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See table of contents

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Article abstract

Science and technology are increasingly present on contemporary societies and the ideological requirement of informed democratic citizenship implies the need that individuals learn and understand science. It is both a cultural object and product that can be received and worked at different levels and within several approaches by the individuals and the communities. Part of this work can be addressed by the professionals of sociocultural community development. A set of fields of action is available for the intervention of these workers, therefore giving to these professionals an important part in conquering, with and within the communities, a democratic space where more informed citizens can improve democratic participation. In this text, the options taken by students when designing science related activities within the context of an optional course of a 1st cycle of a portuguese program over the past four years are analysed and discussed. Entertaining activities seem to be a quite common choice among these students.

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Science related activities within sociocultural community development interventions can be just entertaining?

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La science et la technologie sont de plus en plus présentes dans les sociétés contemporaines et l'exigence idéologique de citoyenneté démocratique informée requiert que les individus apprennent et comprennent la science. Celle-ci est tant un objet culturel qu'un produit qui peut être reçu et travaillé selon différentes approches par les individus et les communautés. Une partie de ce travail concerne les professionnels de l'animation. Un ensemble de domaines d'action est accessible pour l'intervention de ces professionnels à l'intérieur d'un espace démocratique où des citoyens plus informés peuvent améliorer la participation démocratique. Dans ce texte, les options prises par des étudiants en appréhendant la science en lien avec leurs activités dans le contexte d'un cours facultatif de 1er cycle d'un programme portugais au cours des quatre dernières années sont analysées et discutées. Les activités de divertissement semblent être le choix le plus commun parmi ces étudiants.

Mots-clés : animation socioculturelle; alphabétisation scientifique; démocratie.

Science and technology are increasingly present on contemporary societies and the ideological requirement of informed democratic citizenship implies the need that individuals learn and understand science. It is both a cultural object and product that can be received and worked at different levels and within several approaches by the individuals and the communities. Part of this work can be addressed by the professionals of sociocultural community development. A set of fields of action is available for the intervention of these workers, therefore giving to these professionals an important part in conquering, with and within the communities, a democratic space where more informed citizens can improve democratic participation. In this text, the options taken by students when designing science related activities within the context of an optional course of a 1st cycle of a portuguese program over the past four years are analysed and discussed. Entertaining activities seem to be a quite common choice among these students.

Keywords: sociocultural community development; scientific literacy; democracy.

La ciencia y la tecnología son más presentas en las sociedades contemporáneas y la exigencia ideológica de ciudadanía democrática informada requiere que los individuos aprenden y comprenden la ciencia. Ésta es tanto un objeto cultural como un producto que puede ser recibido y trabajado según diferentes enfoques por los individuos y las comunidades. Una parte de este trabajo concierne a los profesionales de la animación. Un conjunto de dominios de acción es accesible para la intervención de estos profesionales dentro de un espacio democrático donde ciudadanos más informados pueden mejorar la participación democrática. En este texto, las opciones tomadas por estudiantes aprehendiendo la ciencia en lazo con sus actividades en el contexto de un curso facultativo de 1r ciclo de un programa portugués en el curso de los cuatro últimos años son analizadas y discutidas. Las actividades de diversión parecen ser la elección más común entre estos estudiantes.

Palabras clave : desarrollo de comunidad sociocultural; alfabetismo científico; democracia.

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Introduction

The field of Sociocultural Community Development (SCD) is well rooted in social and human behavioural sciences, and, in a lesser degree, in management sciences and in arts. Even if some authors consider that it should become an independent science by itself (RIA-1 2004, p.74), SCD has not yet lost sight from its foundations. The relationship between SCD and natural and exact sciences is much scarce. However, a number of connections and possibilities of action can be devised between the two fields. For this reason, hereafter science is used with the meaning of natural and exact sciences.

In this work, the aforementioned connections are explored by first addressing the notions of science, scientific literacy and science as culture, and their links to citizenship and democracy. Then some possible science related activities within the scope of SCD action are discussed. An analysis of the options taken by students when designing science related activities, within the context of a SCD 1st cycle of studies in a portuguese program, is then undertaken.

