RESEARCH-BASED COLLECTIVE ACTIVISM THROUGH THE PRODUCTION AND DISSEMINATION OF VODCASTS ABOUT ENVIRONMENTAL POLLUTION IN THE 8TH GRADE

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ABSTRACT

The present research, involving a group of students from the 8th grade and the subjects of Natural Sciences and Information and Communication Technologies, had the purpose of studying the impact of the production and dissemination of vodcasts, subordinated to the theme of environmental pollution, in the perceptions of students regarding their capability for action and their development of activism skills. The construction of vodcasts by students, being usually associated with leisure and entertainment, can also be used as an activity for science teaching and learning. In this study, its production and subsequent dissemination was also used as a strategy for activism aimed at education and raising public awareness. The study followed a quail-quantitative approach, and is part of a larger investigation. The results show a positive evolution in students' perceptions regarding their capability for action, and the development of basic skills for research-based collective action.

KEY WORDS

Science education, Activism, Vodcasts.

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ATIVISMO COLETIVO FUNDAMENTADO EM INVESTIGAÇÃO NO 8. º ANO DE ESCOLARIDADE: PRODUÇÃO E DISSEMINAÇÃO DE VODCASTS SOBRE POLUIÇAO AMBIENTAL

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RESUMO

A presente investigação, envolvendo um grupo de alunos do 8.º ano de escolaridade e as disciplinas de Ciências Naturais e Tecnologias da Informação e Comunicação, teve como finalidade o estudo do impacto da construção e divulgação de vodcasts, subordinados ao tema poluição ambiental, nas perceções dos alunos relativamente à sua capacitação para a ação e ao desenvolvimento de competências de ativismo. A construção de vodcasts pelos alunos, estando, geralmente, associada ao lazer e entretenimento, pode também ser utilizada como atividade de ensino e aprendizagem das ciências. Neste estudo, a sua construção e posterior divulgação foi também utilizada como estratégia de ativismo visando a educação e sensibilização dos cidadãos. O estudo, centrado principalmente numa abordagem mista, é parte integrante de uma investigação mais ampla. Os resultados evidenciam uma evolução positiva nas perceções dos alunos quanto à sua capacitação para a ação, e o desenvolvimento de competências fundamentais para uma ação coletiva fundamentada em investigação.

PALAVRAS-CHAVE

Educação em ciência, Ativismo, Vodcasts.

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Research-Based Collective Activism Through the Production and Dissemination of Vodcasts About Environmental Pollution in the 8th Grade[1]

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SCIENCE EDUCATION AND ACTIVISM

Education can be defined as a socialization process through which each individual is primed to assume an active role in society (McMannon, 1997; Shor, 1992) through the development of skills that allow for an active civic participation, through promoting citizens' empowerment. Education for empowerment – being participative, affective, problem based, situated, multicultural, dialogical, democratic, research based, interdisciplinary and activist – allows students to became part of a capable working force, thinking citizens, and even more, social critics and change agents (Shor, 1992). The probability that students become active citizens in the future increases substantially if we encourage them to act now, in the present, creating opportunities for them to do so, and giving them examples of successful cases and of interventions carried out by others (Hodson, 2014).

It's urgent to educate citizens that are able to face the different problems that permeate current societies, most of them highly controversial and representing threats to the well being of individuals, societies and environments. Facing these problems requires understanding them, making decisions and acting (Reis, 2013, 2014). Nevertheless, this role does not belong exclusively to adults. Expecting today's students to grow up and became the adults of tomorrow, and then demand them to make decisions and to act when confronted with social and environmental challenges is wasting valuable (and unrepeatable) opportunities to educate today, in our schools, conscious citizens of the need to participate in civic life. Students can, and should, be regarded as being part of the solution of current problems (Jensen, 2002) and for that, Science Education will be crucial to empower them to take on this role. Yet, the prevalence of a science education model almost exclusively established on the positive products of a well established science with few controversies and questions (Bell, 2006), of a decontextualized, prescriptive and impersonal teaching tradition (Bencze, Sperling & Carter, 2012) where students play a passive role, resulting in their disinterest (Roth, 2001), contributes very little to the development of active citizens, participative in the resolution of socio scientific and socio-environmental problems (Jensen, 2002). Even more, it prevents students from expressing their opinions and creativity, and developing an active participation, where they learn to build and achieve compromises, and in that way coming to understand that their voice can influence what happens to them and to the world around them (Figueiredo, 2002).

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If we aim for a curriculum oriented to sociopolitical action (Hodson, 2013) students' learning must be much more than the simple acquisition of science content and concepts, and be organized around problematic issues such as: human health; earth, water and mineral resources; food and agriculture; energy resources; consumption levels and sustainability; industry; transport and communication technologies; and social and ethical responsibility (Hodson 1994, 2003, 2014). The teacher's approach must have in mind the four levels of sophistication that we want students to achieve: (i) assess the social impact of scientific and technological transformations, understanding that science is a product of its time and place, and that it can rapidly change the way people think and act, (ii) recognize the existence of economic interests influencing scientific and technological decisions, (iii) formulate opinions about important questions and establish positions around certain values, and (iv) prepare for sociopolitical action, meaning, for a responsible action in favor of the environment and society. According to Hodson this last level is the one that will allow students to actively take part in the decision making process. This author believes that the concept of scientific literacy must be amplified, also taking into account the sociopolitical dimension (Hodson, 2011).

