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Raising Awareness of the Chemical Engineering Degree among Future Spanish Students through Video

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Abstract

This paper will analyze both the awareness Spanish students have of the new university degrees and the advantages presented by the use of audiovisual formats in giving these information. A two-part questionnaire and an audiovisual correspondent have been prepared for this analysis. The first phase appraised the recognition of the various degrees offered by the Universidad Autonoma de Madrid. We then presented a video prepared by ourselves focusing on what is a degree in Chemical Engineering. The last phase consisted in handing out a questionnaire to analyze the effectiveness of an audiovisual format in the dissemination of this information. The results seem to show that information presented in a conventional format does not allow students to grasp what their academic and professional future might be, whereas the use of an audiovisual format facilitates this process.

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1. Introduction

Our world, which is based on scientific and technological knowledge, is undergoing constant transformation. The lack of adequate training in these fields can affect both the economic and political development of countries which do not keep pace with these changes and the professional aspirations of each individual (Cervello, 2009). This state of affairs has been the object of study of, among others, the “Beyond 2000: Science Education for the Future” report (Millar & Osborne, 1998) and the international study Rocard (2007).

The situation in Europe with regards to the study of Science and Technology is of grave concern as students are gradually veering away from these fields as indicated by the PISA (OCDE, 2007, 2010), TALIS (OCDE, 2009), and OCDE (2006) results concerning the evolution of student interest and by successive Eurobarometers focusing on the relationship between Science, Technology and Society (EC, 2004, 2005^a, 2005^b, 2007, 2008, 2010). The situation in Spain seems to be even worse as the attitude to scientific and technological studies has been observed to be far from desirable (Vazquez and Manassero, 2009). Furthermore, the recent implementation of the new degree system, within the framework of the EHEA, has brought about a restructuring of university studies. This change may not have been adequately communicated to the faculties of secondary schools. In this context an analysis of what secondary school students actually know about university studies, of their perception of what the pursuit of a university degree entails and if they have any references as to what impact these studies will have on their professional careers takes on great importance.

2. Research design

In this work we first sought to ascertain how much secondary school students knew about the new degree system, focusing on the degrees offered by the Universidad Autonoma de Madrid (UAM). We then wished to determine the usefulness of an

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audiovisual medium in explaining how a university degree is obtained and the potential career opportunities made possible by having a degree. We therefore prepared a video relating the process of obtaining a degree in Chemical Engineering and its foreseeable professional applications.

This research is a pilot study which sought to establish an initial appraisal of the situation and therefore is a sampling of convenience which does not pretend to be representative. Moreover, and in parallel, it is also an appraisal of the clarity and pertinence of the questions and the relevance of the answers. It is our intention to improve and deepen our understanding of both the results and the research method for the near future.

To carry out this study a two-part questionnaire and an audiovisual correspondent were prepared. The first part of the questionnaire (questions 1-4) concerned general information (age, academic class...) and studied, using a Likert scale, the perception students had of the different degrees offered by the UAM.

The video, titled "MIRA TU FUTURO" ("LOOK AT YOUR FUTURE") (Ezquerria, 2009), is available on line, at <http://www.youtube.com/watch?v=sfCrvsUQpqq>. The video was produced autonomously by a team made up of professors from the Complutense University and Autonomia University of Madrid. In a very schematic way, the making of the video followed recommendations drawn from previous works (Ezquerria, 2010; Ezquerria y Polo, 2011) and consisted in:

- Creating an outline based on the conclusions of meetings convened for this purpose with various members of the Chemical Engineering department. The objective at this point was to separate the contents we wished to show into the different channels of communication which make up a video (image, locution, soundtrack...). This process in itself became a study of what constitutes relevant information in relation to the chosen degree and how to communicate it.
- Pre-production. In our case this involved selecting and preparing "actors", establishing a timetable for shooting the video, technical means, etc.
- Editing and distribution. A DVD version was produced for distribution in secondary schools, for use in classroom workshops, etc. An Internet version was also prepared which to date has been visited 8417 times (last update 14th October 2012).

The second part of the questionnaire (questions 5-13) sought to gauge the impact an audiovisual format has upon the transmission of information. In this part of the analysis we put forth questions pertaining to different dimensions which we can group together as follows:

- Quality and esthetics of the video.
- Perceived effectiveness of the medium.

3. Data and results analysis

The questionnaire was handed out between the months of November and December 2009 to a total of 408 students proceeding from five different secondary schools in the greater Madrid area. The students were aged between 13 and 18 years old and were in the four grades preceding university entry.

