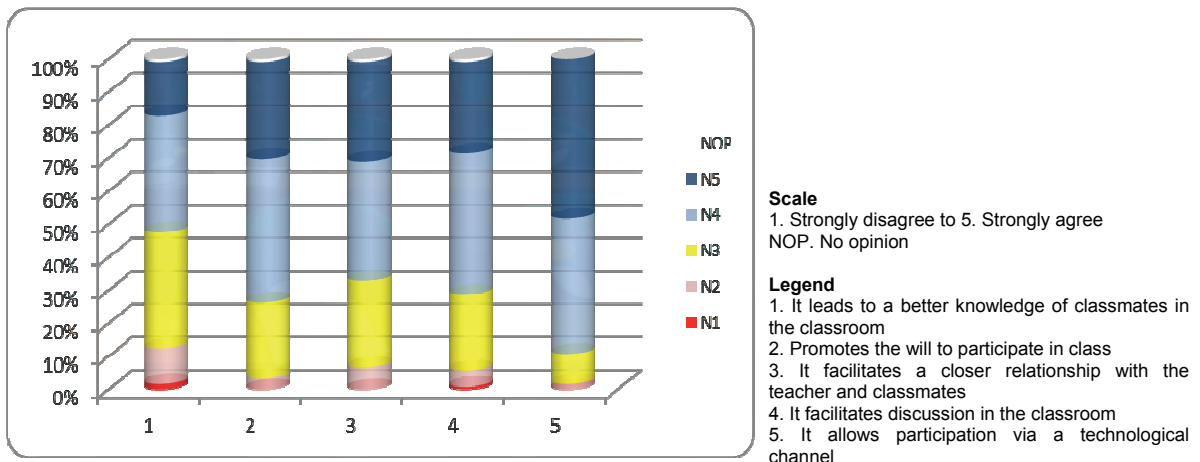


Figure 5: Interaction in the classroom

The results in the dimension "positive behaviour in the classroom" (Figure 6) are in agreement with those of the other dimensions. Considering the average of the 7 items, 75% of respondents "agree" (49 %) or "strongly agree" (26 %) that the resource has positive effects on behaviour in the classroom. The item 1, which states that the resource helps taking better notes in class, holds the highest number of negative evaluations (1 % "disagree" and 15 % "strongly disagree"). This result is aligned with item 7 "it stimulates coming to class to take notes (15 % of respondents answered "disagree") as well as with item 3 in Figure 4.

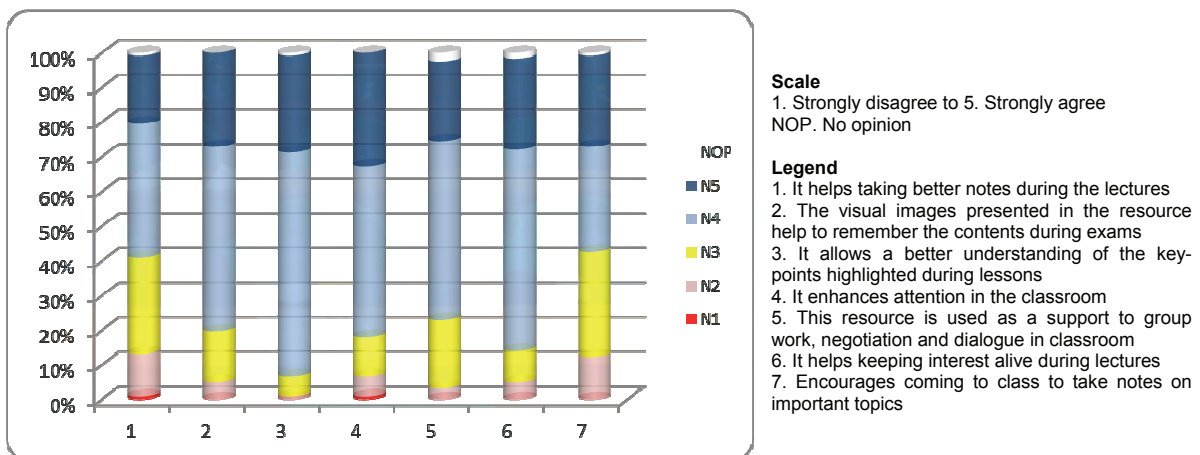


Figure 6: Positive behaviour in the classroom

In the dimension "negative behaviours in the classroom", the scale should be read in reverse: the more favourable views about the resource are located on level 1 and the less favourable in level 5.

Looking at Figure 7 we can conclude that: i) 36 % "agree" and 19 % "strongly agree" that the resource increases the possibility of keeping side conversations while the teacher presents the subject, ii) 8 % "agree" and 8 % "strongly agree" that the resource reduces the motivation to be present in class. This figure (16 %), although low in percentage terms, assumes an important meaning and is not aligned with the very positive evaluation made to other dimensions and iii) 24 % "agree" and 7 % "strongly agree" that they are more likely to skip school if they know that the resource will be available on the web.