Whatever the selection criteria taken into account, for the choice of the problematic issue guiding the students' action, they will need scientific knowledge if we expect them to get involved past a superficial level. Substantive knowledge, guided towards action, is crucial to understand the issues underlining the problem, to assess different stances, and to make informed decisions and arguments (Hodson, 2014; Jensen, 2002). It is this scientific knowledge, resulting from students' lead research that distinguishes the collective activism introduced by authors such as Derek Hodson, from common sense. But besides this knowledge, for Jensen (2002) there are three other levels for involvement in sociopolitical action: (i) knowledge about the social, political, and economical questions related to the issue and how they contribute to the emergence of social and environmental problems, (ii) knowledge of how to promote change in society through direct or indirect actions and, (iii) knowledge about the probable result or direction of possible actions, and the need for such results. We can easily conclude that students must learn how to participate, and experience participation in action (Hodson, 2013). But to learn about action, through action, and from action are different things (McClaren & Hammond, 2005), even though equally necessary to warrant the involvement and commitment of the students in research based collective action (Hodson, 2003). Learning about action has the goal of developing skills and action strategies; providing students with examples of successful actions, preferentially with other students, fuels their belief that they can also change things. Learning through action includes the direct engagement in action oriented projects outside the classroom that will probably have concrete and consequential results. To learn from action happens when students evaluate plans, strategies, processes and the results of their action projects. This is a reflexive and evaluating process that combines a register of what happened or of what the students perceived, in an attempt to explain why, reflecting about the meaning of the action for themselves and the community.

The students involvement in sociopolitical action about socio scientific and socio-environmental controversies allows them to increase (a) their knowledge about these questions, (b) their research and citizenship skills and, eventually, (c) the well-being of individuals, societies and environments (Bencze & Carter, 2011; Roth & De'sautels, 2002). But how can we warrant the students' personal investment and commitment for

the resolution of problems and for action? For some authors the answer requires, in first place, their emotional investment (Hodson, 2014; Littledyke, 2008). This may be accomplished when issues that have a small impact on their lives, are distant to them and have a weak emotional connection start to be perceived as real.

For Schalk (2008) the students' involvement in activism initiatives promotes (a) critical thinking skills, through multifaceted problem solving; (b) communication skills through the need to share arguments that sustain the importance of the initiated action; (c) creativity, in virtue of the need to develop effective initiatives in certain contexts or situations; (d) perseverance, through the understanding that the change will not be done immediately, being that most of them will not be visible in the near future and/or will not be recognized by others; (e) empowerment, from the moment that the students' realize that their actions, even in the absence of authority, allow them to make a change.

In a school setting there are several possible strategies where students and teachers can become involved in direct and indirect sociopolitical action about environmental issues, namely through: 1) the organization of pressure groups responsible for (a) writing and distributing letters and petitions for political powers or other institutions and (b) through the boycott of certain products resulting from socially controversial research or industrial practices; 2) through education initiatives for other citizens with the purpose of promoting a change in behavior; 3) volunteering in initiatives that promote a fair and ethical society; 4) proposing innovative solutions for local and/or global problems; and 5) changing their own behaviors (Hodson, 2014; Reis, 2013). The development of multimedia resources, such as vodcasts, can be part of an educational strategy in support of other citizens.

VODCASTS IN SCIENCE EDUCATION

The term vodcast can be used to refer to video content, generally made for computers or others digital media (Meng, 2005). The prefix vod is based on the expression video on demand, and it implies the capture of video through a camera. The creation of vodcasts can make use of video cameras, digital photography cameras, or even tablets and smartphones – tools that allow the capture of videos which can afterwards be edited. Vodcasts can also be built through combination, animation, and transition of static images interspersed by video excerpts, sound and narration. There are many tools availableor the development and edition of vodcasts, as for example MovieMaker, iMovie and Corel VideoStudio among others. Although they have different attributes – more or less complexity and diversity of functions- it is possible to create quality videos even with very simple applications.

The construction of vodcasts/videos by students, generally associated with leisure and entertainment, can also be used as an activity for teaching and learning science (Serafim & Sousa, 2011), resulting as highly motivating for students and advantageous for the teaching and learning process (Almeida, Rezende & Lima, 2012; Hilton, 2011; Karahan, 2012; Menezes, Kalhil, Maia & Sampaio, 2008; Roehrig, 2015; Vargas, Rocha & Freire, 2007). Engaging with content through the development of vodcasts challenges the students – allowing them to learn more easily through the use of different

technological and cognitive resources during the systematization and the application of knowledge (Almeida, Rezende & Lima, 2013; Serafim & Sousa, 2011). Producing a vodcast targeting environmental issues promotes the development of a reflection process as well as the construction and negotiation of meaning. It is also a learning opportunity where content is engaged with in a pluri-dimensional manner– conceptual, procedural and attitudinal (Almeida, Rezende & Lima, 2013). Independently of the project topic the production of vodcasts by the students can be regarded as a practice that allows them to explore issues resulting from the displacement of students' passive role – as a receiver – towards being an active participant, simultaneously as receiver and producer (Karahan & Roehrig, 2015; Pereira & Filhos, 2013).

There are few studies about the impact of production and dissemination of vodcasts in students activism learning and skills development – international studies are mainly focused on the analyses of the impact of vodcasts' visualization on students learning, with vodcasts being mainly regarded as learning objects (Gkatzidou & Pearson, 2007) or as tools to be used by the teacher (Brown & Green, 2008). There are even less studies dealing with the production of vodcasts/videos as an activism strategy enacted by students.

In 2012 there was a study done in a Higher Education context (Cotner, Kleinschmidt & Kempnich, 2012) in a General Zoology course, where students had to create a small vodcast related with the course topics that were assessed regarding their ability to communicate the scientific topics. The students used different tools to build the vodcasts, such as Prezi, Keynote, Powerpoint, Quicktime, Windows, Movie Maker, iMaker, and others. According to the authors the project allowed the students to develop a) a substantial knowledge about the course topics; b) communication skills; and c) a better understanding about how scientific knowledge improves.

McDonald and Hoban (2009) led a research project where science teachers in training developed and disseminated through a website the produced artifacts with the goal of representing complex and abstract scientific concepts (in the form of slow-motion animation). This research concluded that not only were teachers able to acquire knowledge related to the studied concepts, but also that the sharing of the produced artifacts was highly motivating, prompting them to invest even more in this task.

