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UNCOVERING THE ATTITUDES TOWARDS SCIENCE, SCIENTIFIC CONTENTS AND SCIENTISTS OF MASS MEDIA COMMUNICATION PROFESSIONALS

Descubriendo las actitudes de los profesionales de los medios de comunicación audiovisuales hacia la ciencia, los contenidos científicos y los científicos

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María T. Soto-Sanfiel
España
mariateresa.soto@uab.es

Ph.D. in Audiovisual Communication. Associate Professor (Profesora titular). Dept. Comunicació Audiovisual i Publicitat. Facultat de Ciències de la Comunicació. Universitat Autònoma de Barcelona. Edifici I. Bellaterra, 08193 Barcelona, Spain.

José I. Latorre
España
latorre@ecm.ub.es

Ph.D. in Theorical Physics. Full Professor (Catedrático). Dept. Estructura i Constituents de la Matèria. Universitat de Barcelona. Av. Diagonal 647, 08028 Barcelona, Spain.

Resumen

Presentamos un estudio descriptivo exploratorio diseñado para avanzar en la identificación de las actitudes de los profesionales de los medios de comunicación audiovisuales hacia la ciencia, los contenidos mediáticos inspirados en ciencia y los científicos mismos. La investigación explora las actitudes de un grupo de estudiantes avanzados de Comunicación audiovisual antes y después de que fuesen sometidos a un curso de producción de programas radiofónicos basados únicamente en ciencia. Nuestros principales resultados indican que estos estudiantes, próximos a trabajar en los medios de comunicación, muestran fuertes actitudes en contra de la comunicación científica, además de ausencia de interés por trabajar con contenidos audiovisuales inspirados en ciencia. Dichas actitudes no favorecerían la inclusión de estos contenidos en su trabajo como profesionales de los medios de comunicación.

Palabras claves: Comunicación científica, Comunicadores audiovisuales, Radio, Actitudes, Contenidos científicos.

Abstract

We present an exploratory descriptive study designed to assess attitudes towards science, science based media contents and scientists of media communication professionals. The research explores the attitudes of a group of senior audiovisual communication students before and after taking a course on production of radio programs based on scientific contents. Our main results indicate that these students show strong attitudes against scientific communication and lack of interest to work on scientific contents which would not favor the inclusion of these contents in their future work as media communication professionals.

Key words: Science communication, Audiovisual Communicators, Radio, Attitudes, Scientific contents.

Introduction

Academic research has paid attention on media communicators to explain the presence of Science in media. However, it has traditionally focused on journalists and journalism, especially in newspapers (Sumpter & Garner, 2007; for example), and television (Murcott, 2010), while ignoring that there is a number of other professionals who do work in audiovisual communication media (TV, radio, film and internet) who influence the contents that are being transmitted. Not only journalists but media managers, content developers, program grid schedulers, screenwriters, directors and producers are responsible for the presence of science and scientists in media too. Scarce available data confirm that, at television stations, for example, besides from reporters, producers, managers and even executives determine what is broadcast (Jones, 2011). There are some evidences that decisions about media contents are taken at higher level of the broadcast corporations. These organizational instances impose constraints which narrow the choices on lower levels of the structure (Löffelholz, 2009). Yet, there are no researchers analyzing the attitudes of these professionals of media communication towards science and scientists. It also remains unexplored the effect that their prior attitudes may have on the inclusion of scientific contents in different formats and genres in the media offer. Furthermore, it is unknown what would be the effect of exposing these professionals to scientific contents along their education for the future use of scientific sources to generate new formats. This lack is somewhat curios as there has been a great popularity of medical-based television dramas during the nineties and fictional and reality-based forensic crime shows during this decade. Lay et al., (2012) suggest that the so called *CSI effect* - the purported influence that CSI and other forensic crime shows exert on public beliefs about the forensic profession and its influence in the criminal justice system- must have an effect on public understanding of knowledge, science and technology.

