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Online distributed leadership: a content analysis of interaction and teacher reflections on computer-supported learning

This study performs a content analysis of the communication that develops in online educational situations. It focuses on two aspects of communication in a context in which we observe instructional leadership: how leadership is seen in the virtual classroom and how teachers view their role. Our study attempts to answer the question of how teachers lead this methodological change, that is, instructional leadership at the service of distributed leadership. The study analyzes the online interaction and teachers' reflections on the communication between teachers and students in the process of virtual teaching, specifically in post-compulsory secondary education in Spain.

Keywords: Computer-mediated communication, Computer-supported learning, Online instructional leadership, Teacher attitudes.

Introduction

The main actors in any teaching process are the teachers and the students, who communicate through their interaction. In b-learning, these actors' roles are created and changed through the use of virtual media.

A considerable body of research analyzes the social, psychological, and pedagogical aspects of leadership. There are fewer studies, however, of the content of communication that develops in educational situations. We focus on two aspects of communication in a context in which we observe instructional leadership: how it is seen in the virtual classroom and how teachers view their role. Our study, a content analysis of communication, attempts to answer the question of how teachers lead this methodological change, that is, instructional leadership at the service of distributed leadership.

If we approach this issue from a distributed model, analysis of communication to describe and improve leadership in teaching should attempt to answer the following questions: How do teachers exercise their leadership to steer the group toward success? What paths can teachers take to stimulate the appearance of leadership in the student? And how will they compensate for any weaknesses that they perceive?

In this article, our emphasis is on analyzing online instructional leadership, based first on studies of instructional, distributed, and transformational leadership; and, second, on research on instructional leadership in online learning environments.

Instructional, distributed, and transformational leadership

In the area of education, studies of leadership begin to have some impact on schools in the first half of the twentieth century, with the research by Lewin, Lippit and White (1939), who

propose a classification of school leadership styles: authoritarian, democratic, and "laissez faire."

The first studies of leadership in the area of business emerge at this time as well, focusing on management of business organizations in the decade from 1930 to 1940. These studies are based on the theory of traits. Subsequently, so-called behavior theories of leadership emerge in research performed by Fleishman and Stogdill at Ohio State University and Likert at the University of Michigan.

In the 1980s, lines of research (Greenfield, 1987; Miles & Ekholm, 1985; Sykes & Elmore, 1989) focus on efficacy and improvement in the school. Instructional leadership thus develops with significant repercussions for school management. This focus involves a change of perspective, shifting from an emphasis on bureaucratic management toward the exercise of management concerned with teaching.

MacNeill, Cavanagh and Silcox (2005) propose pedagogical leadership as an alternative to instructional leadership. The former focuses on the students, enabling improvement of their learning and intellectual growth. In contrast, Bolivar (1997) considers instructional leadership to focus on supporting teachers through methodological resources for effective teaching and understanding that schools are organizations with their own culture.

In recent years, a great deal of literature has emerged on this topic. Numerous studies and reviews explore pedagogical leadership, directors' leadership, management for change, educational leadership, learning-focused leadership, and other forms of leadership, such as transformational, moral, participatory, managerial, facilitative, distributed, etc. (Bass & Avolio, 1993; Bolivar, 2010; Gronn, 2002; Leithwood, 1994; Leithwood, Jantzi, & Steinbackh, 2003; MacNeill, Cavanag, & Silcox, 2005; Murillo, 2006; Spillane, 2006; Timerley, 2005).

Kahai, Sosik and Avolio (2003) indicate that the transformational leader influences the motivation of the members of the group or organization to participate and cooperate through intellectual stimulation and intellectual and individual consideration. Transformational leadership is based on three constructs: the ability to foster collegial functioning, the development of goals, and personal development. It should be a dynamic process, changing and generating changes (Leithwood, 1994).

In Spain, leadership practices have changed in recent decades, especially in school educational policy. Schools have greater autonomy and responsibility in their academic results, granting a greater role to leadership in their managerial teams. Leadership for learning takes as the core of its action the quality of teaching provided and the results of learning achieved by the students (Bolivar, 2010). Leithwood, Louis, Anderson, & Wahlstrom (2004) in relation to the teachers consider the substantial direct contribution to student learning of teachers, acting both individually in their classrooms and collectively.