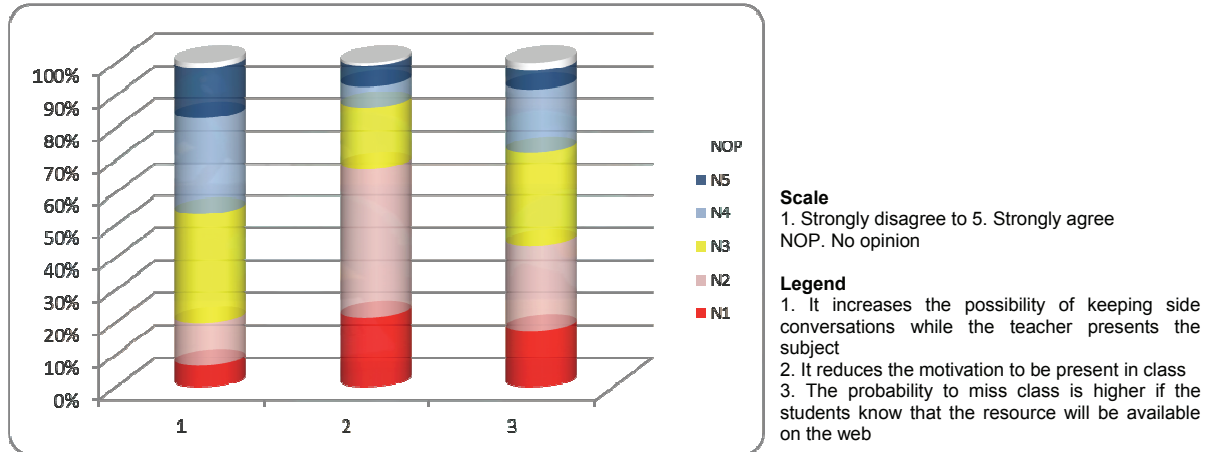


Figure 7: Negative behaviour in the classroom

Table 3 shows the average of responses in each dimension for each course attended. Only courses with 10 or more students were taken into consideration as it was assumed that courses with fewer students didn't have any statistical significance. However, it is important to state that the same class could integrate students from various courses, which increases the dimension of students in each session. What was meant by this analysis was to identify possible differences in opinions according to the type of training. The students from *School Management and Organization* and *Childhood Education and Special Education* courses are the ones that, overall, make a more positive assessment of the resource used. On the same scale of 1 to 5, the average score for items 1 to 5 (item 6 was not considered in this average as it presents a reverse scale) was 4,3. The less favourable reviews were noted in the course *Pedagogical Supervision*, with an average of 3,7. Although the type and size of the sample do not make it possible to establish correlations between variables, the results of this preliminary study indicate that there is material for further analysis in this field.

Table 3: Average of results in each dimension per course

Training Undergone	Pedagogy	Technology	Cognitive Learning	Interaction in class.	Positive behaviour in class,	Negative behaviour in class,	Average items 1 to 5
Education and Music	3,8	4,1	3,9	3,8	3,8	3,2	3,9
Pedagogical Supervision	3,8	3,9	3,9	3,4	3,6	2,8	3,7
Infection and Health Care	4,1	4,0	4,4	4,2	4,0	2,1	4,1
School Management and Organization	4,0	4,4	4,5	4,3	4,3	2,5	4,3
Childhood Education and Special Education	4,2	4,4	4,3	4,0	4,2	2,4	4,3

An analysis of differences in various dimensions, by gender, was made in this study. In dimensions 1 to 5 no significant differences are visible. Gender disparities are only visible in dimension 6, which refers to negative behaviour in the classroom (Table 4). As shown in the three items considered, male respondents considered that the resource has more negative effects.

Table 4: Significant differences per gender

	Men	Women
1. It increases the probability to keep side conversations while the teacher presents the subject	3,7	3,2
2. It reduces motivation to be present in class	2,7	2,2
3. The probability to miss classes is higher if it is known that the resource will be available on the web	3,1	2,5

5. Results discussion and conclusions

Constructivism as a philosophy and pedagogy is now widely accepted and is close to most contemporary theories of teaching and learning: "constructivism", "situated learning", "social cognition", "activity theory", "distributed cognition", "ecological psychology", and "case-based reasoning" (Jonassen, Howland, Moore, & Marra, 2003). Education policies, including the Bologna process, give expression to these pedagogical models of constructivist nature. In line with this perspective is the way new generations of students learn: in a more flexible way, not just playing the role of passive consumers of information, but as active builders in their learning process. The social media provided by web 2.0 support this new philosophy of learning based on community building, participation and sharing.

There are several studies about the use of the web 2.0 tools potential as an approach to more constructivist philosophies. However, few are the studies focused on classroom lectures, where the teacher faces a class-group, consisting of several dozen of students with the need for direct instruction, to be able to present a large volume of information in the minimum time. In this context, which occurs often in higher education, dialogue and interaction are limited.

Figure 8 depicts the morphology of the communication process in a lecture to large groups, in which the electronic presentation only allows one-way communication, the interaction is not favored and the student is sent to a more passive role.