The main goal of this exploratory study is to identify and describe the attitudes towards science, scientists and science based contents creation and production by professionals of audiovisual communication. It also aims at observing if the experience of production of science contents could lead to a better appreciation for them of mass media professionals to include them in the audiovisual media regular offer. We consider that it is important to deeply understand the

attitudes of audiovisual media professionals to said aspects as they could explain the presence of scientific contents on media.

For doing so, the study observes the reactions of senior students, those who are about graduating, to a teaching program that requires them to produce creative science based radio programs. Specifically, these students are registered in a program for Communication Studies. They are not enrolled in a Science Communication course, which would speak about their interest on science (see Mulder et al., [2008] about the growth of this kind of offer at universities). They are being trained in the creation, production and direction of all genres of audiovisual contents for cinema, radio, television and multimedia addressed to different audiences. They are formed to develop creative and technical skills for producing efficient audiovisual programs that deliver any type of information. Their future careers may be also related to the organization of companies in the audiovisual sector, to the production of contents or to working in any communication department. They are the natural employees of audiovisual industry in Spain. For the first time in their studies they are asked to work with science based contents.

The investigation carried among this group of students is a novel way to explore the attitudes and behaviors towards science related matters and to predict the behavior of real media practitioners. It takes into account the theory of reasoned action (Azjen & Fishbein, 1980) and its evolution, the theory of planned behavior (Azjen, 1985). The thesis of the above state that actions can be predicted from behavioral intentions. Those can in turn be determined from attitudes towards behavior and social established norms. To be concrete, Ajzen (1985) found that an attitude towards behavior, subjective norms and perceived behavioral control, together shape individual's behavioral intentions and behaviors. In this investigation we shall advance in identifying the attitudes that would explain the inclusion or exclusion of scientific content in audiovisual messages. Based on the literature that we present through this introduction, the research will advance in isolating the attitudes towards considering science as a source of inspiration for content creation, the conceptions about what are the adequate contents for media, the perceptions about the communicator personal interest in science and the ability to understand and work with scientific information and scientist. Coherent with the mentioned theories, these attitudes could forecast the behavior of these students regarding creating science based audiovisual contents for including in media. It must be emphasize that these theories have been successfully applied to the study of attitudes towards Science in the educational realm (Hadden & Johnston, 1982;

1983). They have also been applied to scientists communication with professional users (Breslin et al., 2001), and to the study of scientists participation intention in public engagement activities (Poliakoff & Webb, 2007). Nevertheless, we have not found any application of these ideas either to audiovisual communication professionals and their attitudes to science communication, nor to media communication senior students.

1. Antecedents

1.1 Relationship Between Scientists and Journalists

In spite of the absence of academic references for studies on the relationship between audiovisual communicators and science, researchers have been concerned about investigating attitudes of scientists and journalists with respect to each other. Their relationship has been defined either as collaboration or conflict (Nelkin, 1995). Those that support the collaborative point of view argue that scientists and media professionals form a symbiosis, though they differ on how they value their respective responsibilities to educate large audiences and on the need for precision in the way a piece of scientific news is offered (Friedman et al., 1986). On the other hand, those that support relations based on conflict argue that scientists and media communicators live in different worlds, and that the relations between Science, scientists and media are *tumultuous* (Besley & Tanner, 2011). As a matter of fact, the majority of studies conclude that scientists do not have a high opinion on media. Scientists often object about the lack of minimum expertise of journalists that cover scientific information. They also complain about the fact that the reduced amount of space given to Science in media prevents the correct understanding of the news, and argue that the culprit for the lack of quality of the scientific information that reaches mass audiences are journalists that transmit biased and flashy news, based on informations released by research institutions (Besley & Tanner, 2011; Peters et al., 2008; Poliakoff & Webb, 2007; Tanner, 2004). Journalists, on their own, also criticize scientists. They argue that scientists lack the basic skills for production routines or are not understanding neither the language used in media communication nor the adequate way of communicating to different audiences (Allan, 2009; Tanner, 2004).