Recent studies highlight how leadership is distributed among all persons who form part of the organization, through sharing activities and focusing on interaction rather than action (Gronn, 2002; Harris, 2008; Spillane, 2006; Spillane, Halverson, & Diamond, 2001). The organization has been redesigned, shifting from a single leader to leadership centered in teams, paving the way for teachers and students to assume a greater role and thus more functions and responsibilities (Harris & Spillane, 2008).

The literature also includes leadership as improvement in managerial functioning, academic results, and quality of education (Day, et al., 2009). In Spain, few studies focus their objectives on investigating the classroom, teacher, or student. Bolívar (2010) develops this area of study, indicating that leadership is not the responsibility of the director but should be exercised by the school or the people who assume commitments, share activities and tasks,

and care about improving the school. This occurs in both formal and informal aspects of educational institutions.

Distributed leadership in online learning environments

Teaching leadership, like the leadership developed in other kinds of organizations, is a complex system subject to various factors to ensure that the group achieves its goals. These factors seem to include the intellectual capability to give the group's objective meaning, imagination to provide a vision of the future that inspires the members, technical operating knowledge that translates strategies into specific plans, and interpersonal abilities to foster commitment (Ancona, Malone, Orlikowski, & Senge, 2007). Further, the leader's "qualities" are not the only things we should consider when analyzing leadership in the school. Other factors, such as the followers, the means of communication, the learning environment, and fluidity of communication will also condition the relationships established in the leadership.

In Spain, research on virtual educational leadership revolves around a figure of the teachers. Along these lines, Gros and Silva (2005, p. 3) indicate that:

> along with the capacity to learn, one element that has also been believed to have great importance in the responding to the current challenges of schools is teachers' leadership capacity. There is a call to understand the teacher as a "knowledge worker," a designer of learning environments, with the capacity to make the most of the different spaces in which knowledge is produced.

Teaching leadership is mediated by the communication pathway in which the teaching-learning process is developed, in our case, online communication. Thus, the teacher's knowledge of the specific characteristics of virtual learning has a direct impact on the development of the educational class sessions. To analyze leadership in virtual teaching, we must consider various information sources: on the one hand, analyses in the literature related to online communication (based on didactic, sociological, and psychological focuses); and on

the other, current analyses of teaching leadership. This intersection is clearly still becoming visible to education researchers and is contributing valuable information.

Our approach draws on the proposal by Strang (2007), which indicates that leadership can be studied from the inputs and outputs and from the cause/effect perspective (such as intra-individual, dyadic, psychological, social). In order to systematize the studies of leadership in virtual educational environments, we have organized the review of the research according to three key issues:

a) Who exercises virtual leadership?

In recent years, we have seen growing interest among international researchers in analyzing distributed leadership, in many cases as organized and planned by the teachers (Gressick & Derry, 2010; Harris & Spillane, 2008; Stahl, 2006). There are also studies that focus on analyzing emergent leadership (Li et al., 2007; Misiolek & Heckman, 2005).

Both distributed leadership and emergent leadership in a teaching-learning situation are orchestrated by the teachers. Teaching presence as studied by Garrison and Anderson (2003) occurs along these lines. The teacher's presence manages social and cognitive presence simultaneously, facilitating both the learning objectives and inclusion of members in a work group.

Kelly, Davis, Nelson and Mendoza (2008) evaluate the variables that predict the appearance of a leader. They observe that many of the variables in the Internet process (emoticons, e-mails, word counts) and individual explanatory variables (technical ability and personality) have a strong positive relationship to the emergence of a leader.

From a perspective of cultural diversity, Lim and Liu (2006) hold that leadership can enable a more uniform distribution of participation tending toward distributed leadership that pays attention to different points of view and confirms these to obtain more information, provides orientation, and summarizes progress. With the leader's guidance, members of the group are

more efficient in reaching agreement on the nature of group work and establishing a route to achieve consensus on crucial topics. Leadership is the adaptation process necessary to face the conflicts between the members' values.

According to Hollander (1992), leadership is not only a process of leaders; the followers are also actors in this process. The leader is responsible for initiating the action, but it is the followers who will determine what happens with the leadership's contributions, an issue also analyzed by Turkay and Tirthali (2010).

b) What are the characteristics of the virtual leader?