Science in current societies, scientific literacy and culture

In the framework of this text one could ask 'What is the importance of science?'. However, it might be interesting to first ask 'What is science?'. It could be defined as "one of the glories of mankind" (Taverne, 2006; p.10) or "a wonderful product of (…) human creativity (…) [that has] provided us with wonderful possibilities" (John Paul II, 1981). In a less enthusiastic and more formal approach, it could be seen as "what is often called modern science – that is, research involving observation and experiment, conducted as an on-going social enterprise by career scientists working in laboratories and contributing to professional conferences and journals" (Ferris 2010, p.2). Moving away from such a precise definition, a number of science properties can advantageously be identified. "Science is practiced by persons of all races and religious beliefs, speaks a universal language, and evaluates results on their merits rather than on their place of origin", being "an on-going enterprise that requires freedom of speech, travel, and association", therefore being an inherently antiauthoritarian, self-correcting, powerful and empowering social activity that "must draw on all available intellectual resources" (Ferris, 2010). A closer look to these features results in finding many of those that can be conveyed to describe none less than democracy. In the opinion of Timothy Ferris (2010), though liberal democracies evolved simultaneously with science those fail in not yet sufficiently self-correct their actions and programs.

On the other hand, today's societies are heavily dependent on science and technology. This can be noticed in a number of situations, as was pointed out in an earlier work (Maurício & Teodoro, 2011): science based infrastructures that provide medical care, transports, energy or communications; use of vaccines, antibiotics, drugs to fight diseases and adoption of behaviours to reduce the incidence of infectious diseases; certain topics of international relevance lye in the scope of health and science: the world spreading of H1N1 flu in 2009, situations of pathogen dissemination through food, natural species extinction. Sometimes, the possibility (occasionally poorly founded in evidence) of harm caused by scientific or technological applications triggers the science controversies as well as the public opposition to those applications. Many democratic debates involving non-politicians relate to community based problems or controversies mostly within the scope of science: higher incidence of leukaemia in some places, resources conservation, nuclear power plants and residues safety issues, reduction of fossil energies use, water and air quality, to list a few. Also, people in some countries, e.g. the USA, are called to vote proposals to allow performing or funding certain science related projects and endeavours (Maurício & Teodoro, 2011). It is more and more clear that the "impact of rapid scientific and technological developments is creating sharp and sudden changes and social problems" (UNESCO, 1960; p.22). In view of all these, it is really difficult to state about a cultivated person of the 21st century what Milan Kundera wrote about the German writer and scientist Goethe who "lived during that brief span of history when the level of technology already gave life a certain measure of comfort but when an educated person could still understand all the devices he used" (Kundera, 1991; p.12).

On yet another perspective, science has been recognised thoroughly as part of the general education and the basic learning needs of children, youth and adults (UNESCO, 1960; Dakar-Faea, 2000). In article 8 of the World Declaration on Education for All, issued in Jomtien, 1990, it is claimed that a close "contact with contemporary technological and scientific knowledge should be possible at every level of education" (Dakar-Faea, 2000). The same idea is emphasized, in connection to environmental awareness and sustainable development, on the Thematic paper on the 2nd Milleniun Development Goal, produced by the United Nations Development Group: "science education is a vital first step to ultimately drive political solutions on these issues and to hold governments accountable for addressing environmental problems" (UNDG, 2010).

At this point it can be resumed the question with which Don Price begun his paper on education for scientific age, 45 years ago: "What must a responsible citizen know of science?" (Price, 1968). A variety of arguments can support the requirement of knowledge implicit in this yet not settled question, and 3 of those arguments are herein briefly explored.

Scientific literacy and citizenship

An education promoting scientific literacy (SL) that prepares citizens to a responsible citizenship has been a recurrent argument across discussions on school curricula. In it scientific literacy is grounded in "science for all" idea and in the connections between Science, Technology & Society (Chagas, 1999). Informed democratic citizenship implies the need for individuals to learn and understand science. "It is no longer acceptable that education, taking place in formal or non-formal settings, dismisses science as a matter to specialists" (Maurício & Teodoro, 2011). Achieving scientific literacy, in the opinion of DeBoer, means:

> Ultimately what we want is a public that finds science interesting and important, who can apply science to their own lives, and who can take part in the conversations regarding science that take place in society. (...) feeling that one can continue to learn and participate are key elements to life in a democratic society (Deboerl 2000; p.598).

