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Editorial EOS

Effectiveness of cooperative learning fostered by working with WebQuest[1]

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Abstract

This research is part of a broader project being carried out by Erain School (San Sebastián) since February-March, 2004. The project is centered on the educational use of digital video. It has been catalogued as an R&D&I Project by the Diputación (provincial council) of Guipúzcoa and the Basque government who collaborated in financing it, together with the European Regional Development Fund.

The objective for using the WebQuest was to introduce a tool that allowed self-regulated and cooperative work of students in making a scientific video. Our research question was the following one: Does the WebQuest foster self-regulated and cooperative work in the students of Secondary Education (16 years old) when making a scientific video? In order to answer this question, we present a project carried out with a group of students in their fourth year of Secondary School. These students had to produce a scientific video about the geography of Guipúzcoa (Spain) for their Geography course. In order to do so, and following strategies to undertake scientific work as designed by the instructor in a WebQuest, they carried out their research work and then prepared the video (http://www.erain.es/vde/produccion3.asp). Data collection was carried out through two surveys which were specifically designed to collect data about this context of cooperative learning. The conclusions of this paper are similar to research about cooperative learning with regard to cognitive and affective variables. Finally, we present some prospects for follow-on research about self-regulated and cooperative learning.

Keywords: WebQuest; Cooperative Learning; Digital Video; Project-based learning; Secondary education.

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Introduction

At present we are faced with the challenge of stimulating in our students skills and competences related to the capacity for information analysis, synthesis and evaluation: the ability to manage large quantities of information that students easily have at their disposal in this information society; the ability to use Information and Communication Technologies (ICT); a critical capacity; and the ability to work cooperatively. The use of a WebQuest is seen as an alternative to promote active and cooperative learning, using information from the Internet (Dodge, 1995; Repáraz, Lara, Mir & Orobiogoikoetxea, 2006; Lara, 2003).

This research is part of a broader project being carried out by Erain School (San Sebastián) since February-March, 2004. The project is centered on the educational use of digital video. It has been catalogued as an R&D&I Project by the *Diputación* (provincial council) of Guipúzcoa and the Basque government who collaborated in financing it, together with the European Regional Development Fund. The project consists of the creation of an Internet educational digital video portal, using the most advanced Internet multimedia technologies in real time video editing and publication (Repáraz *et al*., 2006).

The study presented in this article was made possible thanks to the coincidence of interests of the Headmaster of Erain School and the authors of this paper. On the one hand, the Headmaster of Erain School was searching for a way to improve the guidelines given to students for producing their research videos. On the other hand, the authors wanted to study the effectiveness of WebQuest to foster cooperative learning and scientific inquiry. After some preliminary meetings where the parties' interests were presented, the WebQuest was introduced in the R+D+i Project.

The objective for using the WebQuest was to introduce a tool that allowed self-regulated and cooperative work of students in making a scientific video. The problem that the Headmaster of the School had indicated was that the students focused on the use of the video and forgot the previous task of investigation. The students were not well organized either in the use of audio-visual media or in time management. We proposed the use of the WebQuest as a good method to help students to work independently and cooperatively thanks to the guidelines (metacognitive scaffold) that could be offered to them. Our research question was

the following one: Does the WebQuest foster self-regulated and cooperative work of students of Secondary Education (16 years old) when making a scientific video?

The roles played by the two parties were as follows. The authors adapted the main guidelines that students were given to produce the videos to the WebQuest. Surveys were designed to collect students' opinions once the videos were finished, and results were analysed and reported in this article. The Headmaster of Erain School chose the teacher and group of students. In addition, the teacher that took part in the research followed the guidelines that the authors gave on the implementation of WebQuest.

With this study we have made a preliminary, descriptive-type empirical investigation that seeks to respond to the problem at Erain School. Thus its first purpose was to help them solve an instructional situation for more effective self-regulated, cooperative work by students. At no time did we consider the study for the purpose of generalizing the results. We are conscious of the limitations of this work, as an action research project. Once this instructional strategy was experienced at the School we considered that the research could be continued with a comparative analysis on the use of the WebQuest in different contexts in which an experimental, pretest-postest empirical methodology with measurements was followed, with greater control of possible influencing variables in cooperative learning (friendship, predisposition to the cooperation and the group work, etc.)

To begin with we present some of the conclusions obtained in recent research into the efficacy of cooperative learning and the WebQuest. Secondly, the methodology and the results of our investigation are described. Lastly, we summarize some of the principal conclusions drawn from our study.

Literature Review

Effectiveness of Cooperative Learning

It is well known that Cooperative Learning (CL) consists of the instructional use of small groups, in which students work together to maximize their own learning and that of others. This is one strategy that systematizes, through a series of instructional resources, the need for members of a group to work together, cooperating with each other on an assignment (Johnson, Johnson & Smith, 1981). A real cooperative situation activates, in the members of a

group, the full awareness that they have to work together to do the task; all the cooperative tasks that exist pursue this objective. Examples from the bibliography include[2]: Jigsaw procedure (Aronson, Blaney, Sikes, Stephan & Snapp, 1978), Teams-Games-Tournames (DeVries & Edwards, 1974), Learning Together and Alone (Johnson & Johnson, 1975), Constructive Controversy (Johnson & Johnson, 1979), Group Investigation (Sharan & Sharan, 1976, 1992), Cooperative Learning Structures (Kagan, 1985) and Complex Instruction (Cohen, 1994).