1.2 Bringing Together Media and Science

In order to cross borders between scientists and communicators, noticeable increases of courses are designed to train scientists on communication skills, and to educate professionals of communication on Science (Mulder et al., 2008). The recent work of Besley & Tanner (2011) focuses on the reaction of media professionals to the idea of training scientists on communication skills. They find that the former believe that the scientific community would profit from such an effort and will improve the level of communication with large audiences. In fact, existing literature shows that an increase of Science information in the media is due, to a great extent, to the interest of scientists (Council for Science and Technology, 2005). Scientists seem to realize that they must cooperate with media communicators if Science is to be part of the public sphere (Poliakoff et al., 2004). It is argued that a larger presence of Science in media would make audiences more responsive to the work of scientists and, as a result, would increase the influence of Science on specific public affairs. It would also help to change the perception on scientists by the rest of society, to get funding for scientific research, and would also contribute to the noble goal of enriching the life of all citizens. Notwithstanding these considerations, only a small minority of scientists take active part in communicating Science (Greenwood & Riordan, 2001; Peters et al., 2008; Poliakoff et al., 2004).

In turn, according to Besely & Tanner (2011), researchers in academia with professional experience in media consider that they are not hostile towards Science. Also, this specific part of academia conducts more projects to train scientists. Indeed, it is detected that communication academia is more critical towards scientific journalism than scientists themselves. This study is offered as a contribution to the phenomena of applying educational programs to the development of a greater sensibility of media professionals to Science endeavors.

1.3 Making Decisions About Content

Since this research is about content creation, it must refer studies on how media practitioners make decisions on the production of science related content. As expected, the available literature on the subject is in journalism. However, it can give insights about the general circumstances that explain the presence of science in mainstream media.

Most of the available research is based on the conception that journalism reconstructs the world through the reduction of hyper-complexity using routines that protect the bond between reporters and its audiences. In that sense, previous studies confirm that there are many factors that influence what is included in media offer (Tanner, 2004). For example, daily deadlines in television news and the size of the news hole affect what is on air (Shook et al.,, 1996). The available economical resources, including personnel, are also impacting factors. It is accepted that the difficulty of creating such contents is also a decisive aspect. In fact, journalists can create stories easy to produce rather what audiences prefer or should be covered (Kaniss, 1993).

Preceding researches also confirm there is a link between agenda building and scientific news reporting. Journalists receive ideas about topics and are motivated to cover them directly from a source who personally contacts them (Tanner, 2004). Often the source leads reporters to pay attention to specific issues (Gans, 1979). It has been also proposed that rushes for fulfilling television grids would make journalists to prefer, not only stories, but one source to another. The source that provides not only reliable information but easily transferable into news formats is more likely to be chosen over a source who has given the wrong impression or ignored the journalist before (Gandy, 1982).

Literature also suggests that media professionals are not entirely independent on deciding what to air but dependant on the scientific community and in its explanation of the importance of the material (Corbett & Mori, 1999). The lack of expertise or knowledge on the part of the practitioners, due to the technical nature of information, makes media workers to rely on the sources for clarifying its relevance (Corbett & Mori, 1999; Nelkin, 1995; Tanner, 2004; Tanner & Friedman, 2011). As a matter of fact, a large amount of the technical-scientific media information originates on press releases from specialized publications (Entwislte, 1995) or report industry-supported research, which can sometimes exaggerate the importance of the contributions. Because of their lack of knowledge on specific technical or scientific matters, journalists can even transmit the enthusiasm of the scientific community to the audiences (Tanner & Friedman, 2011).

As scientists and researchers have become awared that they need media for making their contributions to reach audiences and some have used media to advance their own careers and agendas (Nelkin, 1995) or to popularize specific areas of science (Logan, 1991). The fact that television stations are not usually very active in discovering news, and rely on individuals or

corporations that promote events or issues, sometimes for reducing content production costs, implies that these actors ultimately are the ones who shape the public agenda (McManus, 1990). Besides, sources that understand the news process, such as deadline pressure and the necessity for concise responses, are considered more favorably by media members (Conrad, 1999). Resource constraint and visual potential of the stories sent to the newsrooms are also strong predictors of their inclusion on the media offer (Gant & Dimmick, 2000). It has also been demonstrated that human drama and other components of a "good story" are important aspects in bringing science to the news. The dramatic value of a story is more influent than its future impact, indeed. Dramatic considerations drive media narratives on some issues (McComas & Shanahan, 1999).