Whereas to Jean-Marie Moeckli, "a cultivated person is one who has a critical understanding of the society in which he lives and who uses his understanding to nourish his lucidity, his autonomy and his power to act" (UNESCO, 1977, p.22). In societies shaped, as they are, by science and technology, understanding society requires some knowledge of science and reaching decisions involves "a combination of the assessment of risk and uncertainty, a consideration of the economic benefits and values, and some understanding of both the strengths and limits of science" (Osborne & Dillon, 2008, p.7).

Pursuing further the notion of finding science interesting, we draw on research literature. Several studies indicate that, within youngsters in school environments, scientific topics which have a practical or social reference are rated as much more interesting than the corresponding general scientific principles. One study conducted with elderly attending *Université Tous Ages* revealed how keen they are in learning plenty of subjects, including scientific topics, that allow them to better understand the news they hear, the world they live in and how they position themselves in face of and within this world (Chamahian, 2010). It is therefore important to promote the interest in SL at all ages, because all persons have democratically the right to be informed, participate in the debate and in decision making on neighbourhood, community or country level issues (Teodoro & Zérilo, 2012).

Scientific literacy and science awareness and understanding has been the idea beneath initiatives like: science centres – which exceed 2500 centres in 90 countries or regions; the Conseil de développement du loisir scientifique (CDLS), in Québec – that promotes youngsters' interest in science (CDLS, 2013); or the Sense about science (SAS) charitable trust – that aims to equip "people to make sense of scientific and medical claims in public discussion" (SAS, 2013). Increasing scientific literacy can also contribute to reduce some fear laypersons reveal about science and technology, as well as misconceptions about science and unfounded criticism to scientific activity.

Science as culture

A second line of argument resides in establishing connections between science and culture. Culture, in the opinion of Moeckli, "is that which man has added to nature, has grafted on to his natural surroundings: it is the totality of individual and group behaviours and attitudes, and thus encompasses the social and the political" (UNESCO, 1977; p.22). On another approach, culture "is that through which man, as man, becomes more man, 'is' more, has more access to 'being'. (…) [such] concept of culture is based upon *a total view of man*, body and spirit, person and community, a rational being and one ennobled by love" (John Paul II, 1981). Moreover, "science and technology have always formed part of man's culture" (idem). Several links between culture and science have been addressed in a previous work (Maurício & Teodoro, 2011): from the French notion of SL that is termed as *culture scientifique et technologique*, to the category of relevance Science-as-culture within the scope of science education; from the assertion that science *is* culture (because of its specific stages, actors, scripts, methods and audiences) to the idea of science playing a major role in the cultural matrix, not only European but the cultural matrix of mankind. Tycho Brahe, Galieo Galilei, Isaac Newton, Marie Curie and Albert Einstein are both part of the European cultural inheritance and outstanding figures in the world's culture (Maurício & Teodoro, 2011). But so they are Frederick Banting, Bernardo Houssay or Claude Cohen-Tannoudji. The work and discoveries of them all impacted not only on their fellow countrymen but on the development of the whole world.

Science has also been described as *a* culture (because of its specific activities, skills, language, symbols, values and norms). Finally, science is both a cultural object and product that can be received and worked at different levels and within several approaches by the individuals and the communities.

How science works as a possible model for democracy

The third line of argument withdraws from the above stated idea of similarity of properties between science and democracy. Accordingly, an improved comprehension on the nature of science, on how it works, can provide some insight and even a model for how democracy and individual participation can succeed.

"In order to qualify as scientific, a proposition must be vulnerable to experimental testing". If it repeatedly fails such tests it will be dismissed, sooner or later, "regardless of who supported it or how much it may have seemed to make sense" (Ferris, 2010). Such dismissal has to be rooted in evidence, in sound and logical arguments; it cannot rely solely on individual passions. Reversely, the initial proposition also has to be based on evidence and reasonable arguments. The lay citizen can gain a lot if he understands "what scientists mean when they say their factual knowledge falls short of an understanding of reality" (Price, 1968).

In scientific activity, "corrupted data, ill-begotten theories, and instances of outright fraud may not be caught at once, but if significant are unlikely to go undetected for long" (Ferris, 2010), that's why science is considered self-correcting. Scientists, globally, are not more honest than other professionals, but they are caught more when engaged in some sort of intellectual fraud; which turns the scrutiny by their peers into a good strategy to promote intellectual seriousness.