Hilton (2011) carried out a research project to evaluate the potential of video productions made by 7th grade (between the ages of 11 and 13) English students for science learning. In this study two classes worked on the same topic - in one of them the students produced a video, in the other a poster. Both artifacts would be used to raise awareness and teach other students. The author came to the conclusion that the students that produced the video where more involved in their task, collaborating more effectively and demonstrating increased concern about the understanding and explanation of the underlining scientific concepts.

Karahan and Roehring's (2015) research intended to evaluate the impact of the construction and dissemination of artifacts (videos) on science students' ability to be alert and act when faced with environmental issues. The students produced videos that reflected their knowledge, attitudes, awareness and activism about environmental issues. The artifacts were then shared and disseminated making use of a website made for that purpose, through which the students could also communicate with visitors. The authors concluded that the students' awareness and capacity for activism where developed in the artifact construction and sharing process, with a positive impact on their motivation and engagement.

METHOD

The study followed a quail-quantitative approach, and is part of a larger investigation developed in 2013 in an 8th grade class with 30 students in a Cascais area school (Lisbon, Portugal), with twenty two girls; with an average age of thirteen at the beginning of the school year. Framed by a logic of interdisciplinary work, the study included both the Natural Sciences (NS) and the Information and Communication Technologies (ICT) subjects, and their respective teachers, with the NS teacher also acting as a researcher in the project. Given the fact that these students displayed little autonomy and were not used to project work, the environmental activism initiative was prompted, initially, by the teacher. The topic to be addressed and the final products to be shared with the school community were chosen by the students: vodcasts focusing on environmental pollution aimed at being disseminated to the general public. The content of each vodcast was also chosen by the students, working in pairs.

We followed McClaren and Hammond's (2005) recommendations, developing different activities with the purpose of allowing students to learn about action, through action and from action. After an initial raising of alertness to the chosen topic through the use of impacting images, previously selected and organized by the teacher, with the goal to motivate students for action, they were questioned about what they could do to help stop environmental pollution. From this question was then developed the learning about action dimension, through the presentation and discussion of several activism initiatives, some developed by non-governmental organizations, such as Greenpeace, and others developed by other students. By virtue of the participation of the ICT subject the students showed their willingness to develop awareness raising videos for the different issues related with environmental pollution – activity that they had never done before and for which they showed great initial enthusiasm.

The students chose and investigated the subtopics – ocean pollution, fresh water pollution, air and ground pollution – in order to acquire knowledge allowing them to develop the vodcasts, working with peers in the ICT subject. There were fifteen work peer groups: even though some of them worked on the same subtopics of pollution, the aspects that were approached were different. The vodcasts were then presented in promoting sessions conducted by the students, where older students from other classes were present, and posted in the school website.

The video editing software used was Corel Video Studio – a previous lesson of ninety minutes was needed to show the students how it functioned, allowing them to work with it. In this same lesson the students were also informed of the assessment criteria and about the characteristics the vodcasts should have: a clear message, objective and intended impact, a minimum of 2 minutes, include narration, at least one music excerpt, images and videos. The students were warned of the need for coherence between the different video elements. The teacher selected three videos from YouTube to exemplify to the students the aspects that they should consider: one of them was from the non-governmental organization Greenpeace, about ocean pollution, and two others made by 8th grade students about pollution – one of was used as a bad example not to follow due to bad narration, the overuse of text, and the excessive use of different musical excerpts with different volumes.

RESEARCH GOALS

The main goal of the research was to study the impact of the construction and dissemination of vodcasts, on the topic of pollution, as a strategy for research-based collective activism. The research was guided by the following sub questions:

1. What perceptions do students develop regarding their capability for action?
2. What activism skills do students develop?
3. How do students rate the vodcast construction and dissemination activity, and its impact as an activism strategy?

In order to evaluate the impact of the project on students' perceptions about their capability for action, a pre-post questionnaire was used, both in the beginning and at the end of the project, composed of 12 items, rated according to a Likert type scale, in which students would have to indicate their degree of agreement (totally in disagreement, partially disagreement, partially in agreement, totally in agreement). The questionnaire used was developed within the framework of the project "We Act - Promoting Collective Activism on Socio-Scientific Issues" (Reis, 2014a, 2014b) and validated by its application to the 947 participants of this project. The internal consistency of this questionnaire was evaluated through the Alpha Cronbach test, having obtained a value of 0.804 which is considered good. The software SPSS version 22 was used for the statistical treatment of the collected data. The time elapsed between the pre- and post-test was 3 months. The comparative statistical analysis of the results in the two moments was performed using a non-parametric test (Student's t-test, with 95% of confidence level) for paired samples to evaluate the existence of statistically significant differences between pre-test and post-test responses. The Anderson-Darling test was previously performed to ensure that the samples were homogeneous and responded to normal distribution.

Evaluation of activism skills was based on classroom observations – a process guided by observation grids with a descriptive type scale, on the results from the pollution questionnaire (pre and post-test), on the final summative test, on the students' productions (vodcasts) and on students' performance during the dissemination sessions. The students' perceptions regarding the production and dissemination of the vodcasts were evaluated using an open-ended questionnaire implemented at the end of the project; these answers were subject to content analyses, with the results being counted as both absolute and relative frequencies. In order to illustrate them some examples of the students' perceptions were selected.

RESULTS AND DISCUSSION

WHAT PERCEPTIONS DO STUDENTS DEVELOP REGARDING THEIR CAPABILITY FOR ACTION?

From the analysis of table 1, it is possible to verify the statistically significant differences (values under 0.05) between the results of the pre and post test for all items except 1, 6 and 7. In order to facilitate the results analyses, the 12 items of the questionnaire were grouped in 4 separate domains: (i) recognition of the involvement in initiatives that contribute for solving social and environmental issues – items 1 and 2; (ii) recognition of the importance and the obligation to participate and develop initiatives that contribute to solving social and environmental issues – items 8, 9 and 10; (iii) recognition of the ability to develop initiatives that contribute to solve social and environmental issues – items 3, 4, 5, 6, and 7; and (iv) knowledge of strategies and resources for the development of initiatives for solving social and environmental issues – items 11 and 12.

