

WCES-2010

A mobile learning tool for improving grammar skills

Luis A. Guerrero^{a*}, Sergio Ochoa^a, Cesar Collazos^b

^a*Department of Computer Science, Universidad de Chile*

^b*Universidad del Cauca, IDIS Research Group, FIET-Sector Tulcan, Popayán, Colombia*

Received October 14, 2009; revised December 23, 2009; accepted January 7, 2010

Abstract

It seems that actual software tools utilizing Computer-Mediated Communication mechanisms -like messaging or chat systems- do not help young students to learn good grammar skills. On the contrary, these tools can be detrimental for the acquisition of these skills. On the other hand, it is difficult to design and build software tools for supporting the acquisition of language skills, especially if these tools must support a group of students working in a collaborative way. In this paper we present the design of a Collaborative Learning activity and the corresponding mobile software tool developed to support teaching grammar to primary education Chilean students. Some mechanisms were designed to incorporate Positive Interdependencies in the software tool. The tool was also intended to support Individual Accountability for each member of the group. The developed software tool contains two main interfaces, one for individual work and one for supporting face-to-face group work interactions. The tool is intended to simplify the teacher's task in terms of activity creation and monitoring: the tool automatically corrects students' assignments and it also provides statistical reports on students' performance both currently and in its evolution in time. Experimentation was done with 32 seventh grade students (12-13 years old) at a public school in our country. Over 70% of the students thought the activity improved their Spanish grammar, and over 86% of the students found the software tool was very easy to use.

© 2010 Elsevier Ltd. All rights reserved.

Keywords: Mobile learning tools; grammar skills; CSCL.

1. Introduction

As in many countries, language grammar courses constitute a substantial portion of the primary and secondary curriculum in our country. However, during the last years we have observed that some of our university students (Universidad de Chile) have serious deficiencies in writing abilities. Besides, we think this situation is further aggravated by recent technology uses -such as text conversations through cellular phones, chat and forum tools, and even the e-mail- which do not motivate youngsters to apply good language grammar for written communications. Due to this situation, and thinking how to use the technology to revert this tendency, we attempted to design and build software tools that help students working in groups to acquire proficient language and grammar skills.

According to Slavin (1980), many studies have shown that two or more individuals can solve problems better working in groups than independently. A specific type of group work is that supported by Information Technology:

* Luis A. Guerrero. Tel.: +56-2-978-4947; fax: +56-2-689-5531.

E-mail address: luguerre@dcc.uchile.cl.

Computer-Supported Collaborative Learning (CSCL).

As Srijbos et al. (2004) state, group-based learning activities supported by technology should include Positive Interdependences and Individual Accountability. Positive Interdependences refers to the degree to which the performance of a single member depends on the performance of all others (Johnson, 1981), as opposed to "negative interdependences" that stress competition. Positive Interdependences aim to promote cohesion and a heightened sense of "belonging" to a group. Individual Accountability deals with individual responsibilities among the group, for jobs, tasks or duties, central to group performance and efficiency (Slavin, 1980). Individual Accountability implies specifying individual responsibility: something someone is accountable for.

Our purpose in this project was to develop a CSCL tool to support teaching Spanish grammar to primary school students. We design a Collaborative Learning activity that incorporates positive interdependences and individual accountabilities mechanisms. We developed a software tool to support this Collaborative activity. Specifically, this software tool can be applied to 6th, 7th or 8th grade Spanish grammar Chilean students (12-13 years old).

2. Designing the Collaborative Learning Activity

We decided to use Collaborative Learning techniques in order to increase student participation. From a constructivist perspective, Collaborative Learning can be viewed as one of the pedagogical methods that stimulate students to negotiate information and to discuss complex problems from various perspectives. Group work can better support learners to elaborate, explain and evaluate information in order to re- and co-construct knowledge or solve problems (Dillenbourg et al., 1995; Scardamalia & Bereiter, 1994).