Drawing on all available intellectual resources science promotes education for all and equal access to learning and knowledge (Ferris, 2010). Science is powerful because "knowing things is empowering in itself" (Ferris, 2010), and applying science to technology and to develop solutions for real problems, changing the lives of actual persons is really a mark of power. However, one should not be naïve and trust that these applications are always good or meant for the benefit of others. "We know that this potential is not a neutral one: it can be used either for man's progress or for his degradation. (…) [Consequently,] the future of humanity depends, as never before, on our collective moral choices" (John Paul II, 1981). So it happens with democracy; it also relies on all intellectual resources (and education for all came along with universal vote), and politicians must not be trusted with all the power to reach and implement decisions, with all the moral choices, as if the other citizens could not understand the issues or be involved in decision making. Finally, being a social activity, to make progress in science today requires the combined talents of many participants (Ferris, 2010), just as happens with democracy which is not an individual endeavour. Practicing science and democracy is not easy.

Agreeing with Ferris, this comparison does not imply considering science or democracy as perfect, but solely evince that "both science and democracy are based on the rejection of dogmatism" (Taverne 2006), and that the universality of science and of democracy lay as goals in a society really concerned with each person in his dual dimension of individual and member of a community. On the contrary, it is also important to gain the notion that science, as it is practised in a defined moment and place, is dependent on the contextual society and may be "inextricably involved in politics" (Price, 1968).

In summary, if in one hand, science is not the answer for every question, and therefore SL is not a panacea for every lay citizen's problem, then, in other hand, science is too present in everyday life to be avoidable, dismissed or ignored. Consequently some degree of SL comes as an urge to be able to live daily.

Science activities and the work on SCD

One may ask 'How can SCD and science be related?'. We could start by claiming, as Hurstel: the aim of SCD "is vigorously to resist this sort of domination and to oppose every manifestation of dogmatism and bureaucracy" (UNESCO, 1977), and consequently state the link with science, but it seems more useful a more practical approach.

The increasingly important nonformal and informal educational spaces are significant opportunities for SCD practitioners to act. For long the research in SCD argued for the link between educational process in non-formal settings and the SCD goals (e.g. Bernet, 1988). In these settings we can count museums, including science centres. SCD workers can contribute to give relevance to learning science by identifying what interest's youth or adults with whom they work. In the educational field, SCD practitioners can also put their efforts in actions like Peoples' Universities, Popular Education and Senior Universities. On a social approach, SCD workers can establish the connections between organizations and the persons in situations where scientific and social dilemmas appear, like the redevelopment of Bastide Queyries area in Bordeaux. Table 1 presents some examples of these possible connections between SCD and science, in a variety of perspectives. The underlined letters mean that SCD workers were already involved; the other examples are suggestions of involvement.

	When?	What?	Comment	Reference
A	1960	UNESCO – 2nd World Conference on Adult Education	Resolutions: AE should "provide opportunity for free discussions (…) on the rôle of science and technology"; hold "a series of seminars, symposia or roundtables on the problems of popularizing science and art, with (…) leading scientists and creative artists"	UNESCO 1960
B	1968	Canada – Québec - CDLS	To interest the youth in Québec in science; exhibitions; challenges; pedagogical products	CDLS 2013
C	1974	Switzerland – Jura - Hydro-ecology in the Cultural Centre for the Jura	"This is a rather different type of SCD. Though conducted at a definitely scientific level and designed for individuals with a university education, its effect has spread rapidly to a much broader cross-section of the public"; "centred on a problem of general concern and conducted so as to have a wide multiplier effect, could rapidly influence the social attitude of a given community."	Jura report in UNESCO 1977
D	since 1982-1984	Canada, France – Les Petits Débrouillards	Each one becomes actor of his own learning and develops curiosity for the recreational discovery of science; To promote the interest, the practice and the knowledge of science and technology	LPD 2013
E	1990	UNESCO – World Conference on Education for All (Jomtien)	Resolutions: "Other needs can be served by (…) formal and non-formal education programmes in health, nutrition (…) the environment, science, technology"	DAKAR-FAEA 2000
F	1999	USA – New York City - after-school project in a long-term homeless shelter	Transforming an abandoned lot in a useful space for the community; "science in this urban context was ``real'' and was enacted not only for the benefit of the participants but for the broader social implications it had"	FUSCO 2001
G	2000-2003	France – Bordeaux – redevelopment of Bastide Queyries neighbourhood	SCD workers were fundamental to connect with the community and let them accept the Botanical Garden as the first infrastructure to be established in the renewed neighbourhood	TEODORO & ZÉRILLO 2012