3.1. Results on student awareness of university degrees.

The first aspect we must focus on is the level of information the sample students have concerning the different degrees offered by the UAM and, obviously, the Chemical Engineering Degree. To this end they were asked to rank each course of study, using a Likert scale, in terms of how much information they had relative to the course. Table 1 shows the percentages; the data relative to answers not taken into consideration (no answer or answer unclear) is not shown. These answers did not exceed 5% for any degree.

Table 1. Student awareness of university degrees

Degree	Unaware of its Existence (%)	Insufficient Information (%)	(%)Some information	(%) A lot of information
Biology	2,0	43,1	41,4	11,5
Environmental Sciences	32,4	52,7	10,5	4,4
Physics	2,7	41,7	44,4	9,1
Chemistry	3,7	46,3	40,2	9,1
Chemical Engineering	34,6	46,1	15,2	4,2
Economics	3,9	48,0	31,9	14,5
Law	2,7	41,9	36,8	15,2
Informatics	6,6	39,7	32,1	18,1
Telecommunication Eng.	14,5	51,7	21,8	9,6
Teacher Education	11,5	35,3	30,1	20,1
Philosophy	4,9	60,3	25,2	7,8
Art History	12,3	57,6	21,3	6,1
Medicine	1,0	31,9	36,8	24,3
Psychology	3,9	47,8	26,2	18,1

What first draws our attention is that the column with the highest percentages, for almost all of the degrees, is the “insufficient information” one. Furthermore, apart from Medicine and Teacher Education, none of the degrees exceeds 20% in the “a lot of information” option.

We must also point out that more than 30% were unaware of Environmental Sciences and Chemical Engineering. This result in itself makes raising the awareness of Chemical Engineering a necessity.

3.2. Recognition and intention to pursue a degree

To gauge the recognition of degrees and intentions to pursue, students were asked if they had ever witnessed someone working on one of the proposed degrees and if they had considered (even if still undecided) to pursue said degrees. The results are shown in table 2. It is clear that the most readily recognized degrees (Medicine, Teacher Education and Law) are linked to professions that students “see” in their social world rather than to efforts from different universities to educate future students as to what is on offer. As such, Chemical Engineering, Environmental Sciences and Art History are virtually invisible to the majority of students.

Table 2. Recognition and intention to pursue.

Degree	Have seen someone pursue	Have considered pursuing
Biology	34,6	27,0
Environmental Sciences	10,3	7,8
Physics	30,4	13,5
Chemistry	27,7	16,7
Chemical Engineering	9,1	8,3
Economics	27,2	12,5
Law	41,7	17,9
Informatics	37,7	31,4
Telecommunication Eng.	24,0	14,2
Teacher Education	47,8	20,8
Philosophy	23,8	8,8
Art History	16,9	6,6
Medicine	56,9	37,5
Psychology	33,3	29,4

3.3. Results concerning general characteristics of the video

The message in audiovisual communication is of great importance however there are other aspects which can exert enormous influence: the technical quality of the recording, support characteristics, the audiovisual rhythm of the narrative, etc. A broad range of questions was drawn up in order to analyze these factors and the results in percentages are gathered in Table 3.

As can be observed, the aggregate of data is substantial and cross-referencing for age, academic year, etc. is a possibility as well. However, in this summary we will strive to synthesize the information and leave going into greater detail for a later date.

Table 3. Results on general characteristics of the video.

Audiovisual categories	Very poor, unacceptable	poor (%)	acceptable	good (%)	Very good	Don't know (%)
Title	2,7	7,6	37,7	36,5	10,5	4,7
Video length	1,7	7,1	34,6	40,7	12,5	3,9
Easy to view	3,7	13,2	34,1	36,0	8,1	5,6
Soundtrack/Music	7,6	12,3	18,4	25,5	34,6	2,7
Overall sound	16,2	31,6	26,5	19,4	5,4	0,7
Voice of speakers	17,2	31,4	34,6	15,4	2,9	0,2
Image quality	2,7	14,0	42,9	31,1	9,3	0,2
Adequacy of images	3,2	9,6	36,3	38,0	9,3	4,2
Image information	3,7	11,5	36,0	38,0	8,1	2,9
Script-story	8,6	18,4	40,9	26,0	4,7	2,0
Dialogue/explanations	7,4	19,4	33,8	30,9	7,4	1,7
Level of information	3,9	12,0	40,4	32,1	12,0	0,5
Actors	17,2	23,5	30,6	21,6	5,1	2,5
Overall rating	3,4	11,5	41,2	34,1	9,6	1,5

First of all, in order to understand the assessment made of each category we will focus on the two highest valuations within the range of possibilities (data in bold). In accordance with these criteria, we can observe that most sections have been evaluated as being between acceptable and good apart from those related to sound which was unfortunately due to limited resources. We also

regret that the thespian qualities of our “actors” were under-rated but we must appreciate the high standards of our “spectators”, raised on television and film. In our humble opinion their efforts more than stand the comparison. Finally, it would appear that at both a technical and communication level the results ranged between acceptable and good and in no case was the transmission of the message impaired.