The studies that have analyzed the effect of CL on students' learning have shown benefits in variables of both a cognitive and an affective type (Johnson, Johnson & Stanne, 2000; Johnson, Maruyama, Johnson, Nelson & Skon, 1981; Jonhson & Jonhson, 1990; Jonhson, Jonhson & Smith, 1998; Lara, 2001). The majority of these studies compare CL efficacy with competitive and individualistic teaching. In summary, the results are as follows: with regard to the variables of a cognitive type, CL gives rise to greater problem-solving ability, facilitates retention, acquisition of concepts, greater productivity, foments higher quality reasoning, as well as the transfer of what has been learnt. In relation to affective variables: CL encourages better interpersonal relationships among students, the social support of the group members, attribution of the success or failure of the task carried out in the group, greater curiosity and continued motivation, greater commitment to learning.

Effectiveness of WebQuest

A WebQuest[3] is an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet (Dodge, 1995). The WebQuest was created in 1995 by Bernie Dodge and Tom March, two professors of San Diego State University, to help students make good use of their time, to focus on using information more than looking for it, and to develop their thinking at the levels of analysis, synthesis and evaluation (Dodge, 1995). According to March (2004, 42) "a real WebQuest is a scaffold learning structure that uses links to essential resources on the World Wide Web and an authentic task to motivate students' investigation of an open-ended question, development of individual expertise, and participation in a group process that transforms newly acquired information into a more sophisticated understanding." In sum, these authors point to the WebQuest as a means to promote cooperative learning and scaffolding. "Scaffolding is a tempo-

[2] For more information see: www.iasce.net
[3] More information in: http://webquest.sdsu.edu/

rary structure used to help learners act more skilled than they really are. A great WebQuest builds scaffolding into the process as needed so that the bar of what students can produce can be raised." (Dodge, 2001, 58). Scaffolding is based on a novice/expert model of learning (Bransford, Brown & Cocking, 2001).

Despite the rapid introduction of these instructional strategies into actual practice, there are few studies that analyze their effectiveness:

Some quantitative (Blanco, Fuente & Dimitriadis, 2004; MacGregor & Lou, 2004; Gaskill, McNulty & Brooks, 2006) and qualitative investigations (Hung, 2004; Angeli & Valanides, 2004; Almeida, Vesu & Ponte, 2003, 2004, 2005), carried out on the work of students in instructional situations with WebQuests, continue to endorse the same results as other studies developed in collaborative work contexts, in relation to: greater involvement of students in working with real topics of their interest; their predisposition to working in a group; their preference for receiving help from their peers rather than that offered by their teacher; the motivation of students in these contexts; and the efficacy of their learning, reaching a high development of cognitive strategies.

Research shows that scaffolding positively affects student achievement by providing temporary frameworks to support student performance beyond their capacities (Bereiter & Scardamalia, 1984; Cho & Jonassen, 2002; Martínez & De la Fuente, 2004; Torrano & González-Torres, 2004). Nevertheless, there are few studies that provide empirical research on this issue regarding the WebQuest. MacGregor and Lou (2004) revealed that scaffolds, in the form of a study guide and concept mapping, supported students that were engaged in the WebQuest. Also Lee, Pun, Yang and Lee (2005) point at concept mapping as a good tool to help with students' organization when using a WebQuest. Angeli and Valanides (2004) analyse the effects of scaffolding in the form of Filamentality[4]. This type of scaffold serves as a cognitive tool that helps students effectively organize their thinking, and facilitates fast retrieval and use of information when students need to use it later. Some studies indicate that WebQuest implementation may be more difficult than designers expected. The WebQuests

[4] Filamentality (http://keithstanger.com/filamentality.html) provides electronic scaffolding thorough a simple template design, which offers the capability of organizing online information, and, thereafter, creating one or more of five types of activities including the WebQuests.

have to be designed carefully and provide more supporting activities and materials in order for students to use them effectively (Lou & MacGregor, 2001; King, 2003).

Methodology

Participants

This research was carried out in a Geography class of 24 male students (16 years old) in year 11 at Erain School (San Sebastián, Spain). During the month of October, 2004 the students had to do an assignment for this subject: a digital video on various aspects of the geography of the province of Guipúzcoa. The students were divided into groups of 3 persons, with a total of 8 groups.

Context of the study

The task that students are asked to do is truly complex from an organizational point of view. Specifically, they have to carry out a research project, produce a comprehensive scientific video that summarizes what was studied and researched, and work in a cooperative way.

As pointed out above, the procedure for making these videos requires earlier research and planning work. The goal is that videos should express knowledge acquired in the research work undertaken. The production of each video must include the following steps:

1) Justification and research on the topic.
2) Video script: information collected in the research, which will become the text of what is said on the video.
3) *Storyboard*, design of shots and framing. The purpose is to compile all the information from the research work in a visual way.
4) Revision and remake of the work performed in the previous steps. The teacher will be in charge of revising the material made and suggesting whatever modifications are needed.
5) Recording, once the teacher has revised the previous work.
6) Editing and visual effects.
7) Audio recording, both music and voice.