The attained results show, to a great extent, a change in students' activism perceptions after the development of the vodcasts production and dissemination project about environmental issues. Concerning the recognition of the involvement in initiatives that contribute for the resolution of social and environmental problems domain (items 1 and 2) the students already started with a perception of being involved in such initiatives, contributing for the resolution of social and environmental issues, but they didn't recognize such involvement in their peers – this situation was reversed at the end of the project.

In the domain recognition of the importance and the obligation to participate and develop initiatives that contribute for solving social and environmental problems (items 8, 9, and 10) the experience in the project caused a significant change in the students' perceptions. If in the beginning the students showed some doubts as to their obligations to participate in initiatives of this nature, at the end of the project they dissipated.

Concerning the domain recognition of the ability to develop initiatives that contribute to solve social and environmental problems (items 3, 4, 5, 6, and 7) we verified some very interesting improvements, especially as far as their perception of ability and feelings of empowerment to influence others decisions, individually or as a group, are concerned. At this level, the project had a very positive impact, contributing to raise the students' self-esteem and capacity for action. In items 6 and 7, it can be seen that students' start out from a situation where they perceive themselves as being capable of researching and making decisions about problems related with science, technology and the environment.

Finally, in the domain knowledge of strategies and resources for the development of initiatives for solving social and environmental issues (items 11 and 12) there were also significant differences between initial and final results. In the beginning students didn't believe that they had the resources to start up activism initiatives, and showed uncertainty about the knowledge to carry them out. Nevertheless, their experience in the project and in the different learning situations allowed them to reverse these perceptions.

Table 1

Comparing the results attained in each questionnaire question about activism perception in the pre and post- test (p<0,05).

Items	**Difference between pre and post-test**
1. I get involved in actions/initiatives with the goal to contribute to the resolution of social issues that worry me.	0,083
2. My colleges get involved in actions/initiatives with the goal to contribute to the resolution of social issues that worry them.	0,011
3. I'm able to influence my colleges in their decisions about social issues related to science, technology, and the environment.	0,022
4. I have the power to influence other citizens' decisions about social issues related to science, technology, and the environment.	0,005
5. If I collaborate with my colleges, we have the power to influence other peoples' decisions about social issues related to science, technology, and the environment.	0,005
6. I know how to research information about social issues related with science, technology, and the environment.	1,0
7. I'm able to make decisions about social issues related to science, technology, and the environment.	0,327
8. I think I have the obligation to participate in activities/initiatives that will benefit the community that I live in.	0,022
9. I think I have the obligation to participate in activities/initiatives that will contribute to the resolution of global/world issues.	0,006
10. I have the obligation to participate in activities/initiatives that contribute to the resolution of local issues in the community that I live.	0,022
11. I feel that I have the resources to set up initiatives that will contribute for the resolution of social issues related to science, technology, and the environment.	0,002
12. I know ways to influence citizens' decisions about social issues related with science, technology, and the environment.	0,001

WHAT ACTIVISM SKILLS DO STUDENTS DEVELOP?

In this study activism skills were understood as those that contribute to research-based collective action (Hodson, 2014). This way, taking into account Schalks (2008) proposal, we tried to evaluate the existence and the development of skills of a) substantive knowledge about the topic, b) communication, and c) attitudinal through the developmental of several learning situations leading towards the production and dissemination of the vodcasts.

Substantive knowledge skills

The evaluation of the existence/development of substantive knowledge skills about pollution was assessed taking into account the results from the questionnaire (pre and post), the final end of project summative test, and the analysis of the vodcasts produced by the students.

The questionnaire about pollution – developed taking into account the main alternative conceptions the students tend to have related with the topic of pollution – was composed of 40 true or false items. This instrument was used with two goals: to evaluate the students' initial knowledge; and to evaluate the project's impact on the students' capacity to acquire substantive knowledge about the selected topics. For these reasons it was applied in the beginning and at the end of the project. The initial results were not shared with the students, answers were not corrected, the questionnaire was not returned, and they were not informed that they would answer the questionnaire again at the end of the project. Average questionnaire scores, pre and post-test, were 70% and 85%, respectively, showing that the students were able to develop substantive knowledge about the selected topic. However, the chosen typology of question was not free of casual answers – this is an inherent risk in this type of questionnaires that try to classify a proposition's logical value (true or false).

The students completed a final summative test, which was also about the topics studied during the project (ocean pollution and oil spilling; air pollution, global warming and ozone layer; ground pollution; changes in ecosystems' balance). The final average of 72% (standard deviation of 13, 4) shows that, in general, they were able to develop and muster knowledge related with the topics researched for production of the vodcasts.

The produced vodcasts were assessed taking into account their scientific accuracy: it was considered that the presence of scientific inaccuracies – concepts and information scientifically inaccurate or inadequate to the context – either in the narratives or other elements of the vodcast was a reflection of an inadequate construction and/or mobilization of knowledge about the topic. In this domain, all the groups developed a product that, from a scientific standpoint, presented no inaccuracies. This was a result of the previous research and discussion of the concepts, studied in the NS subject, but also the need to elaborate, in the ICT subject, a product that reflected the students' knowledge about the topic, and allowed others to learn from it.