3.4. Results concerning the importance of the work of a Chemical Engineer.

After showing the video and to gauge the effectiveness of the shown information, students were first asked to evaluate the importance of a Chemical Engineer’s work to society. Their answers in percentages are gathered in the following table.

Table 4. Results concerning importance of the work of a Chemical Engineer.

None	Very little	Little	Some	A lot	Great
2,0	2,2	3,2	25,2	52,9	14,7

As can be observed, 52.9% of the students asked considered the work of Chemical Engineers to be of *a lot of importance* which is surprising given that they initially professed to be unaware of this course of study.

3.5. Appeal of a career in Chemical Engineering.

In this question students were asked to comment on the appeal of a career in chemical engineering. In this instance the answers were distributed between *some* and *little*. However it should be pointed out that for 13% the answers ranged from *a lot* to *great*.

Table 5. Results concerning appeal of a career in Chemical Engineering.

None	Very Little	Little	Some	A lot	Great
14,0	16,2	24,3	33,1	10,5	2,5

3.6. Intention to pursue a degree in Chemical Engineering.

Students were here asked if they had any intention to pursue a degree in Chemical Engineering. We note that a high percentage of students do not intend to pursue this degree. Nevertheless, and in coherence with previous questions, there are a significant number of students who state that they are considering this option. Specifically 22.6% if the answers “I will consider it”, “probably”, and “surely” are grouped together.

Table 6. Results concerning intention to pursue a degree in Chemical Engineering.

Surely no	Fairly sure no	Improbable	Will consider	Probably	Surely yes
38,0	15,4	24,3	18,4	3,7	0,5

3.7. Results concerning the information conveyed in the video.

A broad range of questions based on issues raised in the video was drawn up to determine how the contents of the video had been understood. Narrative sequences using different audiovisual resources were chosen to ask, for example, what drove our lifestyle, what had been communicated in a solely verbal fashion in the video, or what the different technological uses of gold were. The results, which cannot be delved into here due to lack of space, show that most responses tend to be bound more to images than to verbal messages. Furthermore it would appear that bringing together dialogue, images and narrative climaxes (soundtrack, audiovisual rhythm, meaningful silences...) substantially improves results.

4. Conclusions

First and foremost we must bear in mind that the students in the sample evaluated their awareness of most degrees on offer to range somewhere in between “did not know it existed” to “insufficient information”. Moreover the results show that unknown fields of study are unlikely to loom large in the future intentions of students. This state of affairs seems to apply to most degrees on offer, not just Chemical Engineering. These facts should lead us to reflect upon how secondary school students are informed, their knowledge of university studies and the consequent decision upon the pursuit of a particular degree or another.

With regards to how effectively information was conveyed in the video, we believe that the overall evaluation has to be positive given that a majority (52.9%) went from being unaware of the existence of the Chemical Engineering degree to actually evaluating the importance of the work carried out by chemical engineers. Furthermore the students expressly stated that the video enabled them to grasp what the pursuit of this degree entailed and up to 13% seem willing to consider this degree as one of their options.

As for the technical questions and taking the step of using filmed narration, results show an evaluation ranging between acceptable and good and in no instance was the transmission of the message impaired. It would seem that we are dealing with students who are more than willing to collaborate as attested by the low percentages of “don't know” (or blank responses) in practically all of the responses. This predisposition suggests a scarcity of information in relation to the different courses of study and the consequent search for satisfaction.

Students, with the means currently at their disposal, probably do have access to information such as the overall core contents of a course of study, where and how to enroll, post-graduate career expectations, etc. Furthermore, in their daily lives, they obviously can and do come into contact with doctors and professors. It is nonetheless safe to presume that it is difficult for them to be in contact with other professionals in work contexts.

To conclude, it is our belief there is a real need for students to visualize exactly what a course of study is and its ensuing professional applications.

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- “Acciones de mejora para la difusión del Grado en IQ entre estudiantes de Ed. Secundaria”. Convocatoria 2010. Oficina para el Desarrollo de las Enseñanzas UAM. Ref. C.L3/4.

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