A Collaborative Learning Activity and a Software Tool for Improving Language Skills

Luis A. Guerrero[1]
Department of Computer Science, Universidad de Chile
luguerre@dcc.uchile.cl

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 other hand, it is difficult to design and build software tools for supporting the acquisition of language skills, especially if those tools must support a group of student working in a collaborative way. In this paper we show the design of a Collaborative Learning activity and the corresponding 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. Both, Collaborative Learning activity and software tool were designed to support teaching Spanish grammar, but they can be adapted for supporting other language's grammar.

Keywords: CSCL, Learning Activities Design.

1. Introduction

Language knowledge is considered one of the most important assets for a person's life. Thus, language acquisition courses constitute a substantial portion of the primary and secondary curriculum in many countries. Many of our university students (from Universidad de Chile) have serious deficiencies in writing abilities; despite the fact the university acceptance selection tests include this subject in their evaluation. Besides, this situation is further aggravated by recent technology uses -such as textual 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 communication. Due to this situation, and thinking in how to use technology to revert this tendency we have tried to design and build software tools that allow students working in group to acquire language and grammar skills.

Group work is not a new paradigm and has long been used as a pedagogical tool in a variety of learning situations. Many studies have shown that two or more individuals can solve problems of different kinds better when they work in groups than when they work independently. A specific type of group work is that supported by Collaborative Learning techniques and Information Technology: Computer-Supported Collaborative Learning (CSCL). CSCL tools could be used to improve the acquisition of language skills in school students.

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 is dependent on the performance of all others [12], as opposed to "negative interdependences" that stresses competition. Positive Interdependences aim to promote cohesion and a heightened sense of "belonging" to a group. Individual Accountability deals with individual responsibilities inside the group, for jobs, tasks or duties, central to group performance and group efficiency. Individual Accountability implies specifying individual responsibility: something someone can be held accountable for.

Our purpose in this project was to design and develop a Web-based software tool to support teaching Spanish grammar to primary school students. We design a Collaborative Learning activity that incorporates positive interdependences and individual accountabilities mechanisms. A software tool was developed to support this Collaborative Learning activity. Specifically, this software tool can be applied to 6th, 7th or 8th grade Spanish grammar Chilean students, but it may be adapted to teach other languages grammar as well.

This paper is organized as follows. Section 2 presents some related works. The design of the collaborative activity used as a basis for the tool is presented in Section 3. Section 4 includes the main features of the implemented tool. Section 5 presents some practice with the system and finally, section 6 presents the conclusions and future work.

[1] Center for Advanced Research in Education, University of Chile

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2. Related work

González-Lloret [11] studies the design of computer-assisted language learning tools that promote collaborative learning. She shows an Internet-based tool developed using principles of language teaching.

E-Cid [7] is an online Spanish course replacing traditional lessons. This course is based on contrastive grammar, and has been designed in a modular form.

Electronic Language Material Archive [8] is a Web-searchable tool that can be used to customize syllabi according to content-based learning practices. This Web-based content will be accompanied by a battery of activities aimed at activating a student's previous knowledge, facilitating the student's ability to organize information and develop interpretive skills, and at generating class discussion.

Rodriguez et al. [16] have designed collaborative learning games using palmtops for students in the area of Spanish language, obtaining high levels of pupil motivation, attention and concentration.

Klein [15] has developed a Spanish class in a collaborative manner without computer support. In his course, Klein improves speaking and writing skills via extensive and intensive practice in both areas.

There are many other computer-supported experiences to teach Spanish and English grammar. These cases focus on student group work, not collaborative groups: collaborative activities do not just happen when people are put together and required to do a task in unison [10]. A supportive social environment and a task infrastructure are required. In this paper, we focus on collaboration as a group phenomenon in which complex tasks are managed through close, step-by-step, apparently casual monitoring by participants of each other's actions, often cued through language.

3. The collaborative learning activity

The decision to use Collaborative Learning techniques arose primarily from a desire to innovate and to increase student participation. A cooperative group does not automatically improve the construction of high order cognitive skills and complex knowledge structures. In order to increase the possibilities for mutual understanding and task-related social interaction, interaction tools are needed that are adequately related both to the new concepts to be learned and to the previous experience and knowledge of the students [14]. There should be flexible methods available for the students, to help them externalize their preliminary ideas and make their thinking process transparent to others. From a constructivist perspective, Collaborative Learning can be viewed as one of the pedagogical methods that can stimulate students to negotiate information and to discuss complex problems from various perspectives. This can support learners to elaborate, explain and evaluate information in order to re- and co-construct (new) knowledge or to solve problems [4]. That is our rationale to design a teaching-learning activity based on Collaborative Learning techniques.