All of this suggests that media could receive cues from elsewhere in the social system (Corbett, 2006) and act as secondary valuators of information when diffusing the claims of other actors (Carvalho, 2007), as Agenda Building theory states (McCombs, 1993). This theory, prior to agenda setting, suggests that many players, as media, government and society reciprocally, impacts one another (Tanner & Friedman, 2011) to construct the issues receiving attention in the press (Lang & Lang, 1983) and to create a public agenda (Weaver & Elliot, 1985). According to this theory, for reaching the audiences, the news programs would be shaped and co-created by journalists, officials and executives sources (Berkowitz, 1987). Media attention to specific subjects and the information transmitted to audiences would shape their interest and modify their behavior (Corbett & Mori, 1999). This is why, as we mentioned before, it is worth paying attention to the sources in the media realm. The attitudes of audiovisual professionals in general, not only journalists, could be important for explaining the presence and impact of Science in media and society.

2. Specific Objectives

The specific objectives of this study are manifold:

1) To identifying prior attitudes of students before participating in a teaching program about Science, scientists and production of science-based radio contents;

2) To identifying (after completing the production of scientific radio contents teaching program) positive and negative attitudes regarding the value of Science as a source of inspiration for audiovisual message creation; and

3) To determine if the experience of working with Science related contents could affect the initial attitudes of students.

3. Method

Given the absence of previous data on the specific subject of this study, we adopt a qualitative approach, which is recommended for research into innovative systems and in situations in which the variables have yet to be identified. By considering that theory follows phenomena, this approach offers data rich in texture and depth (Hodgkin, 2008). Specifically, we adopt a qualitative exploratory and descriptive method for properly characterizing the complexity of the issue at hand.

The study has been conducted with the participation of students from the course on "Theory and technique for radio production and direction", a compulsory program in the fourth year to obtain a degree in Audiovisual Communication, at the Universitat Autònoma de Barcelona.These students are among the best in their high-school promotions, due to the very strict cut in the registration requirements at this school. The students' background includes extensive formation on media technology, audiovisual production, radio language, radio scripts, radio genres and radio programs. The particular course related to this study is the last in radio production and is understood as the most advanced one. The course syllabus was first designed in 2004-2005. The study was produced in 2010-2011. This is the first contact of the students with science based contents.

4. Procedure

The applied teaching program spanned over four months in the first semester of the academic year (October 2010-January 2011). At the outset, students were given complete instructions on the goals of the course, the calendar, the details to produce radio programs and the way they would be evaluated. A total of 12 working teams with 5 to 7 people were organized. Each team

was randomly assigned a specific scientific figure from the past (e.g. Francis Crick, Marie Curie, Pierre de Fermat, Evarist Galois) on whom all the programs produced by the team should focus. Right on that first day, students were asked to fill the first questionnaire (fully described later) and send it signed to the professor.

Students had a total of 12 working sessions (one per week) to produce the following programs: 1 radio art (3 min.), 2 news (1 long piece of 7 min. and 1 interview of 3 min.), 1 fiction (5 min.), 3 free format short radio programs (7 min.) and 1 promo of their own work (2 min.). Students were instructed to work for 15 days on each type of program. Tutoring by the professor was enforced. On the last day of the course, students were asked to answer the second questionnaire (details about it are provided afterward) and turn it in. Filling both the initial and final questionnaires was a compulsory task.

Sample

There were a total of 78 participants. The average age was 23.7 years old (range= 22-28 / *SD*= 1.74) with a distribution of 62% female.