Our literature review analyzes of a wide range of issues relevant to the characteristics that the leader should possess. A first issue is the leader's behavior relative to the group: helping to construct mental models, stimulating cohesion, managing conflicts, planning, organization and supervision, initiation of activities, control of topics for discussion (Balthazard, Waldman, & Warren, 2009; Curtis & Lawson, 2001; Gressick & Derry, 2010; Li et al., 2007; Lim & Liu, 2006; Serçe et al., 2011; Strang, 2007; Walvoord, Redden, Elliott, & Coovert, 2008).

A second issue is the cognitive and technical area: logical and analytic thinking, creativity, and reasoning (Balthazard et al., 2009; Gressick & Derry, 2010; Strang, 2007). Issues related to personality also form part of analyzing the leader: moral values, knowledge sharing, explaining, requesting effort, helping to reduce uncertainty, feedback, exchange of information (Curtis & Lawson, 2001; Strang, 2007; Gressick & Derry, 2010; Lim & Liu, 2006; Walvoord et al., 2008). The study by Balthazard et al. (2009) shows that personality characteristics are related to the appearance of transformational leadership in face-to-face teams but are largely foreign to the virtual team. However, according to Gressick and Derry (2010), the instructor shares control of the topic, avoids soliciting opinion, and participates to varying degrees with the groups (attends to the strongest and the weakest more).

A third issue closely related to personality characteristics is interpersonal capabilities: the capacities to listen and to influence (Li et al., 2007; Turkay & Thirtali, 2010; Walvoord et al., 2008). In a magnificent study, Strang (2007) focuses on the perspective of the traits of the virtual leader, the abilities, functions, and behavior. Leadership traits and behavior, rather than management functions, are examined from empirical scientific studies through qualitative and quantitative research on the organization .

Other analyses focus on the students as followers of the leader. Lim and Liu (2006) start from the hypothesis that the members of groups with leaders show more normative influences in the learning process than members of groups without leaders. They conclude that the members of groups with leaders seem to have enjoyed a more positive environment. But the use of computer-mediated communication (CMC) as a means of communication is likely to diminish the tension and anxiety about grading and to conceal possible conflicts in groups without a leader. The study by Ritter, Polnick, Fink and Oescher (2010) investigates graduate students' leadership in face-to-face, online, and b-learning situations. The perceptions were measured using the Classroom Community Scale (CCS), which includes three measures: classroom community, connectivity, and learning. These authors found that there was a significant difference in perceived classroom community and connectivity between the students attending in both the face-to-face mode and b-learning and the students who attended online classes. Students who received all of their instruction face-to-face with their professors or who had some face-to-face contact with them perceived a greater sense of community. There were no statistically significant differences, however, in the students' perceptions of their learning. The results suggest that teachers in graduate programs change the development of the course to construct a sense of community in their online classes.

c) How do communication and interaction occur in virtual leadership?

The studies that analyze the relationship between virtual leadership and quantity of communication yield some divergent results. In their study of collaborative learning, Curtis and Lawson (2001) find that students who contributed more in virtual communication were the "natural leaders" in each group. The contributions were related to organizing group work, initiating activities, and giving help and feedback. Along the same lines, a study by Kavanaugh, Carroll, Rosson, Zin and Reese (2005) shows that the leader or leaders of an organization tend to send most of the information to members online, whereas this method is rarely used in groups of low economic status or groups with little knowledge of computers. However, in a study by Yoo and Alavi (2004) that analyzes the emergence of leadership in a university program for executives through quantitative and qualitative analysis to identify differences between leaders and nonleaders through e-mail, the authors find that neither group sends a greater quantity of e-mail messages, nor does one group send longer ones. Rather, the emerging leader assumes the role of initiator, manager of the agenda, and integrator of the others' ideas.

The different studies do seem to agree that it is not only the quantity of communication that predicts the appearance of leader but rather the content and quality of the communication (Balthazard et al., 2009; Cassell, Huffaker, Tversky, & Ferriman, 2006; Sarker, Grewal, & Sarker, 2002), such that:

> work today in the world is dominated by computer-mediated communication, and this communication is common in virtual teams. However, the mere transmission of information from point A to point B is not sufficient. Thus, the virtual environment poses significant challenges to effective communication. (Walvoord et at., 2008, p. 1884)

Virtual worlds are places for participation (Turkay & Tirthalia, 2010), in which leaders learn to use their mistakes to improve their projects and in which leaders should introduce online learning carefully so as not to contribute to isolation and anxiety (Dorrian & Wache, 2009).