The designed activity was based on the Language and Communication curricula for 6-8th grades from our Chilean Ministry of Education. The Ministry suggests a series of individual activities using grammar contents in order to achieve the desired objectives.

Our designed activity includes some elements of Cooperative Learning techniques proposed by Johnson et al. [13]. 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 [18]. Positive interdependencies are the key to collaboration, and it is not easy to achieve them. We based our work on Collazos et al. [2], who have developed a mechanism to structure positive interdependences through software tools intended to make students think in terms of "we" instead of "me". When positive interdependences are clearly structured and understood, group members perceive that they –and their work- are linked for mutual benefit, that the efforts of each group member will be unique, and that the unique efforts of all members will contribute to success. Each student must understand and assume their individual accountability in the group work context.

The proposed activity has two roles: teacher and students. The teacher prepares the activity and acts as a facilitator. The students work in small groups. They must perform the tasks assigned by the teacher and solve any stated problems. The teacher must select a set of students to do the activity. The number of students should not exceed six, since several studies suggest small groups are best to generate maximum participation and idea interchange [3]. As an example, the activity development will be explained below for a group of four students.

The teacher must choose the content for the activity. The content for the example will be a morphological analysis: classify each word from a text to belong to just one category, according to context within its sentence. At the beginning, the teacher must select the work categories (for instance: nouns, adjectives, verbs, and adverbs).

The teacher must then find suitable work texts. The number of texts must agree with the number of students who will participate in the activity -four in this case. The activity was designed to be solved using a Problem-Based Learning (PBL) technique, as defined by Duch et al. [6]. According to this, the teacher has to find relevant reference material for the students and make it available to them through the "help" section in the tool.

Planning of the activity is done as follows. In our example we have four students numbered S1 to S4, and four texts labeled Text 1 to Text 4 (see Figure 1). There

are four work cycles; each of them has individual work and then group work. In this PBL activity the teacher assigns tasks to students, and they must do research and other actions to solve the problems by themselves.

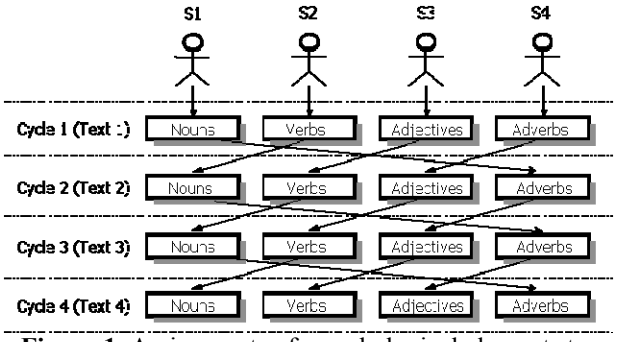

Figure 1. Assignments of morphological elements to student

The individual activity consists of studying one morphological element for one of the texts during each cycle. Every student must identify which words correspond to his/her morphological element in the text. For example, in the individual task of the first cycle student S1 must find all the nouns in text 1; student S2 must find all the verbs, student S3 all the adjectives; and student S4 must find all the adverbs. These tasks can be done in an asynchronous and distributed way, every student in one different computer. This activity involves a positive interdependence called resource interdependence: each member of the group should has only part of the information, resources, or material needed for the task to be completed and the group members' resources have to be combined in order for the group to achieve its common goal.

In order to solve the activity student must do work in two aspects:

1) They must learn about the theory concerning the corresponding grammatical element under study. The student may or may not have previous knowledge. S/he may use the reference material, ask her/his colleagues or consult other information sources.

2) They must apply the theory to identify words being the grammatical element in the text, according to their context.

The student tries to find all words belonging to his/her category in this individual work phase. Three cases may occur in this work: i) s/he rightly chose words belonging to the corresponding category; ii) s/he made a wrong choice when selecting words which do not belong to the category; and iii) s/he omitted to choose words belonging to the category. The teacher uses the whole of these cases to determine the student's strengths and weaknesses and to evaluate his/her performance. Note this problem solving involves an understanding of the grammatical elements; it is not an automatic task.

After the individual work, the students must do a group work. It consists of co-located correction and discussion of the previous activity. The students must have access to the performance as a group they have obtained thus far. This group activity is very important. When an individual member of the group expresses his/her opinion in relation to the shared public understanding of the group, this will be an attempt to synchronize his/her own understanding with the group-accepted version and make clear the disagreements if there are any. Depending on the outcome of this process there may be further interaction and negotiation until a new meaning or understanding is fully accepted by the group. The key aspects of co-construction of knowledge, meaning and understanding lie on this process interaction among individuals, as well as on their shared and individual cognition. 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 group activity ends when the group passes a threshold of performance, e.g., suppose students S1 and S2 chose a certain word as noun (correct) and adjective (incorrect) at the same time. If individual performances were to be considered, there will be a right classification (favorable points) and an incorrect one (no points counted). On the other hand, the group numerical performance would be null, because it is incorrect to classify the word both as noun and adjective for that sentence.