Each group had a Macintosh laptop, a digital video camera, the iMovie software for editing the video, and limited time for carrying out the work. The work they produced can be seen at: http://www.videodigitaleducativo.com/

To ensure success in our proposal, student autonomy had to be fostered. This was achieved by giving them guidelines to prevent them from getting lost in the process. For this purpose we chose WebQuest, since it allowed us to give the guidelines required for producing the videos, as well as to foster cooperative work.

It is well-known that there are five essential components of CL (Johnson, Johnson & Holubec, 1994). We tried to promote all of them in our research:

1) Clearly perceived positive interdependence between the members of the group due to: the final result that had to be obtained when working in group, shared audio-visual media employed in recording and editing the video, and the roles assigned. For production and video editing, we proposed that students would work in groups of three people. Group members did the research work jointly. For video production, different students were assigned the roles of producer, narrator and cameraman.
    - The producer decides –although it is actually done by all three group members- how to make the *storyboard*. He will also diring the cameraman during the shooting and will decide if there are questions as to how different shots are put together.
    - The narrator will be the one writing the synthesis and voice recording, and will perform the interviews that will appear in the video.
    - The cameraman will do the shooting and use the computer during the video editing.
2) Considerable promotive (face-to-face) interaction through group work, most of the video had to be made by all three members of the group.
3) Clearly perceived individual accountability and personal responsibility to achieve the group's goals through assigned roles during all parts and phases of making the scientific video.
4) Frequent use of relevant interpersonal and small-group skills through indications in the WebQuest on how to work.

5) Frequent and regular group reflection on current functioning in order to improve the group's future effectiveness. through the deadline activities posted in the WebQuest, allowing students to control the time and manner in which the work is to be done.

Goals and learning content

Table 1 shows the goals to be achieved through the work undertaken by students, as well as contents that they should learn.

Table 1.- Goals and content of the work to be done by students

<table>
<tr><td rowspan="3">GOALS
- Developing search and information selection strategies
- Producing a scentific video based on previous research
- Using iMovie for video editing
- Fostering cooperative work by using WebQuest to define and develop the activity
- Developing close-up, real knowledge of the geography of Guipúzcoa
- Learning to carry out a research project
- Working cooperatively throughout the entire process
- Teaching students to make an educational use of audio-visual media</td><td colspan="2">CONTENTS</td></tr>
<tr><td>Conceptual</td><td>Attitudinal</td></tr>
<tr><td>- Geography of Guipúz-coa
- Process of executing a research project</td><td>- Evaluating different lifestyles in Guipúzcoa
- Evaluating cooperation as an effective way to work in a group
- Developing the esthetic ability of video editing</td></tr>
<tr><td></td><td colspan="2">Procedural</td></tr>
<tr><td></td><td colspan="2">- Searching for and choosing information
- Reading books and Internet resources about the research topic
- Working cooperatively with other group members
- Using a digital video camera and video editing software</td></tr>
</table>

The WebQuest

We decided to use WebQuest to guide the students' work both during the process of scientific inquiry as well as during video production, providing guidelines for cooperative work. The address of this WebQuest is: http://www.erain.es/vde/produccion3.asp.

A WebQuest is basically presenting the student with a problem that must be solved using the Internet, searching for and selecting information in a guided fashion starting from a set of resources proposed by the teacher. Students are organized in groups, roles are assigned, and students must produce a result, which might be a presentation or a document, a theatre play, a radio script or a video.

Virtually anything may form the content of a WebQuest. The use of WebQuest is becoming very popular in schools to develop curriculum content, as well as to develop cross sectional topics that foster more collaborative ways of working in classrooms.