The leadership style proposed in virtual interaction has been analyzed in studies by Huang, Kahai, & Jestice (2010), in which we observe that decision making in virtual teams creates challenges for leaders with respect to the structure of processes and support in tasks. This study also explores the effects of interaction in leadership styles and the richness of the communication media. The cohesion of the group and the climate of cooperation influence the team's performance and decision making on the tasks at hand. The results suggest that transactional leadership behavior improves the group's cohesion, whereas transformational leadership behavior improves the climate of cooperation. However, these effects depend on the richness of modes of communication exercised by the leader. Along these lines, the study by Purvanova and Bono (2009) indicates that transformational leadership has a stronger effect on teams that use only computer-mediated communication and that leaders who increase their transformational leadership behavior achieve higher levels of performance.

Finally, Cassell, Huffaker, Tversky, and Ferriman (2006) analyze leadership from a perspective of age and confirm through the analysis of messages sent and their use of language that they can predict the choice of the leader. Gender differences also predict leadership style. The results indicate that young online leaders do not fit adult leadership styles, such as offering many ideas, focusing on the task, and using educated language. On the contrary, whereas the young people chosen as delegates do not contribute more, their linguistic style probably keeps the objectives and needs as the central focus, and they refer to the group instead of themselves, synthesize the work of the others, and do not only contribute their own ideas. Further, whether male or female, young leaders follow this pattern of using interpersonal language.

Our study focuses on the analysis of communication in relation to teaching leadership and attempts to answer the following questions:

- How do teachers exercise their leadership to steer the group toward success?

- What paths will the teachers take to stimulate the appearance of leadership in the student?
- How will they compensate for any weaknesses that they perceive?

Materials and methods

Research setting

The study used communication produced between teachers and students in the process of virtual instruction, specifically in post-compulsory secondary education (in Spain, this stage of education is open to students starting at 16 years of age). The sample consists of three teachers (two men and a woman, ages 40-50, with over 15 years of teaching experience) and the students (34 women and nine 9 men, with a mode of 18 years of age).

This is professionalizing study oriented to entering the labor market.

This is a qualitative, exploratory study that permits us to examine the style of teacher leadership that originates at this stage of education. The programming of the course is presented as b-learning instruction. It is organized into face-to-face/virtual/face-to-face phases in the following way:

- Face-to-face: The course planning is presented to the students, along with the methodology to be used, and the grading system. During this period, work groups are constituted, and tutors are assigned to monitor the work. The subject matter is programmed with a problem-based learning methodology agreed upon by the group of students.
- Virtual: In this phase, the students collaborate on the project to be developed. Each member of the group works using the tools provide by the school: a virtual classroom

that provides different resources (forum and diary) and other resources obtained through Internet (e-mail, chat, and online documents).

- Face-to-face: In this phase, the students must defend their final project before a tribunal of teachers from the department.

The time distribution of the course is determined by the number of hours of instruction: 15 face-to-face hours, 60 virtual hours, and five face-to-face hours for defense of the work performed. The students' work is done as group work, through problem-based learning (PBL). Communication was performed using the platform Moodle.

Data source

In the study, we analyze the virtual communication between teachers and students, for which they use e-mail, chats and forum (used in the virtual stage of the course). We also investigate the teacher's opinion through the diary (written from the beginning to the end of the course) and an in-depth interview, conducted at the end of the course. These three sources of information (virtual communication, diary, and interview) are compared to enable understanding of the figure of the teacher as a group leader.

Data coding

We have used the instrument formulated by Gressick and Derry (2010), which was developed from the code system by Li et al. (2007). These instruments are based on work on distributed leadership by Spillane (2006) to examine the leadership that occurs in small groups for collaborative online learning. Our study obtained data from three sources: the virtual communications, diaries and interviews. We have analyzed the data obtained from the e-mail communications, chats, and forum. These communications constitute one group for analysis. The teacher's class diary is analyzed separately. Both the virtual communications and the

diary and interview were analyzed through a coding system created with the codes and subcodes explained in Table 1 using NVivo 8 software. We took thematic unity as the unit of analysis.