The students will have to justify their choices during this group activity, generating discussions. According to Doise and Mugny [5], the benefits of collaborative learning are explained by the fact that two individuals will disagree at some point, that they will feel a social pressure to solve that conflict, and that the resolution of this conflict may lead one or both of them to change their viewpoint. The social pressure in this case is done by group members wishing to improve the group performance.

The teacher makes the evaluation to determine whether or not the group has passed the performance threshold. In case the group does not approve, the students must continue discussing changes to word classifications. If they pass, each student has probably mastered his grammatical element and learned something on the other ones.

A new cycle is then started with each student in charge of a different element from the one s/he worked in the previous cycle (see Fig. 1). This strategy lets each student deal with all concepts of the activity contents. The strategy is consistent with recommendations from standard Collaborative Learning literature: Johnson et al. [13], e.g., recommend rotating roles while the activity is in development. The number of cycles and the number of different texts, then, must agree with the number of students. This also 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 teacher can control the difficulty of the text for each cycle; s/he will probably increase it depending on the previous rate of improvement and to keep students' interest. It is also expected the students will increasingly move from consulting reference material to asking colleagues who have already mastered concepts.

4. The computer tool

There are three types of users in the developed tool: students, teachers, and a system administrator. These users correspond to the Learning Management Systems learners, instructors, and administrators users described by Avgeriou et al. [1]. In our case, a teacher can create and monitor activities, input texts, input grammatical categories, input reference material and register students. A student can read the activity description and is allowed to do individual and group tasks. The administrator maintains activities and users for the system.

In our Collaborative Learning technique the base work unit is the activity. It has name, description, students assigned to it, a specific grammatical category and a text. The teacher must classify the grammatical elements inside the text beforehand. Automatic correction of students' classifications is not provided. The system can notify students they have some mistakes but they must find and correct them.

Monitoring is provided to the teacher through statistical reports showing individual and group performance in terms of number of rightly, incorrectly classified and omitted words. The screen also identifies the problematic words. This information, after each cycle, lets the teacher support students by providing hints or suggesting changes (remember the system never gives the correct answers to students).

Each student gets a personalized screen, describing his/her activities for each cycle, including the text and the grammar category they must work on. Fig. 2 shows the screen for individual work, which may be done in an asynchronous and distributed way. In this practice case, a student must find the verbs (in Spanish) present in the sentence.

Because this is a Problem-Based Learning activity, the teacher gives students the work but s/he does not explain the grammatical meaning of the concepts to be studied. In Figure 2 the systems ask the student to find the verbs on the text but probably the student do not know what a verb is. In the left side menu of this screen there is a help link. Following this link, students can find texts explaining the grammatical concepts involved in the activity. These documents were previously created by the teacher. If the student asks the system for help, an interface similar to Figure 3 shows him/her an explanation of the involved concepts ("nouns" in the example showed in Fig. 3).

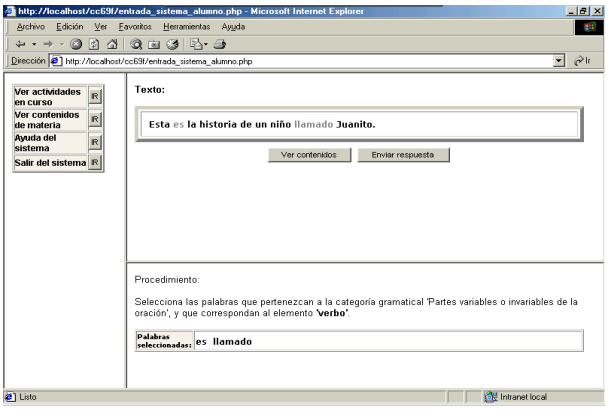

Figure 2. User interface for individual work

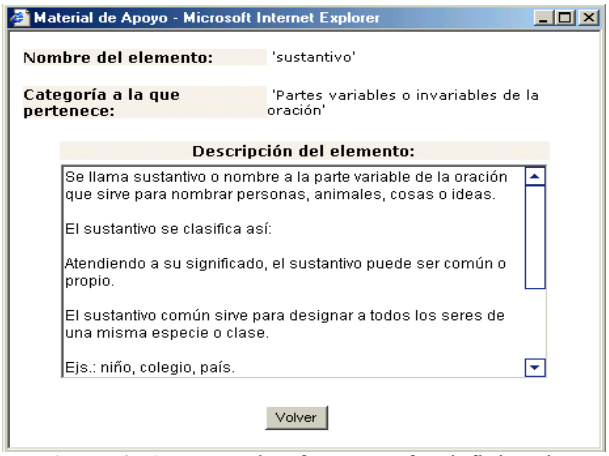

Figure 3. An example of a screen for defining the "noun" concept (in Spanish)

Once all the four students finalize their respective individual tasks there is an instance of group work. The group of students needs to have a face-to-face meeting in front of a common system screen, 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 4. This tool screen gives some information to the students 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 Fig. 4 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. These group works and discussions 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.