5. Data Collection and Materials

5.1 Questionnaires.

A first questionnaire was handled individually to all students before starting any production process. It was designed to identify each student prior conceptions on general aspects of Science and scientists, as well as on the scientific contents in audiovisual mass media. The rational for these questions was that prejudices could bias the conception and production of programs, as well as the value attached to this experience. More specifically, two questions asked the students to freely present their opinions on Science and scientists, respectively (*What is your opinion about science? What do you think about scientists?*). A third question opened the possibility of freely reflecting on the creation of scientific radio contents (*What do you think about creating science based contents radio programs?).* There was no specific format for the answers that could extend at any length.

The second questionnaire was presented to the students four months later, after the production of the radio programs. It aimed at two goals. First, it was designed to detect progress on the identification of the positive and negative perceptions related to producing scientific contents for

media. Second, it explored the degree of satisfaction with the whole experience of radio creation based on scientific contents from the point of view of the students. To be concrete, a first open question asked: *From your experience in this course, what are the pros and cons of producing radio contents inspired in Science?*. A second open question asked about the satisfaction related to the experience: *What is your degree of satisfaction with the work done using Science as content for radio production?* There were not limitations on the lengths of answers.

The two questionnaires required the authentication of students, in order to monitor their possible change of attitudes, thoughts, or behaviors. Students were told that the questionnaires had three main objectives: reflecting about the radio production experience they were immersed, reflecting about the adequateness of scientific content in media, reflecting about the attitudes about science and scientific of audiovisual communication professionals, and observing the virtues and flaws of the teaching program in order to improve its quality in next courses. Students were encouraged to freely manifest all their ideas and opinions no matter they were favorable or contrary to the experience. In fact, they were informed that their evaluation would occur on the basis of completing the task and a solid discussion of their reflections. At the end of the course, it was obtained permission of the students to use the data for carrying this investigation.

6. Analysis of Data.

It was performed a thematic content analysis (Boyatzis, 1998; Braun & Clarke, 2006) using the software *Atlas.ti*, which is particularly useful for categorization of data. There were first identified context unities (sentences, paragraphs, words) in the answers to each questions. Later, those unities were ordered according to their commonalities, differences and frequency (Krippendorff, 1990).

The emergent topics associated to each of the observed aspects are exposed next accompanied by their interpretation according to preliminary literature.

7. Results

7.1 Phase I: prior attitudes (before production of radio contents).

7.1.1. Opinions on Science.

In general, the students participating in the research understand Science in a pragmatical way, emphasizing its usefulness. Many answers started with a sort of definition of Science that focuses on its necessity and practical use. There are researchers that consider this way of thinking a characteristic of post-modernity, an instrumentalist era, in which industries and markets must relate in order to create complex technical artifacts that provoke tangible benefits of society (Nowotny & Pestre, 2005). A second less numerous group of students praised abstract aspects of Science. A yet smaller subset of students talked of the theoretical aspect of Science as the activity that studies and understands the world, the passport to understand Nature.

Nevertheless, a majority of answers showed a limited and stereotyped understanding of Science, its workings and function, and mainly related Science to progress in Medicine. It could very valuable to observe the degree of influence of mainstream media contents itself on these conceptions. Lehmkuhl et al., (2012) report on their study about the presence of science in European television, that the most represented image of science is that related to diseases, because that is the easiest subject to visually create. It could be also related to the popularity of medical-based television dramas during the nineties, referred by Ley et al. (2012). No comments on advanced aspects of Science were ever made.

The polarization between Humanities and Science was, once more, manifest. Some students put both forms of culture on truly different grounds. This reminds to what Snow already described in 1959 about both as being two different and irreconcilable poles, separated by an abyss of mutual incomprehension. According to Snow, particularly within youngsters, their perceived differences provoke hostility and displeasure, which is the major hindrance to solve the world´s progress (Snow, 2002 [1959]). Others students were reluctant to attribute social progress to Science. In some extreme cases Science was simply non-interesting. In fewer cases, understanding of Science produces an initial attraction, although it is confessed that it rapidly fades away.