The designed activity was based on the Language and Communication curricula from our Chilean Ministry of Education. The Ministry suggests a series of individual activities using grammar contents in order to achieve the desired objectives. We include some elements of Cooperative Learning techniques proposed by Johnson & Johnson (1998). In particular, the activity was designed to generate positive interdependencies among group members, such as the need for information interchange during task performing, work splitting into several roles, and the need for explicit knowledge sharing (Salomon, 1992). Positive interdependencies are the key to collaboration, and it is not easy to achieve them. When positive interdependences are clearly structured and understood, group members perceive that they –and their work- are linked for mutual benefit, so that the efforts of each member of the group will be unique and will contribute to the common purpose. Each student must understand and assume their individual accountability in the group work context.

The designed activity has two roles: teacher and students. The teacher prepares the activity and acts as a facilitator. The students work in small groups trying to solve specific tasks. The teacher selects the various groups of students. The number of students should not exceed six, since several studies suggest small groups are better regarding maximum participation and interchange of ideas (Cooper, 1996).

The teacher must choose the content of the activity, for example, a morphological analysis: students must classify each word from a text to belong to just one category, according to the context of the sentence –for instance: nouns, adjectives, verbs, and adverbs.

In the first phase, the students work in an individual activity. This activity consists of studying one of the morphological elements given by the teacher. Students must identify which words correspond to a morphological category in the text. These tasks can be done in an asynchronous and distributed way. In a second phase students must work in group in order to discuss and review the previous –individual phase- work. In a third phase the morphological element of every student is changed and they start a new cycle using a different text.

This activity involves a positive interdependence called *resource interdependence*: each member of the group has only part of the information, resources, or material needed for the task to be completed, and the resources of the group have to be combined in order to achieve the common goal.

All the students of the group must complete their individual work and the corresponding group session before a next cycle begins. This is the main idea between a positive interdependence called *task interdependence*: work has to be organized sequentially. Students have to divide the work and must be linked with each other.

The students will have to justify their choices during the group session, generating discussions. According to Doise and Mugny (1984), the benefits of collaborative learning are explained by the fact that two individuals will disagree at some point, then they will feel a social pressure to solve that conflict, and the resolution of this conflict

may lead one or both of them to change their viewpoint. The social pressure in this case is exerted by all the group members aiming to improve the collective performance.

The number of cycles and the number of texts and morphological elements must be defined by the teacher taking into account the number of students in every group. This provides a new positive interdependence called *role interdependence*: roles are assigned to each member of the group. These roles are inter-connected and they present specific responsibilities the group members need to carry out when completing the tasks in order to achieve the common goal. The roles –as Johnson et al. (1998) recommend- rotate while the activity is going on.

3. The Software tools

We decided to design two different interfaces: a traditional one based on Web, and a mobile one based on PDAs. Figure 1 shows both interfaces –Web-based and PDAs-based- for the first phase of the activity: the individual classification of words according to the morphological category of every student.

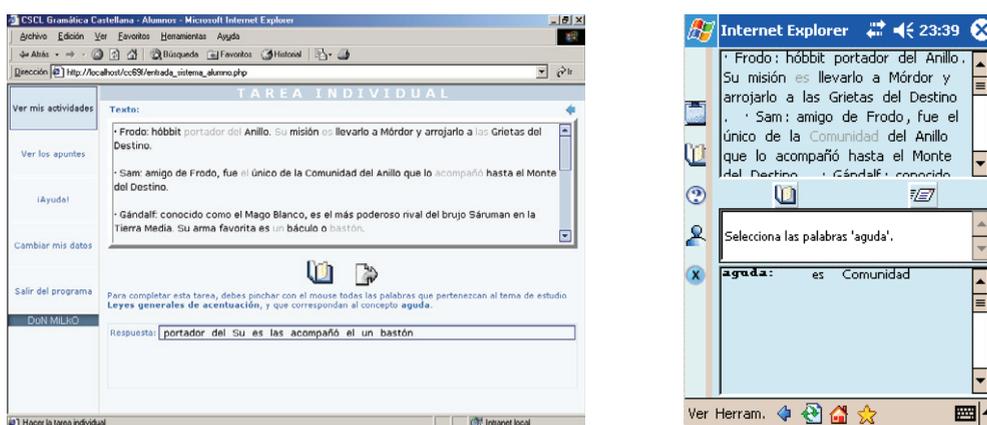


Figure 1. User interface for individual work sessions (in Spanish).