Communication Skills

The evaluation of the existence/development of communication skills was assessed from the observation of the students' performance during the vodcast sharing and dissemination sessions. An important dimension in this skill domain is the use of ICT to communicate ideas. In fact, most of the groups (14; 93%) finished the novel task of constructing a vodcast, allowing other students the opportunity to learn about and experience a new way to communicate their ideas – even if there is still room for improvement that will most certainly result from an intensified use of these types of resources. The students' skills to communicate their ideas creatively through vodcasts was also assessed: it should be emphasized that some videos were more creative than others, being that many students followed primarily their personal taste in the selection of the video elements (music, graphical outlook) that didn't always contribute to the desired impact. However, the students' insufficient knowledge about the video editing software potential and functions hindered the students' creativity. Moreover, the fact that this was their first experience producing a video also limited their creativity. For the students this was a creative video, given that it was the first one ever that they produced – representing something innovative and original for themselves.

In the dissemination sessions, the working groups have had to present their vodcasts and answer to questions posed by the audience (teachers and senior students from other classes). In general, the students showed confidence and ability to argue, presenting the products of their work with clarity and objectivity – to which contributed their knowledge on the subject – and defending with conviction the positions taken in the vodcasts they developed.

Attitude and collaborative skills

The evaluation of the attitude and collaborative skills necessary for productive group work, supporting the development of the activism project, and consequentially the production and sharing of the vodcasts, was done systematically throughout the classes devoted to the planning and construction of these artifacts, allowing for the assessment of the students' progress during a month and a half. This evaluation was carried out by making use of an individual observation grid with a descriptive scale, operationalized with four performance levels for each of the five domains assessed: a) Commitment in the tasks; b) Accomplishment of the tasks; c) Conflict resolution; d) Autonomy; and e) Time management. As an example, for the Time management domain, if the students´ didn't manage their time properly, and for this reason failed a deadline, they would get a score of 1; if the students´ often delayed their tasks, they would get a score of 2; if they were able to complete the task but could not respect the deadline, they would get a score of 3; lastly, if they were able to effectively manage their time finishing the tasks within the deadline, they would get a score of 4.

For the assessment of the students' progress in each of the domains, we took into account the global average score, per domain, in the ICT classes dedicated to the vodcasts development (figure 1) – from its analyses it is possible to observe that there was a global positive progress in all domains.

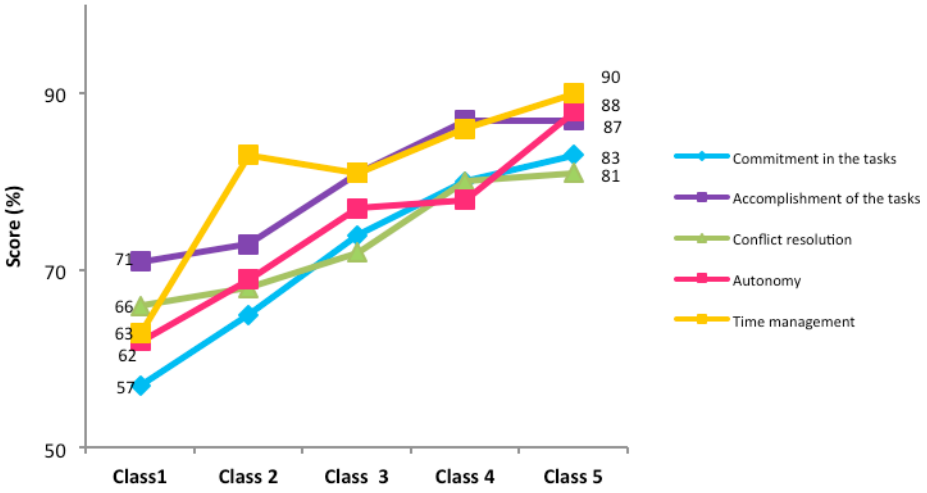

Figure 1. Students' global average scores (in %) in each of assessed domains in the ICT classes. These scores were attained from the individual students' scores per domain. A group score per class was then calculated, and finally the average scores for all class groups.

In general, the students´ were able to complete their tasks with commitment, contributing with ideas, and effort in a positive way – the average global score increased from 57% to 83%. Regarding the accomplishment of the task dimension – that intended to assess the students´ ability to carry out, in a responsible manner, their roles in the group without being warned – even though the results show that from the beginning the students demonstrated good capacity to fulfill the tasks in a responsible manner, they were able to improve it (from 71% to 87%).

Considering the domain conflict resolution – in which we intended to evaluate the students' capacity to effectively prevent or solve conflicts with their group partners – the results show that most students, in the beginning, were not tendentiously conflicting and/or were able to successfully resolve conflicts (increasing from 66% to 81%). In the autonomy domain – where we intended to assess the students' ability to autonomously complete their tasks, without the constant need of help and support from their teachers, only requesting it after exhausting all their problem solving strategies – the results highlight that the students', in general, acquired and/or developed a very good capability to perform the tasks autonomously, relying mainly on their peers, instead of asking for the teacher's support. The global average score increased from 62% to 88%.

As far as the time management domain is concerned – through which it was intended to evaluate the students'/groups capacity to concluded the tasks in the deadline estimated avoiding any delays – the results showed that the students not only

revealed good time management skills from the beginning, respecting deadlines, but also that those that did not have this skills to start with, seem to have been able to develop them. The global average score increased from 63% to 90%.

HOW DO STUDENTS RATE THE VODCAST CONSTRUCTION AND DISSEMINATION ACTIVITY, AND ITS IMPACT AS AN ACTIVISM STRATEGY?