A minor proportion of the students talked of the damages brought up by Science. In many cases, students mixed up Science with human actions, arguing that the bombs deployed in Hiroshima

and Nagasaki were the result of Science, a disgrace for humanity. A more structured answer claimed that there are two sides to Science: it's a moral question, it means progress but also a dire outcome, as wrong use of Science is a catastrophe. This is coherent with Christidou et al., (2010) when conclude that the image of scientific research prevailing in society is a relatively stable albeit formed by a contradictory amalgam of traditional stereotypes, historic references from even pre-scientific periods, and scientific progress with its negative and positive effects on society or planet. This is also coherent with Flicker (2008) when they states that there is an ambivalence and a retrogression of the public between trust and mistrust towards science. Finally, there was another small minority of people that associated knowledge to difficulty and boredom. Science is exclusive and unrelated to daily life. Some students advocated that Science is reputedly boring, gray and complicate, that is why only few people get fully involved with it. This reminds us the observations of Kannis (1993) about the tendency of some journalists to include news stories easy to produce rather than those preferred by audiences. As journalism and audiovisual communication are the typical professional application of media communication sciences, we consider that it is like both practices would share common ideological background.

7.1.2. Opinions on scientists.

In general, student's opinions on scientists followed stereotypes. In fact, they are closed related to the popular visual image transmitted by media (Reis & Galvao, 2004) and, curiously, to the stereotypes of scientists hold by secondary and primary school students (Christidou et al., 2010). Accordingly, students viewed scientists as weird out casted persons that are necessary beings for our society. Some students explicitly accepted their bias but argued that such a vision is common to many people, due to the way scientists are presented in media. In this sense, it must be said that, although media is not a unified or homogeneous entity, or present a universal or consistent description of scientists, there are many clusters of images about scientists that are diffused across time period (Christidou et al., 2010). Nonetheless, a good deal of answers went back to the positive stereotype of fully devoted and generous scientists, who live in a secluded world, sometimes undeservedly forgotten.

A large proportion of answers defined scientists through their legacy for humankind: the value of scientists is as important as Science itself (coherent with Christidou et al., 2010; Nisbet et al., 2002). Perseverance, tenacity, constancy are traits often attributed to scientists. This is in

line with researchers that identify them to combine optimistic faith in a better future, curiosity, dynamism and aspire to investigation (Flicker, 2008; Mitchell, 2008; Pansegrau, 2008).

Some students used a neutral description of scientists. In their view, scientists have vocation for research and are, in some sense, similar to other professionals. The stereotype of a crazy scientist, dressed in white, mumbling equations, too superior to mortals is not valid. Scientists are not demigods with solutions. They are people in need to understand the world that answer fundamental questions and help others. Even though these students try to balance and bring to earth their opinion about scientists, they consider them to be a member of an elite, omniscient and privileged group and are not too far from the considering them heroes of a mythology (Nisbet et al., 2002).

7.1.3. Opinion on radio programs with scientific content.

A large part of the students stated that producing a radio program with scientific contents was, *a priori*, a positive challenge. They considered that the project was innovative and that it would develop their creativity. In particular, they acknowledged the absence of referents in the available radio offer nowadays.

In the view of many students, it is necessary to stimulate scientific knowledge because it enriches the experience of media consumption. The project was considered as a viable possibility, since a radio station based on scientific contents would be a good solution to bring daily life and Science together. Here is another example of the prevalence of the post-modern idea about the necessity of relating science with technological advancement (Nowotny & Pestre, 2005). The relevant common element too many answers was a positive moral attitude of the role of Science in our society.

Some students reflected on why there are so few scientific contents in media. They stated that the addition of scientific contents would be a risky attempt to improve radio contents. Given their curriculum, most of these students believed that the real problem lies in finding the appropriate format to attract the audience attention.

The stereotyped of Science consisting of difficult, non amusing and inaccessible subjects was recurrent and appeared in various vague forms. The idea that scientific outreach is necessary emerged. Popularization of Science should be present in radio, provided that contents are

simplified, since radio remains a conventional mass communication media addressed to non specialized audiences.

