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How Can I Learn More When I Collaborate In A Virtual Group?

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Abstract

Learning in virtual groups has been a process studied and analysed long from multiple perspectives. However, the literature is scarce when we look for models to explain information problem solving skills in online collaboration. A descriptive model of cognitive skills involved in individual information problem solving while using internet information can be found in recent research. The purpose of this study was to find out what information problem solving skills (IPS) students apply when working collaboratively online, and secondly, to analyse what differentiates students who do well on their knowledge tests after collaboration, in relation to these IPS skills. We conducted a research with more than 40 students in 10 virtual groups to analyse the correlation between learning and IPS skills applied by students during an online task that lasted more than 4 weeks. Students completed a weekly self-report with actions related to IPS skills and time devoted to the collaborative task. Findings show that students applied more frequently the skill to check the communication (30%), secondly, read de information (22%), in the third place exchange information (20%), followed by write the information (15%), analyze the information (8%), and finally, search for information (5%).However, only three skills correlate with learning: information exchange, analysis of information and checking communication. Two of them (exchange and check) are collaborative skills and one of them (analysis) is an information problem-solving skill. The conclusions of this study may provide guidelines for instructors and students on ways to improve learning in online collaborative group work.

Introduction

Collaboration and technology and its influence on learning have been studied for more than 40 years and they have

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developed a huge research under the label computer-supported-collaborative learning. The first research focus was on the effect of technology on learning, "the fact that the individuals worked in groups was treated as a contextual variable that influenced individual learning"`[1] (Stahl, Koschmann & Suthers, 2006). Socio-

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cognitive, socio-constructivist and distributed learning theories influenced research tendencies in the 90s, and the focus of research changed to the social aspects of group learning and the way participants constructed knowledge. According to these theories, learning takes place through interactions among students. Students learn by expressing their ideas and questions, and the contrast and negotiation of concepts and information with other members allows students to examine their understanding and knowledge ([1] Stahl, Koschmann and Suthers, 2006; [2] Ng and Nicholas, 2007; [3] Brindley, Walti and Blaschke, 2009)

In general, collaborative learning theories have not included in their studies how students deal with the information they need to work in virtual groups. In an online collaborative task, students need to access different sources (mainly Internet) to obtain the information whereby students exchange, negotiate and solve the problem or task together. However, nor the reception or access to information ensures learning. Information becomes knowledge and access to information leads to learning, when we act on it, process it, organize it, belongs to us, we use it and confront it with other people; that is, when we are able to give meaning to it ([4] Coll, 1999).

In the last ten years, some studies ([5]Brand-Gruwel, Wopereis & Vermetten, 2005; [6]Brand-Gruwel, Wopereis & Walraven, 2009; [7]Wopereis, Brand-Gruwel & Vermetten, 2008) have contributed to build a descriptive model of cognitive skills involved in information problem solving while using internet information. This model considers three types of skills: regulation skills, conditional skills and constituent skills needed to solve information problems. Students use "regulation skills" to direct their learning activity during the entire IPS process. It contains four sub-skills, which are called orientation, monitoring, steering and evaluating. Conditional skills can be considered factors that might influence the IPS process: reading skills, evaluating information and selecting sources, and computer skills. Finally, five constituent skills are involved in different stages of the process of solving information problems. "Define information problem" serves students to get a clear insight into the problem, and includes four sub-skills: read task, specify the problem, activate prior knowledge, and clarify task requirements. "Search information" is a students' activity that involves skills like select a search strategy, derive search terms, and judge search results. The search information strategy can be "goal-driven" or "data- driven", depending if the problem is well or bad defined. "Scan information" consists of a surface review of information in order to get an idea of the kind and usefulness of selected content. This skill currently comprises three sub-skills: scan content of website, judge scanned information, and elaborate on content. "Process information" means a deep processing of information. Activities involved in this skill are reading text, judging the processed information, and analysing, selecting, and structuring information. "Organize and present information" can be considered as a synthesis of all data to develop the product required in the IPS task, and embrace many sub-tasks: formulate problem, outline the product, structure the product, formulate text, and elaborate on content.