As far as the dissemination sessions are concerned, the open-ended questionnaire analysis revealed that all the students (27; 100%) considered important that their colleagues (from their class, other classes, or older) could watch their videos, for the following reasons – several students supported their view with more than one argument. Students valued mostly: a) the fact that they could learn from their colleagues' criticism; b) the fact that they could learn more about other topics; c) being able to teach the topics to their colleagues; d) perceiving the impact of the vodcast on others; e) being able to understand if their vodcasts were able to convey the intended message; f) the opportunity for older students to alert others and help spread the videos. These perspectives can be illustrated by the students' answers to the question "Was it important for you that your classroom colleagues, as well as colleagues from other classes, could watch your video? Why? ":

> Yes, it was important because when we shared the videos, we could get comments and critics from our colleges, and understand, from each group, the video's impact (S);
>
> Yes, because this way we know what they thought about our video and we managed to get the message to other people. (M);
>
> It was important because I wanted to know what the other colleagues thought about the video, that Martim and I made, and if they were going to understand the message. (CI);
>
> Yes. Because this way we could find mistakes and help each other. This way we could learn, about pollution, as well as how to fight it. (D);
>
> Yes, because they learned more things about pollution and learned what they could and what they couldn´t do. (V);
>
> Yes, it was important because they didn't know about the subject, and in that way they can say if the video properly conveyed the message, and if they understood what it was about, and what we can do to improve it. (T);
>
> Yes, first to share the video, and secondly I wanted to see what was the impact that our videos had on them. (Ma);
>
> Yes because it's more people to share the video. (A).

All the students' considered important sharing the vodcasts with their family, friends, and other people. This feature is emphasized by the answers given by the students, grouped in five categories – learning, behavioral change, display of work done, knowing other people's opinions, dissemination help (figure 2). There were situations where students used more than one aspect to support their answers – for that reason there was a total of 32 occurrences. The argument that dissemination of the video can lead other people to learn more about the issues and thus pollute less (learning category) accounted for half of the occurrences (16; 50%); on the other hand, dissemination can also lead to a change in behavior (behavioral change category) – an argument presented in seven occurrences (22%); the importance of dissemination is also related to the fact that the students can share the results of their project work with others (display of work done category; five occurrences; 16%) ; two students (6%) mentioned that they can learn about others opinions about their work (knowing other people's opinions category); two students (6%) believed that other people can contribute to the dissemination of their videos (dissemination help category). The following answers illustrate these perceptions:

> Because our videos have the goal to alert people to the consequences of pollution, and the more they're shared the better! (MA);
>
> Because they learn what pollution is, and can see my 2nd term work in the science and ICT subjects. (Am);
>
> I think it's important because when sharing with others they can learn and change their attitudes and not pollute the world. (J);
>
> This way we can know what our family thinks about the video, and they can share it with others. (S).

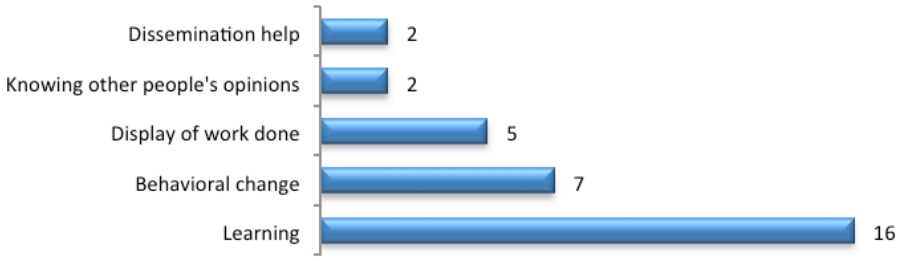

Figure 2. Results from the question "Do you think it's important to share (disseminate) your video with family, friends, or other people? Why? " from the final questionnaire; n =32.

Based on these results it seems possible to infer that the students recognize the importance of disseminating their work – such a finding represents an important step for an activism initiative aiming to contribute to the education and awareness of others.

The results attained from the analyses of the answers to the questions "Do you think that your video, and those of your colleagues, may have some impact on others, leading them to change their behaviors and pollute less / or to be more alert to the issues of pollution?" and "Do you think that with this project you were able to change, even if only slightly, the society in which you live in? Why?" reveal optimistic and confident students. Most students (25; 93%) consider possible that their videos have an impact on others changing their behaviors and/or raising their awareness to pollution issues – only two students (7%) indicate having doubts about this possibility:

> I think it will have impact, but do not know if they will do anything to change pollution, at least they will be more aware and more informed about pollution and its consequences. (R);
>
> I think so, a little, if the videos were disseminated. But I don't know if people would change their attitudes. (AL).

Two examples of more optimist student testimonies are:

> Yes, indeed. I believe our videos were very enlightening and can have an effect on people not to pollute. (S);
>
> Yes because we are "children" and we changed our attitudes, so I think people may change their attitudes as well. (C).

Regarding the second question, most of the students (20; 74%) believed that, with the developed project, they managed to change, even if just a little, the society they live in – the arguments used are: a) people learned more about pollution; b) people will, from now on, have better care; c) the videos had an impact on others. Testimonials:

> Yes; I even think people were shocked when they saw my video; but I think they will be able to alert and change society. (MN);
>
> I think so, because I can already see the little pieces of paper that people throw in the air and then I think what if thousands are doing the same! Then I tell them to pick it up. (C);
>
> Yes because if all people that watched the video stopped polluting, society will change a lot and for the better. (AM).

Four students (15%) consider that, in spite of the developed project, they failed to change the society they live in, given that they still did not have a chance to share their video – this implies that, if they share it, they will manage to do it.

Three students (11%) do not know if the project they developed was able to change society around them, explaining that there are people who do not care about these topics, or the fact that there are already so many videos on the internet, and yet the world does not seem to improve.

Considering the answers to the question "What seems to be the best way to disseminate your video?" from the final open-ended questionnaire, students mentioned different strategies, five of which directly involve using the internet: through social networks, or posting on the school website. Gathering the family at home and sharing the video when they are all together, was a strategy mentioned by several students. In fact, most of the suggested strategies are easy to implement – and since most students, according to the field notes, have access to social networks, having a profile in at least one (primarily Facebook), the possibility of dissemination in such manner is entirely up to them. The following testimonials illustrate the above:

> I think that the best way to disseminate is sharing it, like I did, on Youtube. (R);
>
> On Youtube and other social networks, and also at home for the family to see. (M);
>
> I think the best way to do it is through Facebook because there are millions of people who use Facebook (V);
>
> Spread the word and maybe ask my parents to share the videos (for example by talking with their colleagues or friends). Disseminate in other social networks. (C).