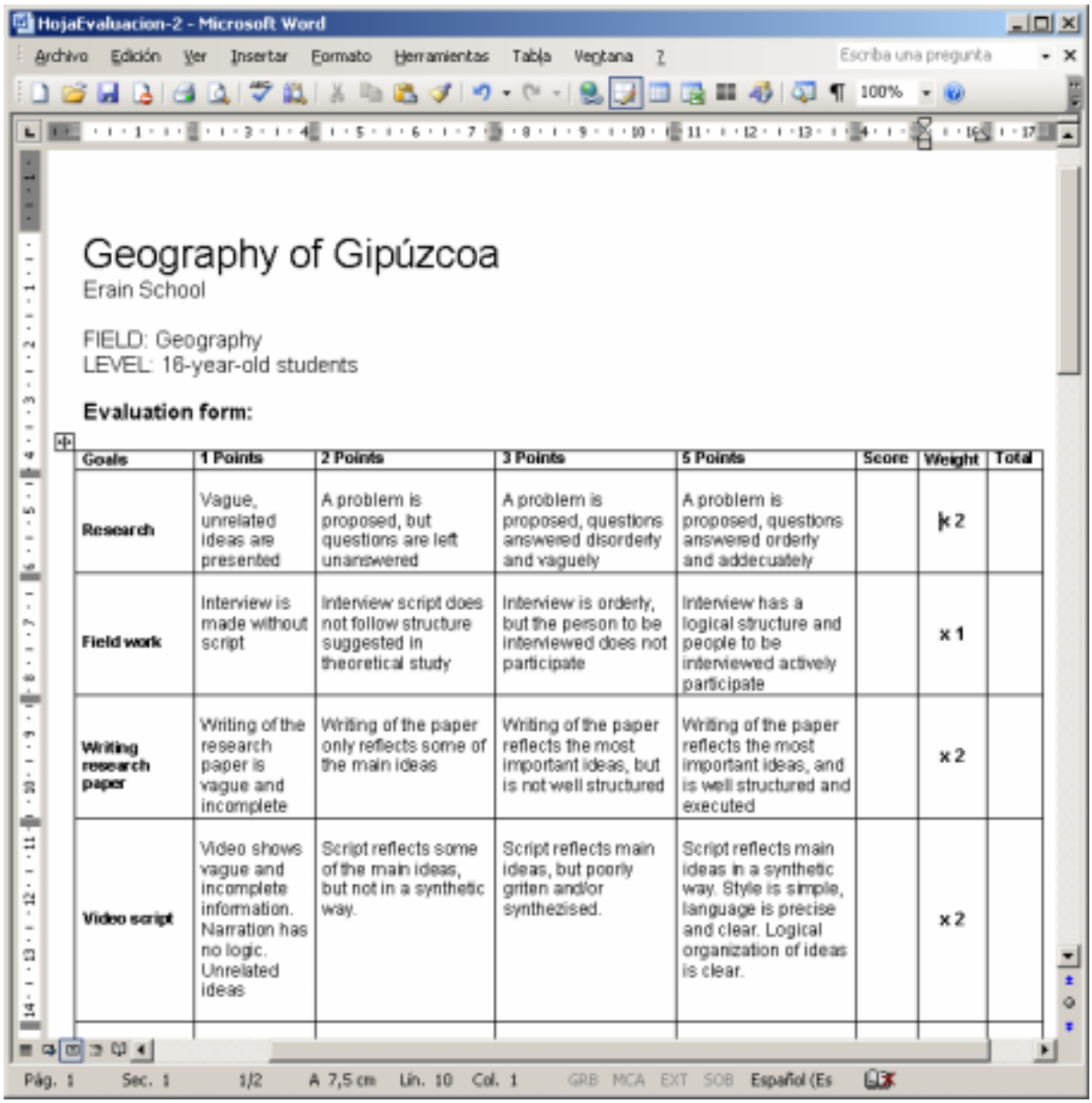
The use of WebQuest is intended to develop competencies related to scientific inquiry such as: the ability to analyze, synthesize and evaluate information; initiative and decision taking; ability to observe and limit oneself to specific evidence; simplification without missing the broad picture; critical thinking; planning and organization; and execution and evaluation of what was planned. All these competencies aid students in internalizing knowledge, relating it to other pieces of knowledge in order to obtain more solid learning. WebQuest has been pointed out as a strategy that helps to develop skills for the 21st Century, since it is able to foster these capacities for inquiry using the web (Lara, 2003).

We want to highlight two important features of WebQuests that contribute to the students' learning process. We refer to scientific inquiry and cooperative learning (Repáraz *et al*., 2006, 117-119):

Scientific inquiry is promoted through guidelines (*scaffolding*) offered throughout the WebQuest to orient students' work, in particular the description of the work that they have to carry out, the steps that they have to follow and evaluation guidelines. These are found in the Task, Process and Evaluation sections of our WebQuest

(see http://www.erain.es/vde/produccion3.asp). The "Task" section offers a description of the project, and the task that students must undertake: research work, video script, translation of the script to three languages, *storyboard,* filming, video editing, and audio recording. The "Process" section describes in detail what students have to do in each task, the time allowed for completion, as well as a deadline. The "Evaluation" section presents a pattern (*rubric*) that details the evaluation criteria to be used (see Fig. 1 and

http://www.erain.es/vde/recursos/HojaEvaluacion.doc)



HojaEvaluacion-2 - Microsoft Word

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Escriba una pregunta

100%

Geography of Gipúzcoa

Erain School

FIELD: Geography
LEVEL: 16-year-old students

Evaluation form:

Goals	1 Points	2 Points	3 Points	5 Points	Score	Weight	Total
Research	Vague, unrelated ideas are presented	A problem is proposed, but questions are left unanswered	A problem is proposed, questions answered disorderly and vaguely	A problem is proposed, questions answered orderly and addecuately		x 2	
Field work	Interview is made without script	Interview script does not follow structure suggested in theoretical study	Interview is orderly, but the person to be interviewed does not participate	Interview has a logical structure and people to be interviewed actively participate		x 1	
Writing research paper	Writing of the research paper is vague and incomplete	Writing of the paper only reflects some of the main ideas	Writing of the paper reflects the most important ideas, but is not well structured	Writing of the paper reflects the most important ideas, and is well structured and executed		x 2	
Video script	Video shows vague and incomplete information. Narration has no logic. Unrelated ideas	Script reflects some of the main ideas, but not in a synthetic way.	Script reflects main ideas, but poorly griten and/or synthezised.	Script reflects main ideas in a synthetic way. Style is simple, language is precise and clear. Logical organization of ideas is clear.		x 2	

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Fig. 1: Rubric for evaluation

Cooperative learning is fostered through defining and assigning roles. Students work in groups of three, splitting the job into three different, interrelated tasks. This distribution of tasks is especially necessary in the video producing phases.