The need to design effective IPS instruction has been defended by several authors ([7]Wopereis, Brand-Gruwel, and Vermetten, 2008; [8]Argelagos y Pifarré, 2012). According to these authors, effective IPS instruction can be embedded in authentic learning tasks, in which learners need to make use of all skills for effective task performance. Authentic activities used in a learning environment are characterized by real-world relevance, ill- defined and require students to use a variety of resources and information to solve them. Designing effective embedded instruction in authentic learning tasks may require reconsidering some characteristics of the IPS model of [5] Brand-Gruwel, Wopereis & Vermetten (2005). It's the case, for example, regarding collaborative learning tasks. In this new learning situation, we will need to identify what other skills related to collaboration can be incorporate to this general model. According to a research carried out by [9] Garcia (2005), two skills should be considered: "exchange information among others" and "check the communication", which may properly reflect the collaborative skills needed by students to manage information in learning groups engaged in an IPS process. "Exchange information among others" involves sharing external (from Internet or other sources) or internal (self- constructed) information with other group peers, by means of a written text (email, forums). "Check the information" consists of reading the messages peers have contributed to the discussion forum.

2. Method

What is measured
Academic Knowledge
Professional Knowledge
How is it
measured By the number of
ideas regarding the content used by students in the exercises.
By the number of specific actions expressed by the student.
Indicators
Ideas contained in the exercises, which belong to the content. Ideas may not be literal; they can be expressed in many ways.
The appearance in the text of specific actions to achieve the objectives sought in the case.
Outcome
Number of ideas expressed by each student in the exercises.
Number of actions (not repeated) expressed by each student in the exercises.
Examples

- We should promote, among teachers, training in the use of relevant and useful information for their classes, in order to encourage greater openness to the use of non-traditional teaching materials.

- It is important to integrate parents and the community in the process. - ICT should be considered a cross-curricular concept to the rest of the subjects.

- Allocate part of the budget to an ICT lab. - Evaluate the level of knowledge to manage ICT by the teaching team.

- Preparation of teaching materials by area coordinators. - Design a school website with the participation of teachers and students.

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This study is part of a larger PhD research project on factors enhancing learning through collaboration in virtual groups in higher education and one of their aims is to identify what information problem solving skills students apply in a collaborative learning task and which of them correlate with students' learning outcomes.

2.1. Learningsituation

The study was conducted in a group of students of the Master of Technologies applied to Education (2010-2011) of the Higher Education Graduate Institute (IUP) in Spain. The students had to be trained to understand, know, evaluate, choose and apply technologies to education (K-12). Students in Module 2 "Introduction of ICT in the school and in the educational programs" were assigned a group task as their final evaluation of the module. They had to present a final report with a plan on how to successfully implement ICT in a real school. Students worked in groups of 4 to 5 people in a discussion forum to develop a proposal together to be delivered as a final task after 4 weeks. They could make use of whatever information they needed from any source available (including module contents, Internet and so on).

2.2. Datacollectionandparticipants

Students were invited to participate in the study. 42 students formed 10 groups that participated in the research: 37% men and 63% women, from Spain and Latin America (Argentina, Chile, Ecuador, El Salvador, Guatemala, Honduras, México, Uruguay and Venezuela), 1 graduate, 38 Bachelor and 3 Postgraduate, all were working in jobs related to Education. Students completed an initial and final case-based exercise to find out their knowledge on the

subject. Learning outcomes were measured by the differences in the knowledge showed by students after the collaborative task. Students filled a self-report daily to make a record of the individual information problem solving activities carried out by them during the development of the task. In this document the student had to select from an exhaustive list of possible activities (in table 2) the ones that reflected what he/she did every day concerning the educational activity and also write down the time devoted to each activity.

2.3. Measures

Table 1 shows two knowledge measures to evaluate learning outcomes. Academic knowledge was measured by the use of ideas from the content which were embedded in theoretical materials by the students, and professional knowledge was measured by the number of specific actions proposed by students to introduce ICTS in the school and in the educational programs.

Table 1. Knowledge assessment
84 individual case-based exercises were analysed: 42 initial and 42 final. The average size of individual case- based exercises was two sheets. Table 2 shows the IPS skills model applied to students' activities during the collaborative task, based on [5] Brand-Gruwel, Wopereis & Vermetten (2005).