FINAL CONSIDERATIONS

The present study intended to engage a group of students in an environmental activism initiative through the production and dissemination of vodcasts about pollution for the citizen's awareness and education. It is the authors' belief (and hope) that regarding and empowering students as citizens of the present, encouraging them to act, as the driving force of the project, will increase the likelihood that they will continue to be active citizens in the future, capable of facing controversial issues, many of which are related to Science, Technology, Society, and the Environment, assuming compromises and realizing that their voice may have influence on what happens to them, and on the world around them (Figueiredo, 2002; Hodson, 2014; Jensen, 2002).

The project was organized around the topic chosen by the students – pollution – which is part of the science curriculum. The option for the production of vodcasts was also the students' choice, motivated by novelty of the task, by the possibility of using the computer, and by the use of the internet to disseminate their work. The chosen topic is broad enough, and the different issues addressed included some of the topics referred by Hodson (1994, 2013, 2014) as problematizing to be included in an action oriented curriculum. Given the fact that action oriented, substantive knowledge, is crucial to understand the underlining aspects of the problems, evaluate different positions, make informed decisions and arguments (Hodson, 2014; Jensen, 2002), one of the students'

focus was precisely the task of research and knowledge development on the various subtopics, essential for the vodcasts production. It is this type of scientific knowledge resulting from research carried out by students that distinguishes research-based collective activism from the one driven by common sense only (Hodson, 2014).

It is important to emphasize that this was the very first activism project in which this group of students participated. This was a group of students little or nothing used to play an active role in the classroom (and school), accustomed to an essentially transmissive teaching model in which the teacher rarely delegates in them the tasks of choosing which subjects to investigate, what actions develop (and how), and what products to design in order to implement them. These students were little or nothing accustomed to the methodology of project work, so a closer orientation was required during its development, especially in its early stages. It was with some surprise that students saw the teacher questioning them about what topics they would like to investigate and why, what products they would like to develop, and how they could spread what they had learned so they could alert other citizens. However, the students embraced with enthusiasm and perseverance the different tasks of the project. And when it was completed, the students were proud of the fact that they were able to contribute little, if anything, to alert others to a subject they considered current and important.

A fundamental dimension of any activism process is the recognition of the capability for action, taking into account its different sub-dimensions, including the recognition, by the individual, of the importance and duty to participate in activism initiatives, recognition of the capacity to develop them, and the knowledge of the means to carry them out. This study evaluated the improvement of the students' perceptions on these sub–dimensions, with very positive results, showing that participation in the project had a significant impact on the development of the students' capability for action. The students were able to learn how to participate in action – learning about the importance of research, the need to create a product and its dissemination – but the opportunity to experience participation in action was crucial for the development of their perceptions. We recall Hodson (2014) who argues that students should not only learn about how to participate, but should also experience participation in action.

The fact that they experienced participation in action allowed students to develop some key skills for the exercise of research-based collective activism (Schalk, 2008): a) construction and mobilization of substantive knowledge on the topic of pollution; b) communication of their ideas through the production of vodcasts; c) arguing of critical questions presented during the dissemination sessions; d) commitment, fulfillment of tasks, conflict resolution, autonomy and effective time management.

Realizing that learning about action, through action and from action are different things (McClaren & Hammond, 2005) but essential for the empowerment for action, we aimed to engage students in tasks that stimulated this learning. During the project introduction session, they had a chance to learn about examples of successful actions involving other students; during the research tasks, as well as the production and dissemination of vodcasts, they had a chance to get directly involved in a project–driven action; and through the final questionnaire they could reflect on the (perceived) meaning of action for others and for themselves. Nevertheless, we consider that this last reflective dimension, which promotes learning from action, could have been better explored. For example, with the development and implementation, by the participating students, of a questionnaire to the students who were present during the dissemination sessions, allowing them to learn about their

perceptions concerning the vodcast messages, its impact, and the possibility of behavior change after the visualization would have been very useful, and the results could contribute to an enhanced reflection about the meaning of the action. Enabling the possibility of commenting on the vodcasts posted on the school website could also provide the students with some feedback for improved reflection. These aspects should be taken into consideration when implementing further projects of this nature.

From the students' answers to the final questionnaire, it is possible to conclude that the dissemination sessions represented the highlight of the project, not only because they allowed them to find out their colleagues perceptions about the vodcasts (message and impact), but also by the sense of pride and satisfaction with the conclusion of an unprecedented project. The answers, in general, reflect optimistic students that believe in the dissemination of the vodcasts, and know how to do it; they also portray confident students about the impact that their actions can have in society. Finally, we reiterate the need in future research for a more thorough assessment of the impact – with more consistent feedback from the audience – in order to avoid creating in the students the illusion that these actions are always successful, stimulating feelings of perseverance, understanding that the desire changes will not happen immediately or may not even be recognized by others (Schalk, 2008).

REFERENCES

ALMEIDA, M., M., REZENDE, L., & LIMA, S. (2012, september). A produção de vídeos digitais: uma situação de aprendizagem na formação de professores de ciências. Communication presented in I*II Simpósio Nacional de Ensino de Ciência e Tecnologia*. Paraná, Brasil.

BELL, R. L. (2006). Perusing Pandora's box. In L. B. FLICK & N. G. LEDERMAN (Eds.), *Scientific inquiry and nature of science: Implications for teaching, learning, and teacher education* (pp. 427–446). Dordrecht: Springer.

BENCZE, L., & CARTER, L. (2011). Globalizing Students Acting for the Common Good. *Journal of Research in Science Teaching, 48*(6), 648-669.

BENCZE, L., SPERLING, E., & CARTER, L. (2012). Students' Research-Informed Socio-scientific Activism: Re/Visions for a Sustainable Future. *Research in Science Education, 42*(1), 129-148.