We have established the following codes and subcodes:

Insert Table 1 near here

Subsequently, we use the interview to contrast and validate the data obtained from the analysis of the virtual communication. We used an open standardized interview with a set of starting questions that were reformulated and contrasted in the course of the interview as the teacher reflected on the data. The interview thus followed a free and open form.

Results and discussion

Documents from online interaction (chats, e-mails, forum)

a) Teachers' contributions according to the tools used: We see that the greatest contribution percentage wise was in chats (46.14% of the total communication consisted of chats), followed by e-mails. This analysis was performed for each type of tool separately.

Insert fig1.docx near here

If we compare the tools used by the teachers to those used by the students, we see that both use the chat in almost the same proportion. The chats were performed by the teacher and each student individually. In e-mails and the forum, the students' participation is considerably higher. As to instructional approach, the teacher's participation in the forum consisted of assuming the role of facilitator, answering questions that the students were not able to answer, elaborating on content, and interventions geared toward motivating students.

b) Distribution of the teachers' contributions according to codes and subcodes: If we group the data according to the three types of tools used (chats, e-mails and forums), the teachers' contributions are distributed as detailed in Figure 2. We see that the greatest contribution was

in code KCE (Knowledge of Contribution Expressed, with 13.15% of the communications by the teachers) followed by OMO, Organizational Moves/Organization. At the other extreme, we have the code AAN (Affective Acknowledgement/Negative), with no contribution from the teacher.

Insert fig2.docx near here

The code KCE corresponds to the academic knowledge oriented to the goal of the work to be performed by the students. There are responses to questions from the students contributing new ideas or expanding on meaning.

The code OMO (Organizational Moves/Organization) also stands out, with a significant contribution from the teachers. This code shows us that the teacher acts as a leader, establishing objectives, procedures, and norms.

The code Organizational Moves/Planning (OMP) takes *quite a high value,* 16.18% of the communications by the teachers. The contributions made by the teacher in communication with students during the online teaching show that organizational issues are important for ensuring that the students do not feel abandoned and for setting deadlines and defining tasks to be performed, etc. If we add to these contributions the conclusions obtained in the code AAP (Affective Acknowledgement/Positive), we can see how the teacher attempts to create a pleasant learning environment.

Thus, the teachers' contributions refer primarily to academic knowledge related to the course objectives, but also answers to students' questions and the expansion of knowledge, such as:

> Usually, having 400 equity and 600 debt—a ratio of 66%—is considered normal in Spain (chat).
>
> Fifth: what about the other months? You have to prepare bills for the rest of the months to the end of 2011, but how are you going to enter this in the accounting? (chat)

Virtual communications by the teachers are often related to the planning, organization and supervision of the training. For example, we find:

> Don’t make another blog; when you enter you’ll see a blog that is called enterprise project (chat).
> The oral presentation will begin at 8:15 a.m. Attendance is mandatory (forum).

Third, we find sentences, particularly in emails, that relate to teachers’ attempts to motivate and encourage students to achieve the learning objectives. These are frequently sentences such as:

> I want to congratulate you for the work done during this period. I hope you’ve learned enough to enter into a new stage of education in business and in the development of your integrated proyect (email).
> I’m sure you will do really well during these three weeks. I have watched how you work, and it has been wonderful to see what you have accomplished. This motivates me to continue with you and you to keep learning, working, collaborating and improving as a group (email).

At the opposite extreme, we find the code AAN (Affective Acknowledgement/Negative), in which the teacher made no contribution through the virtual communication tools. There were negative contributions, especially among the students, in which they demanded that their classmates fulfill their responsibilities in order to achieve the goals established by the group on the project that they had to develop.

Likewise, there were very few contributions from the teachers in the code for Topic Control (TC), which included communication seeking another perspective on a problem, returning to the original topic, or discussing a new topic. These are statements that influence the topic of the discussion or the direction of the project.

c) Contributions from teachers according to tools used in communication by codes. We see that, in the codes to which the teachers contribute, most statements differ depending on the kind of tool used. Thus, in the chat, the greatest quantity of contributions refers to the code KCE (Knowledge Contribution Expressed).

Insert fig3.docx near here

As for the e-mails, the contributions refer to the code AAP (Affective Acknowledgement/Positive). The large number of statements in the code AAP is justified because, in each statement, the teachers make two contributions, one a greeting and one a closing. With this tool, the teacher has provided the organization that the student needed, whether planning, organization or supervision. Knowledge contribution has occurred, but to a lesser extent.