Category 1. Search for information
2. Exchange information.
3. Read the information
4. Check the communication
5. Analyse information
6. Write the information
7. Others
Table 2. Information problem-solving skills model Definition
Activities

Those activities that a student does to find the information needed to support the content that he/she will give to the group project.
Activity that involves sharing external or internal information, or personal opinions with other group peers, bye means of a written text (email, forums).
Activity that involves scanning for information, selecting and reading the information found or given.
Activity consisting of reading what peers have contributed to the discussion forum.
Activities that involve evaluating, comparing, discriminating, summarizing or selecting information relevant to the project.
Write the information processed by the student facing the project to be produced.
Actions not listed in categories 1-6.
- Search bibliography. - Find and collect information from the Internet. - Search for content in magazines and journals. - Search and find websites, discussion forums, articles, etc. - Talk with experts.
- Send messages with external information found: URLs, books, articles. - Send messages with information worked by the student: texts, comments, opinions, observations, ideas and conclusions (inside the message or in an attached file).
- Review and read the literature found (links, articles). - Read the course content. - Read and review the information written by the student. - Read the texts produced by other students.
- Read and review the messages developed by peers. - Read and review forums and message boards.
- Analyze and extract the relevant information from outside sources (links, articles, websites). - Analyze and extract the relevant information from internal sources (texts of their own working group).
- Evaluate the information to extract notes, ideas, conclusions and contributions to the project.
- Write and compose texts related to the project. - Develop additional elements that complement the texts (graphics, images, pictures, etc..). - Make corrections to the common drafts of the group.
For example: personal organization activities; mechanical activities like printing, uploading files; connection problems, etc.

1.050 daily self-reports were collected from 42 students. A total of 3.280 activities were categorized.
2.4. *Dataanalysis* Descriptive and initial bivariate correlations of our measures were calculated: frequency of activities and Spearman's rho (r_S).

3. Results

Students have applied more frequently the skill to check the communication (30%), secondly, read de information (22%), in the third place exchange information (20%), followed by write the information (15%), analyze the information (8%), and finally, search for information (5%). Globally considered, the frequency of

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actions applied by student to manage the information (SI, RI, AI, WI) was a little higher (50,5%) than those related to communicate the information (EI, CC), (49,5%). Concerning academic knowledge learning, the results showed that the frequency, with which a student exchanged information (r_S =0.446; $p<0.001$), checked the communication (r_S =0.369; $p<0.005$), and analysed the information (r_S =0.484; $p<0.001$), have a significant positive correlation with academic learning outcomes. Similarly, the total frequency of activities applied by students (r_S =0.466; $p<0.001$), positively correlated with learning in this dimension. However, searching for information, reading the information and writing the information down had no impact on academic learning. Concerning professional knowledge, students who exchanged information (r_S =0.347; $p<0.005$), checked the communication (r_S =0.360; $p<0.005$), and analysed the information (r_S =0.444; $p<0.001$), provided were able of proposing more actions to introduce ICT in the school and in the classroom programmes. Additionally, the total frequency of activities (r_S =0.453; $p<0.001$), applied by students positively correlated with learning in this dimension.

4. Discussion and Conclusion

Results show that students working in groups to collaboratively develop a written assignment within a moderately broad and definite time, go into the discussion forum many times to see what other students have written and read the documents and files that other peers have posted on the forums. They also frequently sent to the discussion forum comments, opinions or documents and URLs they consider relevant to the group's work. They also write and draw the work they are commissioned by the group and to a lesser extent analyze the information in order to extract relevant information found by them or provided by others. Finally, they do not often seek or search for information. In the latter case, it may be due to the fact that they were working with course materials that were broad and extensive.

Findings from correlation analysis show us, however, that not all informational problem-solving skills are related to students' learning outcomes, measured either through academic or professional knowledge gained. The actions that have to do with collaborative skills (exchange information and check communication) have positive relationship with learning outcomes. And only the ability to analyze information, of all IPS skills, correlates positively with students' learning outcomes. In this sense, for students to learn more when they are working in a group activity, participation and continued reading of messages from peers and analysis of the information received should be stimulated.

However, these results should be taken into consideration in the context of the study, size and type of sample, and technology used for collaboration, as well as other possible variables that may be intervening, not analyzed in this study.

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