Research Question

Analysis in this article is guided by the idea that the WebQuest fosters necessary scaffolding for self-regulated, cooperative student work. Our research question was the following: Does the WebQuest foster the self-regulated, cooperative work of secondary school students (16 years old) when making a scientific video?

Data collection and analysis

The purpose of introducing a WebQuest is to aid and guide students in their research work as well as in video production, so that they work in a cooperative way. The students' work is done individually and in groups, but outside the classroom, that is to say, outside the teacher's reach. For this reason, the only way to know how the students' work was progressing was through global opinions from the group and individual opinions from each student. Another way to know to what extent the students had learned the task that they had to do, independently and correctly, was to correlate the grade expected by the group with the grade that the teacher finally gave. For this reason, the questionnaires try to analyze how work had been carried out within the group: whether or not it was done in a cooperative way, distributing tasks, and whether they had enough guidelines to carry out their research work and production of the videos. Two questionnaires were designed to collect these data.

The first questionnaire is divided into three sets of questions. Each student answered this questionnaire individually, therefore, 24 questionnaires were collected.

- The first set includes eleven questions on a six-point scale. It asks students whether they worked in a cooperative way.

- The second set includes five questions on a five-point scale. It asks the student for a general evaluation of this manner of working.

- The Third set has three open questions, inquiring about the work format –video production versus the traditional pen-and-paper method.

The second questionnaire includes five open questions, asking students about other aspects where the group did well or poorly working together. It also asks about the grade that they expect to get for their work. All three members of the group answered this questionnaire collectively, and hence we obtained eight questionnaires, one for each group.

Results and discussion

First questionnaire

First set: Cooperative learning features

The results obtained in this first set of questions indicate that most students perceived that they had worked cooperatively (see Fig. 2). Taking into account that the questionnaire uses a six-point scale, 0 meaning zero frequency, and 5 meaning permanent frequency, the average obtained for the eleven questions was 3.85 (see Table 2). On the other hand, reliability (Cronbach's Alpha) is 0.78. All this allows us to assess the consistency of students' answers, in addition to the tendency to give a positive evaluation to cooperative behavior. By and large, it may be said that students perceived that they worked cooperatively.

When analyzing the answers in detail, we observe that the most highly-valued items were (see Table 2):

- Item 4 "I help in seeking solutions; I make suggestions" ($\bar{X}$=4.13, SD=0.79)
- Item 5 "I share my information, and take into account information from others" ($\bar{X}$=3.92, SD=0.88)
- Item 10 "I have made positive contributions to the group" ($\bar{X}$=4.08, SD=0.88)
- Item11 "I am happy about the success of the group" ($\bar{X}$=4.55, SD=0.93)

All these items reflect very characteristic behavior types of effective outcomes in cooperative learning, such as active participation in developing joint work, helping other group members, and obtaining satisfaction with the success of the group.

