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The Teaching of Social Technologies: A Report of Experience on Freirean Practices Applied in CTS Education

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ABSTRACT

Faced with the relevance of studies in scientific and technological education that circulate around socioeconomic alternatives and emerge from the perspective of the Social Studies of Science, Technology and Society (ECTS), this experience report analyzes the feasibility of seminars as a proposal for the teaching of social technologies. The examples brought to these discussions through these channels of communication make mention of the following projects implemented in different contexts, such as the Literature projects of Light and Revolution of the Baldinhos. It is about presenting how ECTS can be in tune with certain proposed themes related to students' daily life and how it can be transformed by a collective action committed, both in curricular terms and the training of the students involved. A teaching model was provided as a new learning proposal in this field of knowledge: CTS studies.

KEYWORDS

Scientific and technological education. Social technologies. Freirean practices.

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O Ensino das Tecnologias Sociais: Um Relato de Experiência Sobre Práticas Freireanas Aplicadas na Educação CTS

RESUMO

Diante da relevância de estudos em educação científica e tecnológica que circulam em torno de alternativas socioeconômicas e que emergem na perspectiva dos Estudos Sociais da Ciência, da Tecnologia e da Sociedade (ECTS), analisa-se, neste relato de experiência, a viabilização de seminários como proposta para o ensino das tecnologias sociais. Os exemplos trazidos para estas discussões por estes canais de comunicação fazem menção aos seguintes projetos implantados em diversos contextos como, por exemplo, os projetos Litro de Luz e Revolução dos Baldinhos. Trata-se de apresentar como os ECTS podem estar em sintonia com certos temas propostos relacionados ao cotidiano dos alunos e de como este pode ser transformado por uma ação coletiva comprometida, tanto em termos curriculares quanto à formação dos alunos envolvidos. Foi proporcionado um modelo de ensino como uma nova proposta de aprendizado neste campo do saber: os estudos CTS.

PALAVRAS-CHAVE

Educação científica e tecnológica. Tecnologias sociais. Práticas freireanas.

Las Tecnologías Sociales: un Relato de Experiencia Sobre Prácticas Freireanas Aplicadas en la Educación CTS

RESUMEN

Ante la relevancia de estudios en educación científica y tecnológica que circulan en torno a alternativas socioeconómicas y que emergen en la perspectiva de los Estudios Sociales de la Ciencia, la Tecnología y la Sociedad (ECTS), se analiza, en este relato de experiencia, la viabilidad de seminarios como propuesta para la enseñanza de las tecnologías sociales. Los ejemplos traídos para estas discusiones por estos canales de comunicación hacen mención a los siguientes proyectos implantados en diversos contextos como, por ejemplo, los proyectos Litro de Luz y Revolución de los Baldinhos. Se trata de presentar cómo los ECTS pueden estar en sintonía con ciertos temas propuestos relacionados al cotidiano de los alumnos y de cómo éste puede ser transformado por una acción colectiva comprometida, tanto en términos curriculares como en la formación de los alumnos involucrados. Se proporcionó un modelo de enseñanza como una nueva propuesta de aprendizaje en este campo del saber: los estudios CTS.

PALABRAS CLAVE

Educación científica y tecnológica. Tecnologías sociales. Prácticas freireanas

Introduction

Given the relevance of studies in science and technology education that circulate around socioeconomic alternatives and that emerge from the perspective of the Social Studies of Science, Technology and Society (ECTS), it is analyzed in this experience report, the feasibility of seminars as a proposal for the teaching of social technologies.

The seminars that were presented by five groups of three students took place in a postgraduate course in science and technology education at a public university in the south of the country entitled Seminars on Language in Science and Technology in its 2017 edition, with master's and doctoral students. According to the applied methodology, seminars related to the theme, the results of these studies, analyzed in their qualitative form, aimed to bring to understanding the conceptual and language variables developed by and from conventional technologies, intermediate technologies and social technologies.