BROWN, A., & GREEN, T. D. (2008). Video Podcasting in Perspective: The History, Technology, Aesthetics, and Instructional Uses of a New Medium. *Journal of Educational Technology Systems, 36*(1), 3-17.

COTNER, S., KLEINSCHMIDT, J., & KEMPNICH, M. (2012). Video Podcasts Add Life to General Zoology. In A. H. DUIN, E. NATER & F. ANKLESARIA (Eds.), *Cultivating Change in the Academy: 50+ Stories from the Digital Frontlines at the University of Minnesota in 2012*. Minnesota: University of Minnesota.

CRESWELL, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches*. California: Sage.

FIGUEIREDO, C.C. (2002). Horizontes da Educação para a Cidadania na Educação Básica. In DEB (Eds.), *Novas Áreas Curriculares* (pp. 41-66). Lisboa: Departamento da Educação Básica, Ministério da Educação.

GKATZIDOU, S., & PEARSON, E. (2007). Vodcasting: A case study in adaptability to meet learners'needs and preferences. In *ICT: Providing choices for learners and learning. Proceedings ascilite Singapore 2007* (pp. 325-332). Singapore: Nanyang Technological University.

HILTON, G. (2011) Rehearsing for an audience: Students learning science through video production. *International Journal of Innovation and Learning, 9*(3), 311-324.

HODSON, D. (1994). Seeking directions for change: The personalisation and politicisation of science education. *Curriculum Studies, 2*, 71-98.

HODSON, D. (2003). Time for action: science education for an alternative future. *International Journal of Science Education, 25*(6), 645-670.

HODSON, D. (2011). *Looking to the future: building a curriculum for social activism*. Rotterdam: Sense Publishers.

HODSON, D. (2014). Becoming part of the solution: Learning about activism, learning through activism, learning from activism. In J. L. BENCZE & S. ALSOP (Eds.), *Activist science and technology education* (pp. 67-98). Dordrecht: Springer.

JENSEN, B. B. (2002). Knowledge, action and pro-environmental behaviour. *Environmental Education Research, 8*(3), 325-334.

KARAHAN, E. (2012). *Constructing media artifacts in a social constructivistic learning environment to enhance students' environmental awareness and activism*. (Master's Thesis). University of Minnesota, Minnesota, EUA. Retrieved from: http://conservancy.umn.edu/handle/11299/132314

KARAHAN, E., & ROEHRIG, G. (2015). Constructing Media Artifacts in a Social Constructivist Environment to Enhance Students' Environmental Awareness and Activism. *Journal of Science Education and Technology, 24*(1), 103-118.

LITTLEDYKE, M. (2008). Science education for environmental awareness: Approaches to integrating cognitive and affective domains. *Environmental Education Research, 14*(1), 1-17.

MCCLAREN, M., & HAMMOND, B. (2005). Integrating education and action in environmental education. In E. A. JOHNSON & M. J. MAPPIN (Eds.), *Environmental education and advocacy* (pp. 267-291). Cambridge, UK: Cambridge University Press.

MACDONALD, D., & HOBAN, G. (2009). Developing science content knowledge through the creation of slowmations. *The International Journal of Learning, 16*(8), 319-330.

MCMANNON, T. J. (1997). Introduction: The changing purpose of education and schooling. In J. I. GOODLAD & T. J. MCMANNON (Eds.), *The public purpose of education and schooling* (pp. 1-17). San Francisco, CA: Jossey-Bass.

MENEZES, A., KALHIL, J., MAIA, D., & SAMPAIO, E. (2008, june). O uso do software Windows Movie Maker como recurso facilitador no processo de ensino-aprendizagem no ensino de ciências na Amazónia. Communication presented in *I SENEPT*. Belo Horizonte, Brasil.

MENG, P. (2005). *Podcasting & Vodcasting: A white paper*. Columbia: University of Missouri. Retrieved from http://www.tfaoi.com/cm/3cm/3cm310.pdf.

PEREIRA, M., & FILHO, L. (2013). Investigando a produção de vídeos por estudantes de ensino médio no contexto do laboratório de física. *Revista Tecnologias na Educação, 5*(8), 1-12.

REIS, P. (2013). Da discussão à ação sócio-política sobre controvérsias sócio científicas: uma questão de cidadania. Ensino de Ciências e Tecnologia em Revista, 3(1), 1-10.

REIS, P. (2014a). Promoting students' collective socio-scientific activism: Teacher's perspectives. In S. ALSOP & L. BENCZE (Eds.), *Activism in science and technology education* (pp. 547-574). London: Springer.

REIS, P. (2014b). Acción socio-política sobre cuestiones socio-científicas: reconstruyendo la formación docente y el currículo. Uni-Pluri/versidad, 14(2), 16-26.

ROTH, W. M. (2001). Learning science in/for community. Communication presented in *Congreso Enseñanza de las Ciências*. Barcelona, Spain.

ROTH, W. M., & DE´SAUTELS, J. (2002). *Science education as/for sociopolitical action*. New York: Peter Lang.

SCHALK, S. (2008). *When Students take Action: How and Why to Engage in College Student Activism* (Thesis). College of Arts and Science, Miami University, Ohio. Retrieved from: https://etd.ohiolink.edu/pg_10?0::NO:10:P10_ETD_SUBID:58118#abstract-files

SERAFIM, M. L., & SOUSA, R. P. (2011). Multimídia na Educação: o vídeo digital integrado ao contexto escolar. In R. P. SOUSA, F. MOITA & A. B. CARVALHO (Orgs.), *Tecnologias Digitais na Educação* (pp. 19-50). Paraíba: Editora da Universidade Estadual da Paraíba.

SHOR, I. (1992). *Empowering Education: Critical Teaching for Social Change*. Chicago: The University of Chicago Press.

VARGAS, A., ROCHA, H., & FREIRE, F. (2007). Promídia: produção de vídeos digitais no contexto educacional. *Novas Tecnologias na Educação, 5*(2), 145-151.

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