Part of the students compared their initial uninterested vision of the course syllabus to the actual scientific experience. Notably, they accepted that they started to see scientific communication as a virgin territory. The production of a scientific program was considered as a challenge that made sense, although they would not a priori choose to produce scientific programs since they preferred magazines, sports, culture, games and fictions. They acknowledge that the project was interesting and ambitious, and that it could deliver novel products. A minority of people argued that producing programs based on the work of a single scientist would be sort of boring, but the same fact would force them to be more creative.

Let us emphasize that not a single student complained about the goal and structure of this experimental course.

7.2. Phase II: a posteriori attitudes (after production of radio contents)

7.2.1. Pros and cons of production of radio programs with scientific content.

The group at large praised the work on scientific contents as a way to develop their creativity. The absence of referents and the need to drain their brains to get a reasonable output were among the most frequent answers. The need for innovation of formats was detected as a major positive aspect of their experience. Another positive aspect widely accepted by the set of students was the fact that scientific information was easy to access. Plenty of information could be obtained by simply visiting a laboratory. It was generally agreed that good scientific information must come from real scientists who are easy to meet since they are normal, kind and educated people. A third positive outcome of the project was that many students realized that the work on scientific radio programs made the media professional a wiser person, with a better understanding of the issues at stake.

On the negative aspects associated to the course experience, the unanimous complaint was the problem of understanding the basic concepts that form the basis of a scientific program. This is the reason why many of the students resorted to experts, in need of solid, bona fide, unquestionable authority. This is in agreement to preliminary work on television science news about the necessity of journalists of relying on scientists for understanding the importance or

implications of science events (Corbett & Mori, 1999; Nelkin, 1995; Tanner, 2004; Tanner & Friedman, 2011).

The contact with real scientists was generally viewed as positive. Nonetheless, several caveats were detected. Students argued that talking to scientists slowed down the production pace (in agreement with Conrad, 1999). This must be framed in the context of the nowadays extreme urgency in the production of any media content. This opinion could be phrased in stronger statements: it was humiliating and enervating to have to get to experts and to prepare stupid questions. This emotional response of professionals to the lack of their own knowledge is a contribution of this work as it hasn´t been identified by previous literature. On the converse, students complained about the lack of understanding by scientists on the radio language (coherent with Allan, 2009; Tanner, 2004). Scientists talk a specialized jargon, not useful for radio, without the will to communicate and not understanding that there is a need for edition. This is in line with Gandy (1982) whom identify that the sources that provide transferable into news data are more likely to be chosen by the media professionals.

As compared to the production of humanistic contents, students made it clear that Science is a far more difficult subject. The need for high quality documentation was obvious. It was then non trivial to produce contents for a general audience, since the presentation of scientific contents must remain entertaining.

7.2.2. Degree of satisfaction with the work done using Science as content for radio production.

The general reaction of all the students was that their work using Science as a source of contents was a distinct experience. Science opens new possibilities.

Yet, the widely acknowledged positive experience faced reluctance. They maintained their preferences for other genres. They were happy with the experience but they would have chosen another subject. This experience confirmed their choice for Humanities instead of Science. This takes us again to Snow (2001 [1959]).

A large proportion of the students did accept that their attitude towards Science had changed to some extent. Their a priori reluctance to work on scientific subjects had turned into a defense of the quality of their production. It was possible to create high quality radio scientific contents, it

was useful, and it even produced in some of them the urge to read popular Science for the first time.

On a more technical approach, students could apply skills for genre production (fiction, radio art, news) to scientific contents. In this sense, they understood that they mastered techniques that can be translated to very different contents. For many of them, the extreme case turned out to produce radio art based on Science.

Finally, students praised the learning procedure. This course was distinct for its methodology, which went far beyond the syllabus of other radio courses. In particular, the obligation to work out different genres on the same subject was considered a revelation.