During the first phase, every student is given a personalized screen describing his/her activities for each cycle, including the text and the grammar category he/she must work on. Figure 2 shows the screens for individual assignments, which must be done in an asynchronous and distributed way. Once all the students complete their individual tasks, an instance of group work begins. The group of students needs to have a face-to-face meeting in front of a common system screen –PDA or Web-based interface-, in contrast to the previous individual work in which students can use the tool in a distributed and asynchronous way. The common interface is showed in Figure 2. This tool screen gives information to the students with respect to the previous individual tasks.

Color cues are provided in the common screen for easy visualization. Thus, the screen for group work presents all words classified by a specific student with the same color. A distinctive color is used for conflicting words, i.e., those ones chosen by two or more students –selected in one or more morphological categories. The current group performance is also presented in graphic form (not showed in the screen). It is important to note that the system does not give the students the right answers. The system gives the students a percentage of correctness of the whole work. They must discuss the final result and probably they must change or add some words to the list of categories. The screen showed in Figure 2 permits students to correct (change) the words listed in each category. The teacher determines what the accepted percentage of correctness is. For instance, the teacher can configure the system to allow passing the second phase with a score superior to the 90% of correctness in the first work phase. According to this, students must discuss among them about the performance in the previous individual tasks. The group work and discussion allow students to understand their individual accountabilities respect to the whole group work. This is an example of another positive interdependence, the *goal interdependence*: students must perceive they can achieve their goal (learning) if and only if the other members in the group can achieve their goals.

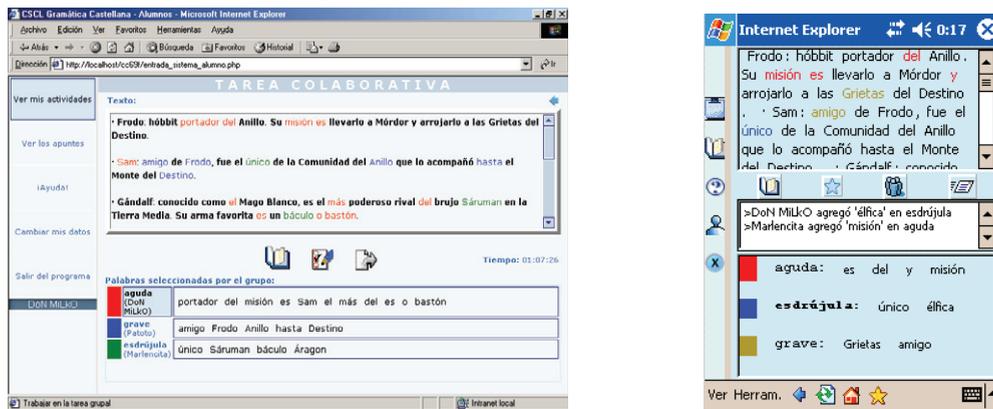


Figure 2. User interface for group work sessions (in Spanish)

Table 1. Some of the most important results of the questionnaire

Question	Likert avg.	Disagree	Neutral	Agree
The activity improved my Spanish language knowledge	3.8	13.3%	13.3%	73.4%
The activity was funny	2.5	26.7%	23.3%	50.0%
The group work improved my personal knowledge	3.6	20.0%	16.7%	63.3%
We finished the activity successfully	4.0	6.7%	16.7%	76.6%
I enjoyed the group work activity	3.8	6.7%	33.3%	60.0%
Four people were a good group size	3.5	13.3%	33.3%	53.3%
I contributed to my group knowledge	4.3	3.3%	16.7%	80.0%
The group contributed to my own knowledge	3.6	20.0%	16.7%	63.3%
I liked the activity	3.8	6.7%	30.0%	63.3%
I liked the software tool	4.1	6.7%	23.3%	70.0%
The software tool was very easy to use	4.3	3.3%	10.0%	86.7%
The “help” section of the software was very useful	3.8	13.3%	13.3%	73.4%

4. Experimenting with the system

For experimenting with the system we create a questionnaire based on the critical incidents technique proposed by Flanagan (1954). In a first phase we developed an open questionnaire asking positive and negative aspects of the software tool. This questionnaire was applied to a first group that used the tool. Using this information we defined the most mentioned characteristics. Once the critical incidents of the software tool were determined we used them to define dimensions of quality. Using these dimensions of quality for critical incidents we defined the second questionnaire, which had a Likert format.