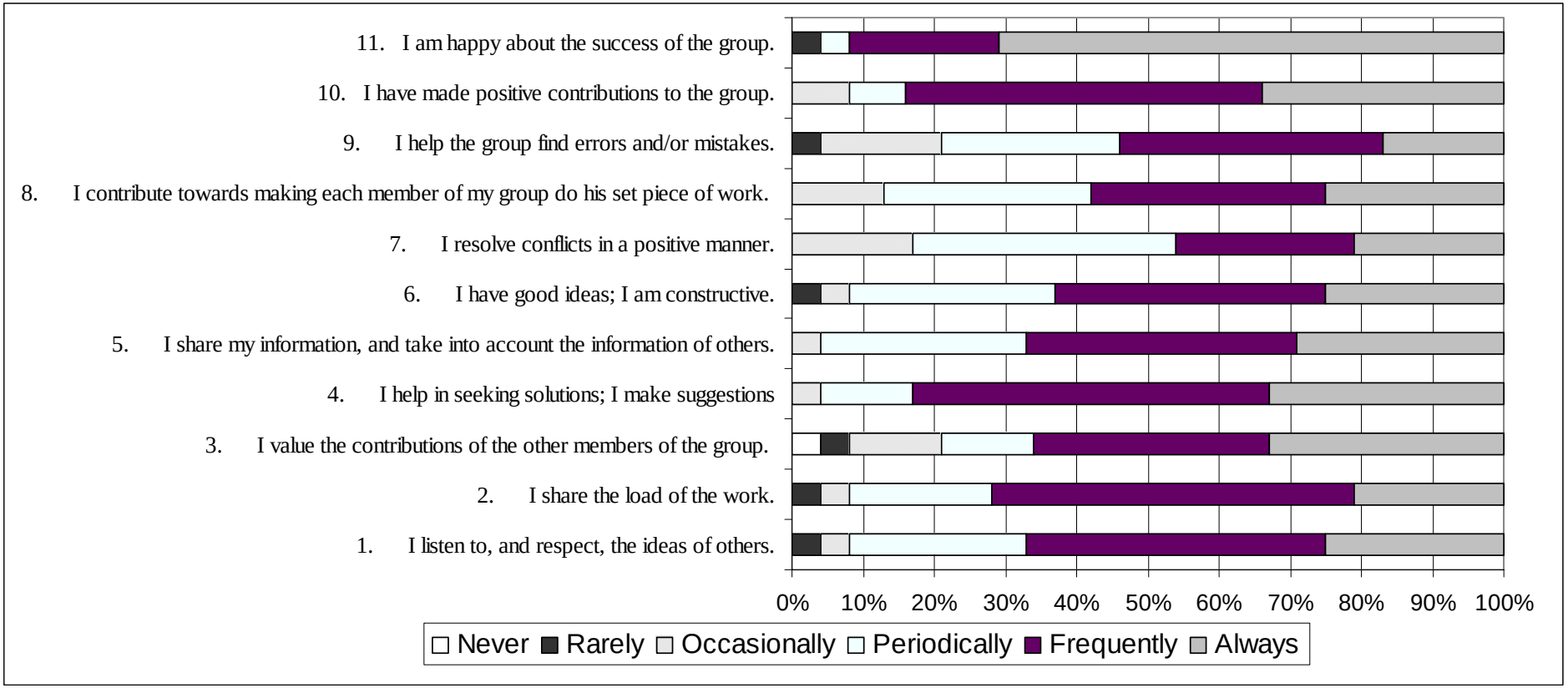

Fig. 2 First survey (set I): Cooperative learning features

Table 2.- Descriptive statistics on first survery (set I).

Questions/answers	n	Mean	SD	Minimun	Maximun
1. I listen to, and respect, the others' ideas.	24	3.79	1.02	1	5
2. I share the load of work.	24	3.75	0.94	1	5
3. I value the contributions of the other members of the group.	24	3.71	1.42	0	5
4. I help in seeking solutions; I make suggestions.	24	4.13	0.79	2	5
5. I share my information, and take into account information from others.	24	3.92	0.88	2	5
6. I have good ideas; I am constructive.	24	3.75	1.03	1	5
7. I resolve conflicts in a positive manner.	24	3.50	1.02	2	5
8. I contribute towards making each member of my group do his set piece of work.	24	3.71	0.99	2	5
9. I help the group find errors and/or mistakes.	24	3.46	1.01	1	5
10. I have made positive contributions to the group.	24	4.08	0.88	2	5
11. I am happy about the success of the group.	24	4.54	0.93	1	5

Six-point scale: 0=never; 1=rarely; 2=occasionally; 3=periodically; 4=frequently; 5=always

Furthermore, if we analyze the Spearman correlation coefficients of the items (see Table 3), we may observe that there are significant correlations ($p<0.01$) between several of the questions in this part of the questionnaire. For instance, item 10 "I have made positive contributions to the group" has a significant correlation with items 2 "I share the load of work", 3 "I value the contributions of the other members of the group", 6 "I have good ideas; I am constructive" and 9 "I help the group find errors and/or mistakes." Item 5 "I share my information, and take into account information from others" also has a significant correlation with item 1 "I listen to, and respect, the others' ideas", and item 3 "I value the contributions of the other members of the group." Also item 11 "I am happy about the success of the group", has a significant correlation with items 2 "I share the load of work", and 4 "I help in seeking solutions; I make suggestions". All these results confirm what was stated above, that students consistently give positive evaluations of their perceptions of having worked cooperatively.

Table 3.- Spearman correlation coefficients on first survery (set I)

Questions/answers	1	2	3	4	5	6	7	8	9	10	11
1. I listen to, and respect, the ideas of others.	-	0.21	0.54**	0.15	0.65**	0.22	0.47*	0.33	0.14	0.22	0.22
2. I share the load of work.		-	0.48*	0.10	0.36	0.44*	0.11	0.09	0.25	0.44**	0.52**
3. I value the contributions of the other members of the group.			-	-0.11	0.54**	0.48*	0.18	-0.20	0.19	0.43**	0.29
4. I help in seeking solutions; I make suggestions.				-	-0.04	0.33	0.34	0.51**	0.24	0.40	0.47**
5. I share my information, and take into account information from others.					-	0.19	0.23	0.35	0.24	0.24	0.14
6. I have good ideas; I am constructive.						-	0.29	0.09	0.17	0.66**	0.31
7. I resolve conflicts in a positive manner.							-	0.35	0.00	0.15	0.24
8. I contribute towards making each member of my group do his set piece of work.								-	0.32	0.37	0.15
9. I help the group find errors and/or mistakes.									-	0.48**	0.11
10. I have made positive contributions to the group.										-	0.15
11. I am happy about the success of the group.											-

*p<0.05 **p<0.01

Second set: General evaluation

The results obtained in this second set of questions reflect a positive evaluation of this manner of working (see Fig. 3). Keeping in mind that this questionnaire uses a five-point scale, where 1 means an unsatisfactory evaluation, and 5 an excellent evaluation; the average for these five questions was 3.93 (see Table 4). Therefore, it may be said that students positively evaluate this way of learning.