The social technologies theme proposed in the form of debates that the seminars provided initially underlined the importance of this theme. Admittedly, the differentiation between appropriate conventional and social technologies and their examples corroborate with liberating and freirean practices. In this scenario, it is evident that the whole debate that followed was based on the Latin American perspective of the Studies on Science, Technology and Society (ECTS) proposed by Linsingen (2007). In the context of teaching, the objective was to provide a debate with the students using the communication technologies in the classroom, in this case, with videos, the internet and the data show.

The examples brought to these discussions by these communication channels mentioned the following projects implemented in various contexts in science teaching, such as the Litro de Luz and Baldinhos Revolution projects. The projects presented provided a framework for debates about social technologies and CTS studies.

Theoretical Basis: Conventional Technology vs. Intermediate or Appropriate Technology

Further study of the use of technologies leads us to consider that it is a process resulting from interrelationships between society and science. Such analyzes reflect on what political, ideological, historical, cultural, ethical, environmental outcomes will emerge from the cause-effect system from a particular social organism. In this comprehensive bias, we see the importance of taking resources, apparatuses, inputs, in short, so that the technological product becomes part of a system that should articulate with the dominant cognitive model.

A given technological model, whether authorial or indigenous, may give rise to technological products in and from the environment that demands it (social technologies). On the contrary, if there is a transplanted technological model, the vision of a world outside the

demanding reality may cause damage to ideas and values different from the real local need, not always assertive for its implementation in a new space (appropriate technologies).

Given these effects, Dagnino (2009) warns about the insipid side and possible solutions to and from the sociocultural environment that requires it. Experiences, worldviews, tacit knowledge, varied languages are the driving force for an effective social technology project. This corroborates, according to the author, in feeling, authorial belonging, authentic need and participatory action of those who, perhaps, are in time and space in a state of exclusion.

Historically, in ancient Rome, catapults, ballistic resources, and other war arsenals were used (MARTIN, 2014). At first, there was the questioning about elements that triggered that whole society and its warlike culture, in the educational formation of children and youth for the Roman army, massifying them socioculturally, within political-ideological conceptions of their empires and their dynasties.

The "conventional technology", widely used by Roman armies, as a classic and historical example of a class action, in socio-political privilege in the transposition of technical knowledge. Certain characterizing aspects of a conventional technology are understood, namely: optimized production scale, aiming at the market economy; unreflect effects on the environment, inputs and rates of production at scale, social controls, productive segmentation - direct producer does not exercise control; relevant state of alienation of the producer and the end user - substitute element of human work.

With its apparent ingenuity and neutrality, it becomes invasive in the field of human doing, its social action, as it intensifies the confrontation of knowledge, powers and hegemonic disputes (FIGUEIREDO, 1989; CORRÊA, 2017; LINSINGEN, 2007).

On the other hand, the process of collective, interventional construction, which could be limited to Freire generative themes, would end up competing with the formation of social experts in science and technology, capable of giving answers to the identity system that is found in the locus of their communities. Collective needs and requirements. That is, just as lay people can gain expertise in hydraulic mechanics, carpentry, law and real estate, they can gain expertise in some areas of science and technology. (COLLINS; PINCH, 2010, p. 88)

In a discursive consensus, the challenge of analysis by the students about the image of a “Xinguana maloca”, raised by natives, in Boa Viagem-RJ, was also raised. This architectural object, coming from the tribes of Alto Xingu and Guarani, demonstrated knowledge and knowledge about techniques needed in the construction of typical dwellings, associated with the technologies of the “white man”, raised at this stage of the seminar, as what is called “technology”. Appropriate or intermediate”.

Appropriate or intermediate technology is still an inclusive, people-oriented technology, libertarian in the Freirean sense of promoting the process of adaptive rereading.

Even so, it uses a research and development (R&D) movement, leading to the identification and resolution of proximate, immediate problems, with repercussions for the entire surrounding community.

For Dagnino (2009), the promotion for a participatory production requires a structuring base on a democratic ideology, promoting solidarity economy processes and that seeks a creative and adaptive way to establish its bases, as a requirement of this same reread technology, intermediating the needs of a vulnerable social group.