8. Discussion

This investigation has addressed the relationship between Science and media contents from a specific agent perspective in the media environment: the audiovisual communication professionals and their attitudes towards Science, scientists and scientific based audiovisual contents. Audiovisual Communication professionals, although ignored by preliminary studies mainly focused on journalists and scientists, hold responsibilities in the creation, production, direction or programming of those contents in media. Their attitudes, thus, are important to explain the presence or absence of scientific programs in radio, television or cinema as well.

The investigation reveals the existence of strong attitudes of audiovisual communication students against the adequacy of scientific information for media creation and consumption. In fact, they hold similar conceptions to those reported when studying the relationship between media journalism and Science. It also shows their preference for entertaining or artistic source of inspiration instead of that derived from Science. Furthermore, it adds that audiovisual communicators consider that scientists need to adapt themselves to production routines, languages and concerns of media in order to be taken into account as object of interest by media. This is not only similar to the critics of journalists to scientists reported by previous studies (Allan, 2009; Nelkin, 1995; Tanner, 2004), but it also adverts that in order to reach more visibility, scientists must cooperate with media communicators, as it has been recommended by some researchers and institutions (Council for Science and Technology, 2005). It also shows that these professionals do not consider themselves as the typical communicative mediators defined by the deficit model (Public Understanding of Science, see Nieto-Galan, 2011) in front of the

superior authority of scientists. On the contrary, their attitude is that of the powerful owner of the information channels and controlling the direct contact to audiences.

Following the theories of reasoned action (Azjen & Fishbein, 1980) and of planned behavior (Azjen, 1985), our investigation adds useful information to the design and implementation of courses on Science communication (Besely & Tanner, 2011). Indeed, it shows the influence which is exerted on the teaching program efficacy by the preliminary attitudes about social norms related to media, the personal interest on Science together with the believe about its contribution to media artistic creation, and the attitudes towards the willingness of including these type of contents in media offer or enjoyment of the experience. As this is an exploratory study, future quantitative researches should define a profile or model of behavior and validate it following the recommendations of Azjen (2006).

Although some audiovisual communication students could eventually enjoy the experience of producing scientific based media content, the investigation shows that they manifest their preference for humanities. They also consider general audiences not to be interested in Science. The study shows that these previous attitudes are difficult to change. This is similar to what has been found by previous studies observing children and teenager attitudes towards Science in educational environments (Hadden & Johnston, 1982, 1983). The development of interest for Science must likely to be instigated through primary learning experiences. Indeed, this study has also found evidences that there are commonalities between opinions about science and scientists by these university students and those identified by preliminary studies with primary students in the same context (Ruiz-Mallén & Escalas, 2012). Future studies could work specifically on that.

It is important to emphasize that a key element of our investigation is the fact that participants have been openly monitored. Each person was properly identified. Maybe, it explains that some students actually claimed to have experienced a positive change. Because students are still pending their final evaluation, they could express a magnified positive appreciation of the work and experience of producing scientific radio contents. Future studies designed with this methodology must observe students with a blind design or through a proctor researcher to avoid these effects. In spite of that, we consider our investigation valuable as it has identified a varied set of conceptions about the experience of production of scientific media contents, science, scientists and media science teaching that not only can illuminate future researches but explaining the presence of science in Spanish media to some extent.

We also consider that a necessary next step of this study is to validate and weigh the impressions of students obtained in the qualitative study through the use of quantitative techniques. Such approach would be ideal for establishing numerical relationships between the identified factors and inferring the mental map of these students, as qualitative data are not enough to establish broader correlations (Denzin & Lincoln, 1994). Such a study would also produce information about the factors that predict the willingness to include scientific contents in media by these future professionals.

Also, we consider necessary to validate these results in other cultural settings. As Lehmkuhl et al., (2012) have recently shown, there are differences not only in the variety of the representation of Science in mainstream media, but in its quantity. Spain, where this research was produced, holds the small volume of Science content at off-peak television hours within a sample of 11 European countries. In this sense, the attitudes isolated by this research must be compared to audiovisual professionals of Europe, Asia, and all Americas countries, so to universalize its appearance and influence.

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