	When?	What?	Comment	Reference
H	2001	Greece – Patras Univerity - Science and Technology Museum	Former technical staff members, retired, were invited by the museum to reassemble the telephone central that become the first object of the Museums' collection. SCD workers can find such opportunities	personal comm. Peny Theologi-Gouti
I	since 2002	UK – Sense About Science	"works with scientists and members of the public to change public debates and to equip people to make sense of science and evidence"; "programmes to promote general understanding of scientific evidence"	SAS 2013
J	prior to 2003	Brasil – Popular Education	Numerous NGO promote courses, documentation, radio and TV emissions in the topics of health, medicine, ecology	Wanderley in RIA-1 2004
K	prior to 2003	Equateur – Youth and Adolescence Forum	"The environmental topic is one of the lines of action more engaging"	Astorga in RIA-1 2004
L	about 2003	Argentine – People's University Mothers of the May Square	Workshops, amidst several, on the subject: health and popular education	Algava in RIA-1 2004
M	since 2010	UK – Maths Busking	"Maths Busking aims to show the public the surprising and fascinating side of mathematics through the medium of street performance"	MATHSBUSKING 2013
N	2011	Portugal – Science centres -Mora fluviarium	The Mora fluviarium has an explicit educational goal, and a real science experience may be achieved if the visit or the outreach activity are properly conducted. This can be the task of the SCD worker.	MAURÍCIO & TEODORO 2011
O	2012	Portugal – Science centres	Some science centres of the Ciência Viva network have programs specifically conceived for senior citizens	TEODORO & ZÉRILLO 2012
P	2012	Portugal – Senior Universities	Health is one of the most frequent topics chosen by the elders attending an increasing number of Senior citizen Universities	TEODORO & ZÉRILLO 2012

Table 1 – *Summary of possible examples of action of SCD practitioners in science related activities, withdrawn from literature.*

Type of science activities that SCD students design

Methods

The current work analyses the type of activities designed by students within the scope of an optional course in *Sociocultural Community Development through Science* of a SCD 1st cycle of studies Portuguese programme. Activities designed by 109 students distributed in small groups (mostly 2-3 elements, rarely 1), belonging to classes of 4 school years (2008 to 2012), are analysed. Each small group had to produce two proposals of science related activities during the semester; each activity should be designed for two different age groups among six possible choices (kindergarten children, elementary school children, K5-9 children, secondary school youngsters, adults, retired or senior citizens).

The activity subject had to belong to the list of topics taught in class. For each activity the group of students had to identify and present: the activity goals, the space and context in which the activity would be implemented, the required resources, the underlying scientific concepts, the description of the way the activity should be conducted and the safety issues to be considered. A content analysis of the produced goals and of the full description is performed to assess if the activities are *mainly entertaining*, both *entertaining and SL promoting*, or *mainly SL promoting*. In a first stage a selection of words was considered according to their perceived frequency and relation to these 3 types of activities. When proceeding with the analysis, it became notorious the need to add some more terms or expressions. The content analysis was then applied to the goals presented and whatever other text was used aiming to justify the options assumed by the group in the proposal. Occasionally, the same expression appeared in several parts of the proposal and all the occurrences were counted.

Results and discussion

The study comprised practically all the students that attended the course, because being an optional course it was offered only on the mentioned school years. A small group of students was not included because they took the course with a different teacher. Table 2 summarises the data on the sample and Table 3 summarises the data on proposals and age groups for which the activities were planned.

	Classes	Number of students per 1st cycle year		Number of groups per group size		Number of proposals per schedule	
	2008/09	1st	59	1 element	28	1st proposals	42
	2009/10	2nd	32	2 elements	11		
	2010/11	3rd	18	3 elements	3	2nd proposals	39
	2012/13						
Total	4		109		42		81

Note: Not all groups have presented the 2nd proposal of activity.

Table 2 – Classes, number of students, number of small groups and proposals that characterise the study.

Age groups	Proposals per schedule and age group			% of Total
	1st	2nd	1st + 2nd	
Kindergarten children	9	5	14	9.1
Elementary school children	26	9	35	23
K5-9 children	22	19	41	27
Secondary school youngsters	7	10	17	11
Adults	9	15	24	16
Senior citizens	11	12	23	15
Total			154	

Table 3 – Distribution of proposals of activities per defined aged groups and per the 2 moments scheduled in the semester.