The most valued items were number 14 “This way of learning, as opposed to individual work, is” ($\bar{X}$=4.21, SD=0.83) and 16 “I have learnt things of real value.”($\bar{X}$=4.25), which directly refer to student learning. Specifically, students make a very positive evaluation of group work compared to individual work. Furthermore, this instructional strategy helped them to better understand the subject, and at the same time, they indicate that they learnt really valuable things. The answers show that students were involved in the learning process and that they enjoyed this way of learning.

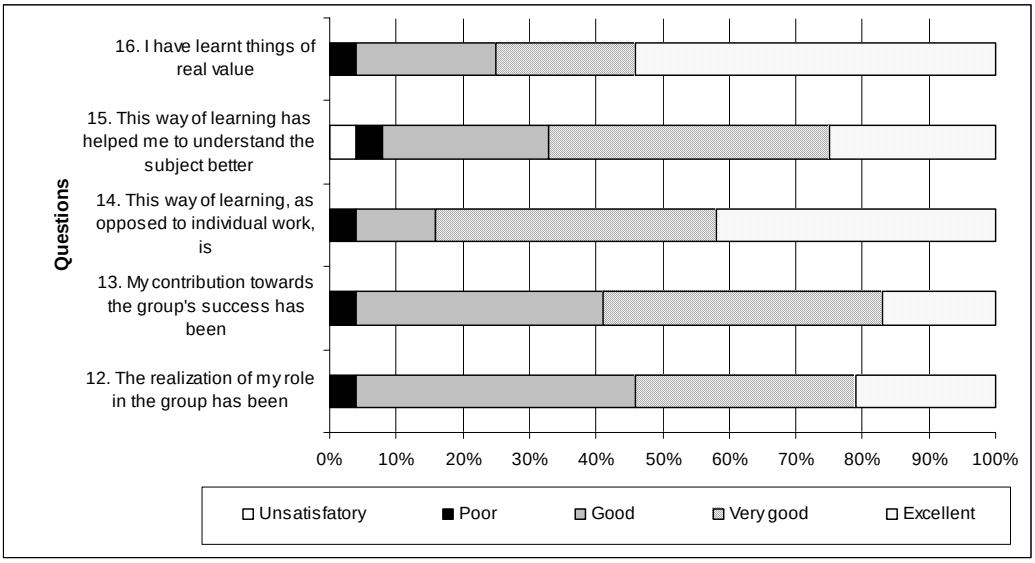

Figure 3.- General evaluation

Table 4 Descriptive statistics on first survery (set II).

Questions/answers	n	Mean	SD	Minimun	Maximun
12. The realization of my role in the group has been	24	3.79	0.88	2	5
13. My contribution towards the group's success has been	24	3.67	0.82	2	5
14. This way of learning, as opposed to individual work, is	24	4.21	0.83	2	5
15. It has helped me to understand the subject better.	24	3.79	1.02	1	5
16. I have learnt things of real value.	24	4.25	0.94	2	5

Five-point scale: 1=unsatisfactory; 2=poor; 3=good; 4=very good; 5=excellent.Third set: Digital video work

Tables 5, 6, and 7 present the answers given by all 24 students. About the first question "Did you like presenting your work in video format?" all students answered affirmatively (see Table 5). The main reason given is that they enjoyed carrying out the project (62.5%). Additionally, they say that the final product may be shown to other people through the project's web (16.6%). Other answers refer to learning how to use computers and networks, learning in a different way, having new experiences, and a way to learn content more easily.

Table 5.- Did you like presenting your work in video format? Why?

Answer	Frequency	Percentage
Enjoyable way to work	15	62.5%
The final outcome of the video	4	16.6%
Learning how to use a computer, ICT	3	12.5%
Another way to present knowledge and abilities	2	8.3%
New experiences	2	8.3%
Concepts are more clear and it makes them easier to present	1	4.1%
You let your imagination fly	1	4.1%
Classroom presentation of the work is easier than with written work	1	4.1%

The answers to the third question show that only one group found it difficult to produce the video, and that over half of the groups say that it was not difficult (see Table 6). Ten groups point out that some parts of the video involved some difficulty. Most say that introducing audio in the video, as well as editing, was difficult. Some groups answered that they would have needed more time to better complete the work.

The groups that experienced difficulties referred to their classmates to answer questions (7 answers), to the teacher (5 answers), exercised more patience and more work and effort (2 answers) or did not solve the problem at all (1 answer). These answers show once again that students worked cooperatively and independently, since they more frequently refer to their peers and intensify their effort rather than referring to the teacher to overcome difficulties.

Table 6.- Did you find it difficult to produce the video?

Answer	Frequency	Percentage
No	13	54%
Yes	1	4%
A little, some parts of the video, lack of time	10	42%

All students prefer to carry out the work in video format rather than pen-and-paper format, except for one student, who did not like the video because it involved more work. Most students say that this was more fun, less boring and a more engaging way of learning, even though more work is required (75%), and that contents are more easily learnt, as well as information being better retained (33%) (see more students' answers to this question in Table 7).