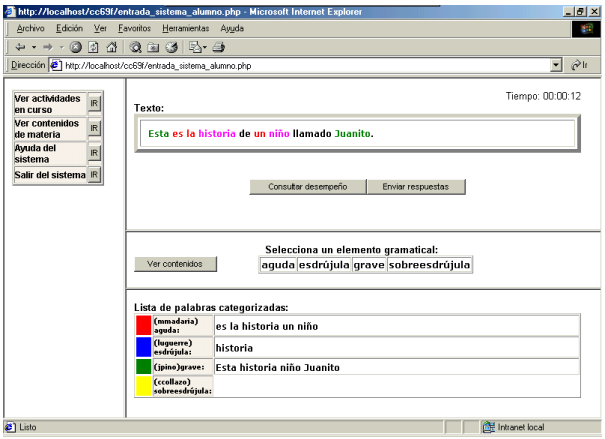

Figure 4. Common interface for the face-to-face meeting work

Both individual and group work user interfaces have a quick access button to the reference material. Therefore, they can easily review relevant theory respect to the morphological elements been studied. Once the four phases work (i.e. the work with the four texts) is completed the students "send" it to the teacher.

5. Experimenting with the system

Experimentation was done with 32 seventh grade students (12-13 years old) at a public school in our country, divided in eight groups of four students. We would have liked to assess whether a collaborative learning activity such as the proposed one actually makes students learn the subject. Furthermore, we should compare this activity to traditional ones to determine the value students of our schools give to the collaborative learning approach.

The experiment consisted of two work sessions with a questionnaire at the end of each of them. Some improvements to the usability of the software tool were done after some testing sessions, according to the comments of the students. Some of the improvements were: use of standards in colors and icons, a simplified way to enter the application (avoiding the use of login and passwords), use of nicknames, more graphical information (instead text-only interfaces), use of a more simplified language (in the directions and messages), the possibility to change the student data (the nickname, the colors), a simplified way to manage the software security (login and passwords are very complicated concepts for 12 years old students).

Table 1 presents the most interesting 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 70% of the students think the activity improved their Spanish language knowledge; 60% of the students also liked group work, and most of the rest were neutral about group work. Only two students (6.6%) did not like the activity.

Table 1. The most important results of the questionnaire

Question	Likert average	Disagree (1 & 2)	Neutral (3)	Agree (4 & 5)
The activity improved my Spanish language knowledge	3.8	13.3%	13.3%	73.3%
The group work improved my personal knowledge	3.6	20.0%	16.7%	63.3%
We finished the activity in a successful way	4.0	6.7%	16.7%	76.6%
I like 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 contribute to my group knowledge	4.3	3.3%	16.7%	80.0%
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%

6. Conclusions and future work

Collaboration is not simply a treatment with positive effects on participants. According to Roschelle & Teasley [17], collaboration is a social structure in which two or more people interact with each other and, in some circumstances, some types of interaction occur having a positive effect. Activities should then be designed accordingly to get a shared understanding of the problematic situation.

Our basic assumption is that CSCL tools must be associated to 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 Problem-Based Learning: 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-, 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.

The developed activity attempts to generate a Collaborative Learning environment, where individual experimentation and group collaboration play a key role

in the teaching/learning of grammatical concepts. Two important aspects in the design of the activity were the positive interdependences and the individual accountability. Carefully designed features to support these two key aspects were embedded in the software tool.

The software, on the other hand, 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.

Despite the fact the developed activity and tool were designed to support teaching of Spanish grammar in Spanish as a first language courses, we think it can be easily adapted to the grammatical elements of other languages. Of course, the current software tool can be used to support teaching Spanish as a second language, and can be also adapted to support English as a second language in countries like Chile (which have Spanish as a first language).

Finally, it is possible to consider the use of some alternative development and implementation platforms, which could provide additional flexibility to the tool. Specifically, we could include wireless mobile devices as PDAs (Personal Digital Assistants). Naturally, the impact of this technology on the design of the application must be evaluated. The 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 devices. Individual tasks can be made in an asynchronous distributed way and thus, it should be easy to support them. The synchronous face-to-face group activity could also be supported in its discussion with PDAs.

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