The six age groups were defined based on similar development stages, skills and occupation. In Portugal, a great number of schools are clustered in administrative sets that include kindergarten, elementary and K5-9 schools; often secondary schools are set apart. The overall number of age groups differs significantly from 1st to 2nd proposal because students of the most recent class were required to plan the 2nd activity to a single age group instead of two as all the others were required to do.

At the first proposal of activities students tend to give more attention to children. Later on the semester their choices change a little because they were not allowed to design activities to the same age groups as before. Nevertheless, children between the ages of 6 and 15 correspond to 50 % of all choices in terms of the age groups for whom science related activities were proposed. This suggests that, at this point of their training, students value most children as their preferred group to intervene within SCD and science related activities.

Form all the proposals including children and youngsters (64 on 1st, 43 on 2nd proposal) the majority were planned to take place on school or school extension settings (23 and 24 respectively). This proportion might be well underestimated as many groups forgot to explain the context in which the activity for children or youngsters would be implemented (25 activities on 1st proposal, 10 on 2nd). Additionally, 3 activities for adults and 1 for senior citizens also were planned to take place in school and in a senior university respectively. These results suggest two questions: Students do associate SCD educational purposes mostly with activities developed in formal settings? Students do associate science mostly with school?

One further comment to state that only in 3 activities (among the 154 age groups chosen) the public was handicapped; and in only 13 the proposal suggested the interaction of the different age groups considered, which mostly translates into activities for parents and small children or grandparents and small children.

Regarding the proposed activities, two classifications were attempted: one considering the importance of the course goal of promoting scientific literacy and help students identify opportunities to implement science related activities within the scope of SCD intervention; the other taking in account what people are expected to do during the activity. In this later classification, bearing on the literature as well as on the actual proposed activities, three types were defined: *hands-on activities*, in which there are some objects or materials manipulated by the public in order to build something or to produce some kind of phenomenon (e.g.: to produce a rainbow with a basin of water, a mirror and a light source); *show-and-tell activities*, in which essentially the public is not handling anything but the SCD worker is doing the real hands-on and showing to others; and *not hands-on activities*, in which the public is really involved but is not handling anything (e.g.: when participating on a debate or visiting a museum).

In the first classification, attention was given to the entertainment degree and SL promotion degree. Activities *mainly entertaining* are those for which the goals and the description seem to go no deeper than the moment of the activity and the possible wonder effect it may produce on the public; *entertaining and SL promoting activities* are those where it is noticeable some intention to make people think, reflect, raise questions or to learn science concepts correctly - beyond common knowledge and misconceptions - during the activity; and *mainly SL promoting activities* are those in which that intention is evident, or people are expected to go further, relate things, ponder about consequences, discuss ideas about science, technology, sustainability, future of mankind, etc.. This classification was applied accounting for the full description of the activity, because in many cases the goals expressed seemed to be pointing to SL promotion but the activity itself felt shorter than the goals. In fact, agreement between the goals and the description, in terms of type of activity, happened for solely 22 proposals out of 42, in the 1st moment of the semester, and 30 out of 39 in the 2nd set of proposals. The results of applying both classifications are in Table 4.

Type of activity per proposal and entertaining degree				Type of activity per proposal and hands-on degree			
Entertaining degree	Proposals		% of Total	Hands-on degree	Proposals		% of Total
	1st	2nd			1st	2nd	
Mainly entertaining	30	26	69	Hands-on	33	26	73
Entertaining and SL promoting	12	9	26	Not hands-on	5	11	20
Mainly SL promoting	0	4	5	Show-and-tell	4	2	7
Total	81			Total	81		

Table 4 – Type of activity in terms of entertaining degree and hands-on degree.