Insert fig4.docx near here

Insert fig5.docx near here

In the forums, however, the code OMO (Organizational Moves/Organization) is the code with the greatest number of contributions, but it contains fewer contributions than do the e-mails. These results may be due to the accommodation between communication needs and the simultaneous vs. non-simultaneous character of each tool. We must remember that the teachers used the tools as needed for their own teaching as well as that for the students at each moment in the teaching and learning process, attending to the goals established in the programming.

In the results shown in Table 2, we can see the percentage values for teachers' contributions in each of the tools relative to the students' contributions. For example, the teachers contributed 1.62% to the code AD with the tool chat.

Insert Table 2 near here

The teachers contribute 66.99% and the students the remaining 33.01% of the communications analyzed in all of the tools. These data show the minimal participation of students.

Teacher diary

We analyzed the teacher's diary as a single unit that provided information proceeding exclusively from this unit. This information source differs from the previous documents (chats, forum and e-mails), in which only part of the information came from the teachers and the other part from the students.

In the following figure, we see that most of the interventions refer to the code OM (74.75% of the communications), distributed as explained in the following.

Insert fig6.docx near here

In contrast to the other tools, we see that organization and positive affective acknowledgement again predominate,

> The tutoring for both modules is performed by the teaching staff that provides direct teaching in previous modules. The tutoring is presential (Teacher diary).
> This week I chatted with two students. I have a very consistent relationship with them (Teacher diary).

But we would stress the appearance of negative affective acknowledgement, which constitutes 10.87% of the teacher's reflections.

> As anticipated, this triggered a pretty intense discussion forum on the participation and collaboration of students in this forum. In this case, I let them express themselves as they wish. They know that insults are not allowed (Teacher diary).

The leadership performed is classified as distributed, as the students have to take their own responsibility in the work group. The teacher emphasizes the heterogeneity in forming the groups, stressing that the group work was unequal. In one of the groups, the leadership was assumed by the students themselves, but the other groups had no leaders. Among the latter, one emerging leader appeared, who was assigned the role of initiating, managing, and integrating the ideas contributed by the other classmates in the group.

Teacher interview

Our analysis of the interview with the teacher focuses on identifying issues that were not found in the diary. We also seek to resolve the questions for which we found some contradiction between the findings in the virtual communications and the diary.

The interview thus helps to explain the very low presence of the code negative affective acknowledgement (AAN), as this kind of commentary is made face to face. The code control of topics (TC) shows quite low levels of presence in the communications. For this kind of indicator, the teacher consciously considers in his or her teaching methodology that it should be the students who contribute to this code. This belief arises from the fact that the virtual communications are developed in a second phase in the process of instruction, a phase whose goals are autonomous work by the groups of students:

> The action in the online part is more distributed, requires more responsibility and less control on the part of the teacher, and less directed, this is the teacher's goal. (Interview with the teacher)

Third, the levels of argument development (AD) found in the communication are also quite low, as the teacher explains:

> this is developed in face-to-face work, in this project they should not develop more knowledge but rather put into practice what they already know. (Interview with the teacher)

In the interview, the teachers corroborate the data found in the code of organizational moves. Thus, the teacher considers that the characteristics of the material require this high level of impact on the communication:

> In this field, organization is very important, and I wish to transmit it in this way…in their professional development, they are going to have to work in a group. (Interview with the teacher)

On the other hand, it is important to point out that teaching leadership is oriented to delegating this responsibility to an emerging leadership. Thus, he/she indicates:

> For a group to function, it must have at least one leader (Interview with the teacher).

Contrast of the findings as a whole

Insert fig7.docx near here

In the previous figure, we synthesize the issues we have analyzed above. We observe the following findings:

The contributions to OM (whether OMO, OMS or OMP) arise to a large extent in the diary. This suggests that writing of the diary focused fundamentally on two issues: contributions describing how the course was organized and those referring to negative affect.

The contributions to AAN come exclusively from the diary. At no time in the development of the course was there a negative statement. Only the teacher's reflection confirms this fact.

For the codes TC, SI, AD (and minimally in KCE), there is no contribution in the diary. We interpret this data as indicating that these codes are associated more with direct work with the students and that the diary is a personal reflection.