> [...] reflections of lack of democracy may have delayed the recognition of this "lay expertise", but the solution was not only to increase the level of democracy. After all, what expertise can one person - just as one person - be able to offer in technology decision making? (DAGNINO, 2009, p. 8)

In this perspective, there is an authoritative productive model that raises requirements / needs in the process of elaboration / technological conception from the social organism that evokes it. The lay expertise movement emanates the prerequisites of authorship in the construction of techno scientific knowledge relevant to the sociocultural movement, which projects itself as dynamic, ergonomic and creative.

Social Technologies: Discussing Social Concepts and Projects

To conceptualize social technology is to refer to two authors who have different perspectives on the importance and use of this tool: Hernán Thomas and Renato Dagnino. Both seek to justify the existence of social technology according to the knowledge they have acquired, especially from the experience of localities that have developed skills using a particular technology.

When it comes to teaching, social technology emerges for students as a collective experience within a community that lives the problems of everyday life and needs to reconcile work and survival. Another important point is that it cannot simply be copied (or recreated) to another space that has different experiences in terms of community survival.

Thomas (2016) argues that some technologies actively participate in the dynamics of concentration of power and the appropriation of wealth, that is, the technologies are political and not neutral. For Dagnino (2014), social technology can be understood as something socially constructed, based on the survival needs of a population and the development of creativity by the actors interested in it. According to the author, there are many who can be involved with social technology in Brazil: governments, social movements, NGOs, universities, etc., and by analyzing the involvement of these actors and the institutional arrangements in which this technology is created. "The cognitive models through which they perceive the relationship between TS, the socioeconomic context and the environment of the relevant public policies" (2009, p.15) are evident.

Social technology is based on both scientific and popular knowledge, even some knowledge where it originates from exclusion itself. Undoubtedly, a technology that arises from the protagonism of the excluded. According to Linsingen (2007, p. 13): “to the social-cultural environment where it operates”, without the people involved there losing their identities, but being aware of the use of their spaces and their rights and duties. Together and without reproducing a dominant system, school and society can enjoy their own creations and means to survive committed to and in their own social spaces.

The excluded ones referred to by Dagnino (2012) are those who are in the informal sector of the economy, especially in Latin America, in informality and who need job and income generation opportunities. For the author there will be no space for everyone. The author states that since the 1990s research on productive restructuring and labor relations has revealed a growing precariousness of employment, with many failed companies and economic segments of production and services that have not evolved in the technological field.

A decolonial turn of social technologies, those emanating from a need for impoverished communities, transcends colonial rule and provides an emancipatory experience of identities forced to live always under the same aspect. For Fanon (1968, p. 195), "there could be no absolute identity because the cadence of the people and that of the leaders is not uniform." This shows that the search for alterity, liberation or decolonization begins with the formation of movements among the social groups most forgotten by the public power.

In another aspect, Mignolo (2003, p.53), evidences the distance between colonized and colonizer, classifying it as “colonial difference”. For the author, it is true that in Latin America the problem of these differences overlaps with the legacy of Western political, economic, social and cultural institutions.

Seminars as Learning Practices in CTS Studies

With the proposal to bring to the presentations of master's and doctoral students practical examples of what would or would not be social technology could better clarify the proposed theme, making the discussion of concepts clear. At this point, it was necessary to relate Freire's practices that would be more directly related to the projects presented. By establishing a more detailed analysis of the application of such projects in the social context, it is possible to verify, qualitatively, the interest on the part of the students to associate or question several other implanted models of technologies. Thus, it was possible to analyze the creation of new projects in society.

The relationship between STC studies and Freire's practices emerge in a scenario where social reality concerns intellectuals, public managers and social entrepreneurs. This

means establishing a dialogue between the underprivileged and those in power. It is essential that any debate be guided by democratic principles.