As was expected, *hands-on activities* correspond to the most frequent choice among the students. However, it is not so obvious that these activities should be *mainly entertaining*; somehow it suggests that students didn't grasp yet the idea that SCD is much more than entertaining people. Moreover, science related activities must be opportunities to increase SL and not just "find it's easy", "magical", "wonderful" or "funny". Notwithstanding, that is exactly want can be found in the hands-on, funny activities performed by Les Petits Débrouillards (example D, Table 1) and similar organizations: the wonder effect is the starting point, but the discussion, full understanding and establishing relations among concepts, raising questions and searching for solutions immediately follow. This result is even more surprising in view of the strategies used in the course. Namely, among others, the fact that in each year students have to plan, prepare and implement, all together, a science related event aiming to the whole school community (teachers, students, staff) of the higher education institution they are attending. In 2 years the events were the projection of movies (*Apollo13*; *Wall.e*) followed by debates with the presence of experts; one year was a roundtable about Galileo, Darwin and revolutionary ideas, also with experts; and one year was the announcement, explanation and promotion of observations of the lunar eclipse visible in Portugal that took place during the winter solstice.

The slight reduction of *mainly entertaining* and slight increase of *mainly SL promoting* activities during the semester may be seen as a sign of hope, but simultaneously defies the teacher to improve strategies in order for students to be more aware of the potential of intervention and democratic promotion brought by science related activities. The increase, during the semester, in proposals that involve people in doing things other than *hands-on activities* is also interesting.

The frequent classification of the proposed activities as *mainly entertaining* is confirmed in part by the content analysis of the proposals (Table 5). The category of expressions I, which includes *recreational*, *funny* and *active/dynamic*, amounts for half the occurrences of the expressions of category II. The expressions on category II would be more expectable when talking about science, but *to be aware*, *to think*, *to reflect*, - important mental processes in effective SL - taken together weight about the same as *funny* in the students' proposals. The single subcategory more relevant seems to be *to know/ understand*. This might be explained by the fact that all the proposals had to approach subjects taught in lessons; and when studying light or sound students were themselves confronted with unknown concepts that probably felt should be known or understood during their proposed activities.

	Categories and expressions	Full count	Occurrences			
			Proposals			
			1st	2nd	1st + 2nd	% of Total
I	Recreational (ludic)	23	28	23	51	23
	Funny	16				
	Active/ dynamic	12				
II	To be aware	8	46	52	98	45
	To learn	25				
	To reflect/ think	9				
	To know/ understand	56				
III	Promote interest/ appreciation	25	22	19	41	19
	Promote/ develop curiosity	16				
IV	Pedagogical	10	5	5	10	4.6
V	Other	18	11	7	18	8.3
	Total	218	112	106	218	

Table 5 – Results of content analysis on activity goals and description present on students' proposals of activities.

The critics addressed to students' proposals of activities within the context of an optional course in *Sociocultural Community Development through Science* of a SCD 1st cycle Portuguese programme are the same critics that are sometimes addressed to school science and can be redirected to some science centres learning activities (Maurício & Teodoro, 2011). In agreement with some critics outlined in Rennie (2007), occasionally the activities in science centres are almost only entertainment with science toys or, worst, are presented as magical activities.

Final remarks

As pointed out in the 1976 UNESCO International Seminar on Cultural Education and Life-Long Education, the initial choice of activities to stimulate the participation and the path towards group autonomy depends upon the SCD worker's personal ideological choices or on the entity promoting the project. "This initial choice, this attempt to set the ball rolling, is not neutral: it harks back to the cultural worker's previous experience, to his theoretical training, technical skill or personal taste" (UNESCO, 1977; p. 4). For these reasons, it is believed that SCD training, at higher education level, should offer students courses connected with natural and exact sciences and the nature of science to help them mature in identifying possibilities of bringing science related activities - that are not merely entertaining but rather can promote citizenship and democracy - in their "backpack" of SCD intervention strategies. Because, as Autès (1991, cited in Gillet, 2006) states the SCD practitioners are those that enable the existence of public spaces in which discussions, debates and decisions can occur.

Accordingly, the SCD workers, and really all of us, should feel challenged by the following idea:

> The moral and political choice that faces us is that of putting all the resources of mind, science and culture at the service of peace and of the building up of a new society, a society that will succeed in eliminating the causes of fratricidal wars by generously pursuing the total progress of each individual and of all humanity. (John Paul II, 1981)

To conclude this remarks, and getting back to one of the questions proposed for this symposium: 'Deepening democracy: towards which forms of democracy?'. A contribution to answer may include the following strong ideas: "from now on, it is only through a conscious choice and through a deliberate policy that humanity can survive" and "the cause of man will be served if science forms an alliance with conscience" (John Paul II, 1981).

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