Only 3.3% of the contributions in the diary were not classifiable into any of the codes because they corresponded to disparate sentences not considered in this coding system.

Taking into account all of the information sources, we find that most of the teachers' contributions refer to the organization of the work and, to a lesser extent to argument development, followed by positive affective acknowledgement.

Likewise, when we consider all of the information sources, the issues on which the teachers reflected least refer to control of the discussion topics and the search for entries. These data may be attributed to the fact that, since the mode of teaching is b-learning, the bulk of the theoretical content was covered in the face-to-face classroom.

Discussion

Our findings agree with the prior literature in several aspects: First, we agree with the study by Kahai, Sosik and Avolio (2003) on the notion that the transformational leader influences the group's motivation and organization, and we have found a large amount of virtual communications devoted to these aspects.

On the other hand, leadership is distributed (Gressick & Derry, 2010) among all members of the work groups. As we confirmed through the interview, the teachers perceive that the members underwent a process of adaptation to address conflicts (Lim & Liu, 2006).

Further, each work team is led by a person who emerges within the group (Harris & Spillane, 2008). These findings are also reported in the conclusions of the study by Yoo and Alavi (2004) to identify leaders via e-mail, where the emerging leader assumes the tasks related to the initiation, management and integration of his/her classmates' contributions. This distributed leadership structure is coordinated and organized by the teachers (Gressick & Derry, 2010), who in our study focused especially on the contribution to knowledge.

Whereas Gressik and Derry (2010) focused on design of activities to motivate and to provide knowledge, affect, and practice in the development of group work, our research focuses on analysis of the communication performed by the teacher and students, through technological tools and their contribution to leadership.

Thus, we have found that leadership is a process in which the teachers, emerging leaders and followers play an active role in the construction of knowledge (Turkay & Tirthali, 2010).

Conclusions

Our study analyzes the communication between students and teachers, focusing attention on the development of teachers' leadership in a b-learning environment oriented to success of the

learning process. Given the organizational structure of the teaching-learning process, leadership is always exercised by the teacher, but he/she may encourage the group of students to assume leadership, creating a situation of distributed leadership. To achieve this result, the interaction of teachers and students through two-way communication is crucial.

The indicators that reflect leadership in the classroom are varied and affect various questions: organization, motivation, and content.

Our study finds that the organizational aspect of the course was treated virtually. And this topic occupied a significant percentage of the virtual communications. Therefore, this is an important issue for the development of the teacher's leadership.

The positive dimension of the motivational aspect is treated in the communications, essentially in the chat, and we find the negative dimension in the intimacy of the diary. Perhaps this is due to the fact that the negative issues are treated more directly because the teacher perceives a certain communication barrier and affirms that he/she prefers to handle them face-to-face.

Third, issues of content (argument development, seeking input, knowledge contribution, and topic control) are relevant in the responses and depend on the tools used. We can thus see how, in the chat, the knowledge contribution is greater due to the form of communication that the teachers and students have—simultaneous and personal. Problems or doubts are resolved directly.

Argument development achieves little representation, due to the methodology used, the content, and the type of project that the students performed in their training.

The procedures established by the teachers to make leadership effective were based on the assumption of responsibility by the students within their group in developing the activities. This is shown in the data obtained from the diary and the resources used in the communication, with very significant weight on organizational issues and planning. This

without doubt contributes to the success of the group of students. The teachers assume the role of leader at times when the students need a person to guide them.

Our second objective was to determine the paths by which a leader emerged in the group of students. In some groups, this is the natural leader, but in others there is no leader. Even so, the teacher does not intervene. In such cases, conflicts arise among the students that require the teacher to act with negative affective acknowledgement, but with one exception: face-to-face communication, not technological tools, was used.

The excessive communication in the code OM (organization and planning) was decisive in causing a leader to emerge in the groups that lacked one.

There is a lack of communication that receives negative affective acknowledgement, especially publicly, as in contributions to the forum. On the other hand, we find very significant data on positive affective acknowledgement, both in e-mail and in the forum. The teacher uses positive affective acknowledgement to motivate and encourage the student's abilities, thereby exercising distributed leadership.

Nevertheless, there is little knowledge contribution, and when there is, the parties use a single channel for communication, the chat. We believe that the teachers should use more communication channels. There is a need for greater intervention from the teacher in the forums to reorient the debate in order to enable learning among the students themselves.

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