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Table 7.- Is it equally good to do the project with video or on paper? What do you prefer? Why?

Answer	Frequency	Percentage
It is more enjoyable, interesting, less boring	18	75%
Ease of learning and retaining content	8	33%
Learning how to use ICT	2	8.3%
Presentation of the content is clearer in video	1	4.1%
Video, we have done enough of them on paper	1	4.1%
Ease of classroom presentation	1	4.1%

The last question in this part asks students about how easily they use Macintosh laptops and their preferences for Macintosh or PCs. All students say that the use of computers as well as software to edit videos was easy. 63% (15) of the students prefer Macintosh and 37% prefer PCs (9).

Second questionnaire

Things that the group did well in working together

Most students think that they distributed the tasks well among group members (87%). Over half of the groups consider that they agreed when making decisions, taking into account the opinions of all group members, listening to and respecting others' ideas (62%). Both behaviors are essential and characteristic of cooperative learning (see Table 8). One of the goals of using WebQuest was precisely to foster both a cooperative manner of working as well as setting guidelines and steps to help students work with some autonomy. The students' answers make us conclude that this was achieved in most groups.

Table 8.- Evaluation of behaviors that made group work easier

Opinion	Frequency	Percentage
Distribution of tasks, organization, teamwork	7	87.5%
Reaching an agreement, respecting others' ideas	5	62.5%
Enjoy working together	2	25%
Time distribution	2	25%
Distribution of the materials	1	12.5%
Making work easier	1	12.5%
Working fast	1	12.5%
Working intensely	1	12.5%
Having clear ideas of the work to do	1	12.5%

Things that the group did poorly in working together

At least four groups (50%) consider that they did not anticipate the timing. Other answers refer to difficulty in meetings, wasting time in arguments, lack of effort, and difficulty in sharing computers (see Table 9).

Table 9.- Evaluation of behaviors that made group work difficult

Opinion	Frequency	Percentage
Poor time distribution	4	50%
Scheduling difficulty in setting up meetings	1	12.5%
Wasting time in arguments	1	12.5%
Little work effort and intensity	1	12.5%
Not sharing the computer	1	12.5%

Expected grade

There is a high correlation between the grades that students expected to get and what they ended up getting (Spearman's Rho=0.82). Although *n* is small –the correlation was calculated between eight groups only- this result suggests that grades are in line with students' expectations. This fact could be attributed as a consequence of working with WebQuest. Specifically, the structure of well defined work provided by WebQuest helps students to understand clearly what is expected from them, and it also helps them to better evaluate their work. Along these lines, the WebQuest that we designed includes a part with evaluation criteria, detailing all aspects that the teacher would take into account in evaluating the final work (see Fig. 1). For more information: http://www.erain.es/vde/recursos/HojaEvaluacion.doc.

Summary

As we pointed out at the beginning of this article, the Headmaster of Erain School was concerned about students being more interested in producing videos than in doing the research required to build the video content. For this reason, he was searching for a way to give students guidelines for their work. The results of this study show how WebQuest –designed to foster self-regulated learning and cooperative work in video production– has been effective to reach our goal. However, this study has its limitations. The results cannot be transferred be-

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yond the purpose for which this work was undertaken: to provide a solution to a real problem at Erain School. On the one hand, the motivating effect of using video could influence the students' perceptions. Using digital video is in itself motivating for students, since it implies a way of working that is completely different from work carried out on paper. This way of working, as students acknowledge in the surveys, requires more effort than a pen-and-paper task, but it motivates them to use ICT and to present their work to their classmates and family members through the school's website. On the other hand, a number of variables that could have affected cooperative learning in the students, for example the students' willingness to work as a team, were not controlled *a priori*.

In spite of the limitations of this article in terms of transferring the results, the Headmaster of Erain School and the teacher involved in this investigation considered that they had reached their initial objective: that WebQuest would prove to be an instructional strategy for improving self-regulated, cooperative work of students of Secondary Education (16 years old) in the production of scientific videos. Furthermore, most of the research results are consistent with those obtained in the literature on the effectiveness of WebQuest to foster cooperative learning and self-regulated learning:

- Specifically, we refer to cognitive as well as affective variables. On the one hand, data show that students think that they more easily learn and retain whatever content is worked on this way. There is a greater involvement in the task, they make a greater effort, and they search for alternative ways of finding information. They learn valuable things. It makes undertanding a course easier, and students know how to organize work. On the other hand, students are more motivated to work in a group producing a video. They attribute success to effort and work done, since they know what is expected from them and they know the evaluation criteria. Better relationships within groups are fostered, since most acknowledge that they respect the opinions of other group members, that they contribute to the success of the group, and that they refer to other classmates when difficulties arise.

- According to the results on benefits of scaffolding, we may say that the guidelines offered in the WebQuest to make students work cooperatively and independently were sufficient. Most students say that they managed to organize and distribute tasks among group members. However, it is necessary to give more guidelines for helping them

manage time. Apparently, the information given –deadlines for each part of the project, as well as the indication of estimated times for each task– was not enough. It would be useful for future versions of the WebQuest to introduce some kind of help to guide students in this area (Lou & MacGregor, 2001; King, 2003).

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