Among the projects of this incubator, we have the Healthy Cooperative - where a group of women works in the production and distribution of organic foods at fairs and events where the valorization of agroecology promotes new models of solidary economic enterprises; and ITACA - Business Technology Incubator for Food and Agroindustrial Chains - with the mission of developing innovative and sustainable businesses in the agroindustrial chains of the Porto Alegre region, enabling the transfer of technological and managerial knowledge, where teachers and students propose the teaching of new technologies. For worked in needy communities. Support services such as finance and market communication, distribution and new business support were developed.

During the presentation of the seminar two other examples were also brought, through videos, of what could be social technology: the Liter of Light and the Revolution of Baldinhos, to be described below.

The Litro de Luz project started in 2011 and brings light to communities through a partnership with large companies, such as Kalunga and Pepsico. This technology uses a photovoltaic plate coupled to a PVC pole where a lamp is lit. These streetlights are placed in the streets of communities, where there are no lighting projects, as in the outskirts of São Paulo, Manaus, Rio de Janeiro and Santa Catarina.

Historically, Litro de Luz appeared in Uberaba (MG) by Alfredo Moser, a mechanic who during a blackout in 2002 installed on his roof what he called “handmade lamp”, a pet bottle with bleach, in which the reflection of light illuminated the room. Another fact about Litro de Luz is that, being constituted as OnG, it started to obtain external resources from companies interested in the project, either for the co-participation in sales of photovoltaic plates as in the reduction of taxes. According to Dagnino precepts, such a project misrepresents the real concept of social technology. This became clear during the seminar exposition and which served as an example to other models discussed later.

The Baldinhos Revolution is a socio-environmental project for urban agriculture and a Community Organic Waste Management model that emerged from a local problem in the Chico Mendes community, located in the Monte Cristo neighborhood in Florianópolis, Santa Catarina.

In 2008 the community suffered from an outbreak of leptospirosis causing the death of two young people who lived there. Given this conjuncture, residents and community leaders together with the neighborhood schools, the Health Center, women from the Temporary Work Front and the Center for Studies and Promotion of Group Agriculture (CEPAGRO) came together to understand the problem in order to solve it. Thus, to reduce the number of disease-transmitting rats, the solution was to separate leftover food into lidded buckets and recycle into the community itself through the composting process. In 2016 the project

covered 100 families, recycling a total of 12 tons per month of organic waste, resulting in around 03 tons per month of organic compounds (CEPAGRO, 2016).

It was noticed that the Baldinhos Revolution brought interdisciplinary elements because it pointed to a methodology of urban ecology with social and cultural bias, which through the awareness and mobilization of the Chico Mendes community and in partnership with public agencies, solved a serious local problem. This has led to positive changes for the population living in this region, such as the integration of young offenders into the activities that this movement has led to the production of healthy food.

Freire's Social Technologies and Practices

One of the leading thinkers of progressive pedagogy, educator Paulo Freire, even though he lived and elaborated his main pedagogical concepts at a time when access to computers, internet, social networks, etc., was not widespread, contributed to most of his students. Teachings that continue to be present today. Proofs of this are the ideas about technology and science that the educator left in his writings. For Freire, technology is understood as one of the "great expressions of human creativity" (FREIRE, 1968, p.98), and is part of the natural process of human development, involving the individual to the world.

Proposing the debate in the classroom about this theme is nonetheless pointed out in Freire (1987) as a model of literacy. It is through people's lives, such as those living in communities, and where such technological practices are highlighted; one can build insight into a way of life. From this conception, a qualitative analysis on the construction of a community ethics is present, and that knowledge is not something put and finished, it is a social construction.

Freire (1992) points out that the use of technology should not be done in any way or without adequate preparation, but intentionally used as a political act. It must be understood and contextualized by those who will use it, arousing curiosity and a sense of vigilance, criticality and constant reflection. By applying information and communication technologies in the classroom, the educator understands that one cannot demonize or divinize technology and its artifacts, because it is neither bad nor good in itself, but it acquires the format of interests. Who handles it. Undoubtedly, the use of technologies in the presentation of this seminar was fundamental for the debate and understanding of the theme proposed by the group. In his writings, Freire (1987, p.98) emphasizes that "the generating theme is not found in men isolated from reality, nor in reality separated from men. It can only be understood in human-world relations".