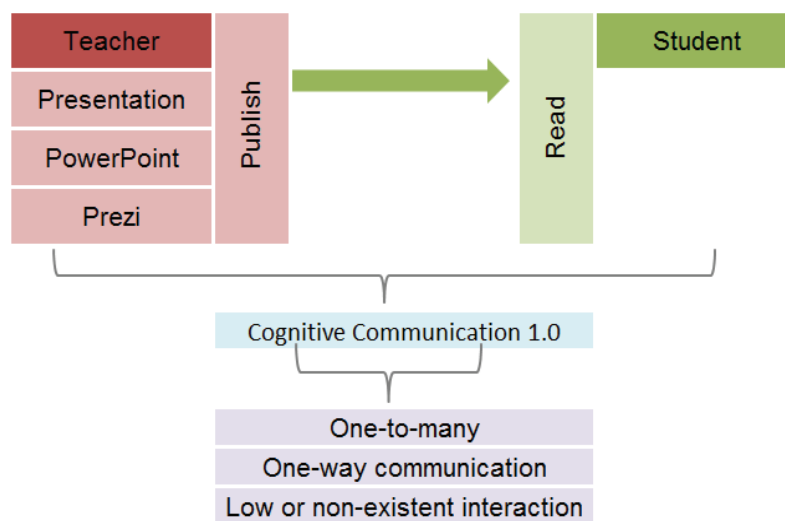


Figure 8: Cognitive communication morphology 1.0 in the context of a lecture

Mayer (Pennsylvania State University, 2010) admits the possibility of using resources more associated with direct instruction to achieve more constructivist approaches. In this study we sought to determine whether the integration of the web 2.0 tool Twitter micro blogging in a PowerPoint presentation contributed to the upgrade of a cognitive communication 1.0 to a cognitive communication 2.0 in the context of a lecture (Hu, 2011). The applied questionnaire allowed to assess various dimensions of the resource used in the classroom and to verify the changes in the morphology of cognitive communication. The results indicate that students recognize the potential of the resource used in the dynamics and dimensions of a cognitive communication situation 2.0, in particular with regard to: i) pedagogical aspects, ii) technological aspects, iii) cognitive learning; iv) interactions in the classroom and v) positive behaviour in the classroom.

In Figure 9 the results of the resource at interaction level and the direct effects on the student's activity are summarized. Twitter integration favours a multidirectional communication and an increase of the interaction between teacher-student, student-student and student-content. This leads to an upgrade of the level of cognitive communication from version 1.0 to 2.0. The findings corroborate the results obtained when applying this questionnaire to a smaller sample (Ferreira, Castro, & Andrade, 2011) and are aligned with other studies, namely: i) the positive effects on learning (Balanskat, Blamire, & Kefala, 2006; James, et al., 2006; Junco, et al., 2010) and ii) the relation between the use of technology and the student involvement in school activities (Balanskat, et al., 2006; Chen P., 2010; Junco, et al., 2010).

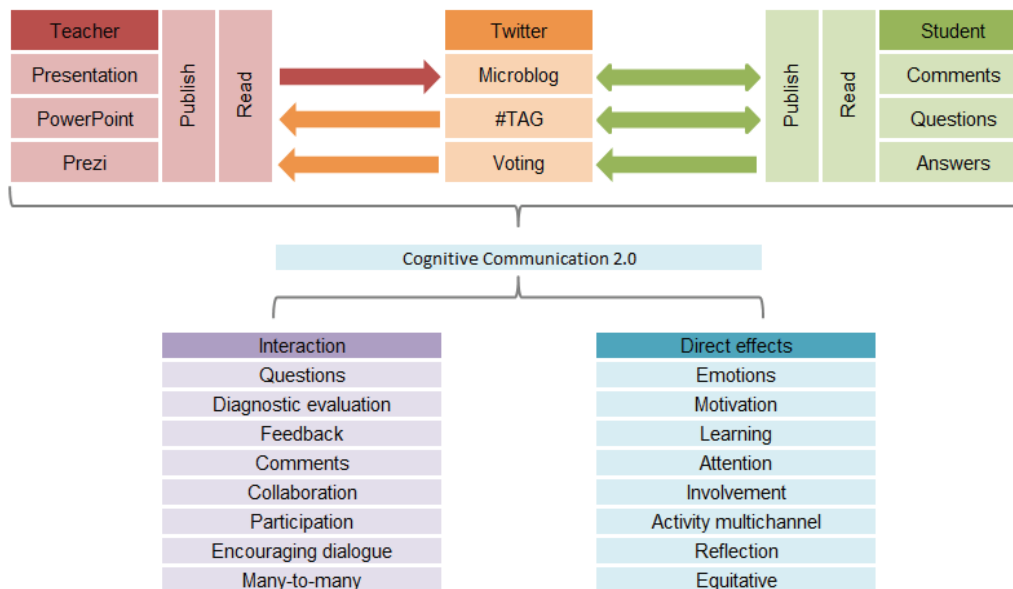


Figure 9: Morphology of cognitive communication 2.0 in the context of a lecture

For future studies, it is suggested i) to extend the sample in order to validate the questionnaire and to allow the study of correlations between variables and ii) to develop a more systemic way of research, integrating the issue of cognitive communication 2.0 in the context of the classroom in HIPLE context.

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