Using the second questionnaire experimentation was applied with 32 seventh grade students (12-13 years old) at a public school in our country. The students were divided in eight groups of four students. We went to know if our collaborative learning activity was useful for the students to learn the topic. Furthermore, we want to compare this activity to traditional ones to determine the value students of our schools give to the collaborative learning approach.

Table 1 shows some of the results of the anonymous questionnaire. Answers to the questions were in a Likert 5-value scale (5-totally agree; 4-agree; 3-neutral; 2-disagree; 1-totally disagree). Most interesting results were the following ones: over 73% of the students thought the activity improved their Spanish language knowledge; 60% of the students also liked group work; 86.7% of the students found the software tool was very easy to use, and 80% of the students thought they contributed to the group knowledge.

This preliminary experimentation showed us that it is possible to design and develop software tools which are easy to use and incorporate well designed pedagogical objectives. Students realized the convenience of group work not only in the pedagogical objectives achievement but also in the social and communication skills development.

5. Conclusions and further work

One of our basic assumptions is that CSCL tools must be associated to well-designed Collaborative Learning techniques to be truly considered “collaborative”; otherwise it may be just “group” or “collective” learning tools. The chosen technique in our case was a Problem-Based Learning one: the activity begins as a task the students must achieve. It is while trying to do the assignment when students need background theory and concepts. Of course, most of the required information is easily available from the reference material -through the software tool itself-, but it is while trying to assimilate it when that information is transformed into useful knowledge. Note that some PBL characteristics such as freedom to decide the methods or plan development, do not apply here.

Finally, we consider the use of some alternative development and implementation platforms, which could provide additional flexibility to the tool. Specifically, we include wireless mobile devices as PDAs (Personal Digital Assistants) for implementing the designed activity. Naturally, the impact of this technology on the design of the application must be evaluated, in contrast to the Web-based one. This evaluation must include both the technical feasibility and the pedagogical and psychological aspects modeled in the collaborative tool. Our first impression is that both individual and group tasks can be supported with these mobile devices in the same way they are supported by the Web-based tool. Individual tasks can be made in an asynchronous and distributed way, thus, it should be easy to support them using PDAs as well as Web-based tools. The synchronous face-to-face group activity could be probably best supported using PDAs devices.

Acknowledgments

Both tools, PDA and Web-based modules, were developed by Milko Maradiaga. This project was partially supported by the Chilean Fund for Science and Technology (Fondecyt), Grant No. 1090352, and LACCIR (Microsoft Research) Grant No. R0308LAC001.

References

- Cooper, J. (1996). Small-group instruction in science, mathematics, engineering and technology. *Disciplines: A status report and an agenda for the future. Cooperative Learning and College Teaching Newsletter*, 6(2).
- Dillenbourg, P., Baker, M., Blake, A. & O'Malley, C. (1995). The evolution of research on collaborative learning. In Spada, H. & Reimann, P. (Eds.), *Learning in Humans and Machines*.
- Doise, W. & Mugny, G. (1984). *The social development of the intellect*. Oxford: Pergamon Press.
- Flanagan, J. (1954). The critical incident technique. *Psychological Bulletin*.
- Johnson, D. W. (1981). Student-student interaction: The neglected variable in education. *Educ. Research*, 10, 5-10.
- Johnson D., Johnson R., Holubec, E. (1998). *Cooperation in the classroom*. Interaction Book Company, Edina, MN.
- Salomon, G. (1992). What does the design of effective CSCL require and how do we study its effects? *SIGCUE Outlook*, Special Issue on CSCL, 21 (3), 62-68.
- Scardamalia, M. & Bereiter, C. (1994). Computer support for knowledge-building communities. *Journal of the Learning Sciences*, 3 (3), 265-283.
- Slavin, R. (1980). *Using Student Team Learning*. Baltimore, MD: Center for Soc. Org. of Schools, J. Hopkins Univ.
- Strijbos, J.W., Martens, R.L. & Jochems W.M.G. (2004). Designing for interaction: Six steps to designing computer-supported group-based learning. *Computers & Education*, 42, 403-424.