Freire's pedagogy has its great value in ECTS studies because they seek to broaden the movement towards a dialectic methodology that is aware of the path to generative themes that help in the implementation of social technologies in education. Therefore, we could not fail to highlight the practices of Freire's pedagogy, which through generative themes (in this case,

social technologies) promote the learning of the subjects - in this case the students - enabling a hypothesis to be worked on in "a minimal thematic universe" (FREIRE, 1987).

With these issues in mind, it is noted that Freire was in favor of the advancement of science and technology, but sought to make clear that its use needs to be reflected in different areas to which it applies, including in the field of education.

Results Analysis and Discussion

During the seminar and taking as a starting point the cognition of material elements in the imagetic and / or figurative field of technological characterizations, discussions began on the first impressions about the application of technologies in society.

It seems that when it comes to a Latin American perspective, in which STS education, as an area within the ECTS (Studies of Science, Technology and Society), there is the emergences of a new look at scientific and technological studies. Linsingen (2007) points out that the philosophical, linguistic, anthropological, political and sociological aspects of science and technology, as well as the educational elements involved, must be addressed in their relation to scientific and technological development.

It was presented during the seminar exposition how the ECTS can be in tune with certain proposed themes related to the students' daily life and how it can be transformed by a compromised collective action, both in curricular terms and in the formation of the students involved. Mentioning the importance of these collective constructions, a debate began by addressing the concepts that differed from conventional or appropriate intermediate technologies, articulating examples of their social applications.

In a Freirean context and when it comes to the school, the importance of generating themes is highlighted (FREIRE, 1987), because they will always be related to the students' experience in which, by understanding reality, they build historically produced knowledge.

Given the exposure of the theme social technologies, came the debate, the opposition of ideas and many doubts, both for those who conducted the discussions and for the other participating researchers. It was even argued that by not having a thorough knowledge of the subject, it would be safer to rely on concepts established by great authors and to present examples already given by other researchers. Thus, certain doubts could be easily resolved and there would be nothing to discuss because the formation on the subject would already be given, with ready concepts, without opposition of ideas and examples taken from other examples. Why risk a critical stance and bring new examples, right or wrong about what social technology would be?

Subsequently, the analysis of the presentations showed that there was much more interaction and learning in what was exposed and debated. It can be seen that there were many misguided claims about what social technology would be, but with the contribution of

peers, the media resources used as videos and data shows, and the enlightenment by teachers, factors emerged that contributed to learning; socialization of knowledge.

With the help of the teacher, the development of criticality by the students must take into account: the conditions of production of the text, that is, which produced them and how the authors conceptualize technologies, as well as videos, besides the items that stood out most in these presentations. Therefore, holding discussions with students about STS in society brings possibilities of understanding social technologies as a form of practical knowledge to higher education teaching.

Final Considerations

Debating about social technology in these learning spaces is to establish an axis between teaching, new social practices and scientific and technological development. This is necessary in a world where changes are possible where creative initiatives meet the social demands of particular locations, such as education, culture, art and rescue or combat the vulnerability of cultural, immaterial or historical heritage. In addition to these demands, there is the production of clean energy and food, with the correct use of natural resources, among others.

As a generating theme of STS research, the concept and practice of social technology will always be in constant debate. Promoting the application of social technology for social and economic development within a community is no easy task. First, the community needs to be aware of their problems, secondly, to organize socially so that they can promote economically sustainable and supportive work.

Different authors propose different qualitative analyzes when it comes to inclusive technology, but all provide an educational practice. During the seminar, we tried to present the various possibilities of reframing the use of social technology based on innovation and CTS strategies. The models visualized and debated helped in the most correct differentiation between conventional, intermediate and social technologies. By accompanying each of the presented items and viewing the videos about the projects, a teaching model was provided as a new learning proposal in this field of knowledge: the CTS studies.

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