



## ACTIVE TEACHING METHODOLOGY IN ERGONOMICS AND THE LEARNING ACQUIRED IN THE WORK N'ROLL PROJECT SINGING O WORK

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### Summary

This article aims to show the impact of active teaching methodologies on learning Ergonomics. To do this, the authors are based on an experience carried out from a project conceived and developed in the Ergonomics disciplines of the Health and Safety Engineering degree at the Federal University of Itajubá, which seeks to understand the history of work in Brazil through the music produced. between the 1930s and the present. The method developed was the application of questionnaires to the two students involved, at two different moments of the project, generating responses that were analyzed with the aim of understanding the relationship between active methods, music and learning in ergonomics. These results showed that the active methodology using music as a tool enabled a significant increase in student engagement in carrying out the proposed task and, consequently, allowed deeper learning about the history and concepts about work and ergonomics presented in the proposed activity. Finally, we consider that active methods, such as the one developed in the experience reported in this article, meet the logic of a liberating education, which places the student as a central element of their learning process, and which contributes to their own emancipation.

**Keywords:** Teaching in ergonomics. Active teaching methodology. Pedagogical practice. Music and ergonomics.

### 1. INTRODUCTION

The technological, scientific, economic and social changes experienced in recent years have a direct impact on different fields of social life, such as the organization of work, forms of production and professional training, imposing constant adaptations on individuals to keep up with them. In the field of education, especially in higher education institutions, professional training courses are responsible for preparing students for these transformations, providing a context that resembles the reality of work (Casale, 2013). It is in this circumstance that Active Teaching Methodologies emerge, with the aim of developing methods that bring the student to the center of the learning process (Berbel, 2011). The diversity of active methods is normally high, with different experiences using music as a central pedagogical tool in the teaching process (Gaiza, 1998).

The Federal University of Itajubá (UNIFEI) has been developing training for its teachers in active methodologies for some years, as part of a process of modernization of teaching that

this university has been undergoing. As a result, the syllabus of the two Ergonomics subjects of the undergraduate course in Health and Safety Engineering (ESS) were restructured, in order to incorporate active methods as a central approach in the students' learning process. As a result of this, one of the projects developed in one of the Ergonomics disciplines was aimed at understanding the historical and social context of work in Brazil, using as an analysis tool the interpretation of the lyrics of some songs released between the 1930s and the current years, thus making a parallel between the history of work and the history of Ergonomics itself, which always considers the difference between what is prescribed and what is real in work situations (Rocha, 2017).

In this way, a professor and two musician students from this degree created the project entitled "Work n'roll: singing the work", in which 12 songs are played, from the 1930s to the present, related to human work. With each song played, an analysis is made by the trio themselves about the historical context of the work in Brazil at the time this song was composed. Presentations of this project were held in 3 different environments, as well as virtual material was created, made available on the internet. All this material produced was then used in ESS undergraduate Ergonomics classes, drawing a parallel with the history of the discipline itself.

The process of choosing the songs and analyzing the lyrics involved long periods of study and dedication from the students and the teacher involved. However, even though it began in the context of an Ergonomics discipline, the project went beyond the discipline itself, and remained active for at least the following three years. Thus, at least two questions arise in this context: why did the teacher and students get so involved in the project, given that there was no objective assessment for them? What is the impact of this process on learning Ergonomics content for the students involved in the project?

To try to answer these questions, the objective of this article is to analyze the project carried out as a teaching tool for the two students involved, seeking to understand the impacts of this activity on their learning process. The purpose of this article is not to detail the musical analyzes themselves or the discussions held with the songs, but rather to understand how a project of this nature can facilitate the learning of the students involved in it, in relation to the content present in the Ergonomics discipline.

## 2. THEORETICAL FRAMEWORK

In the search for the design of new pedagogical proposals with the potential to promote student autonomy and that satisfy new professional profiles, higher education institutions have made use of Active Teaching Methodologies (Berbel, 2011). While in traditional methodologies the teacher is responsible for transmitting knowledge to students in lectures on theoretical content (Ponciano, Gomes & Morais, 2017), in Active Methodology the teacher is not the only source of knowledge, but a guide in the teaching process. which encourages the student to build knowledge and interact with what is studied through problem solving or projects (Barbosa & Moura, 2013).

Active teaching methodologies take as a starting point what students already know for the construction and expansion of knowledge, making them aware of their

learning process (Masson et al., 2012). They allow students to develop, in addition to the technical skills of their area of specialization, a set of transversal skills, such as communication skills, leadership, conflict management, critical stance, respect for diversity, social responsibility and sustainable vision (Correia & Oliveira, 2020).

For the method to be successful, it is necessary for the teacher to adjust the curricular content to the specific objectives of each project, getting involved in the preparation stage and adapting to respond to the needs of the students during the activities (Fernandes, Flores & Lima, 2012). When structuring the project, the teacher must make the quality criteria clear, encourage the search for problem solving, evaluate the stages and offer constructive feedback, leading the student to the role of protagonist of learning (Campos et al., 2016).

Bell (2010) points out that Active Teaching Methodologies should not be seen simply as a complementary activity to support teaching, but rather as the basis of the curriculum, as many projects are supported by science or originate from current social problems. The result is a greater understanding of a subject, deeper learning, higher level reading and greater motivation to learn.

Among the various tools that exist as teaching methods, music has long been used as a tool, from basic education (Gaiza, 1998) to higher education, in courses such as Biology (Paixão et al., 2017), Geography (Oliveira et al., 2005) and Law (Junior, 2018), since it is a language that allows human beings to create, express themselves, know and even transform reality (Tavares, 2000). If music has been used for a long time as a pedagogical tool, it can and should be incorporated into active methods, with the aim of contributing to greater student learning in the process.

Learning, therefore, is closely linked to music, through different concrete experiences. When the proposal for using music is presented to students, the tendency to become curious is that they become curious, with a receptivity that is almost always satisfactory, as music favors concentration and absorption of ideas in a more natural way (Oliveira et al., 2005). In the teaching-learning process, music is, therefore, a strategic possibility, that is, a tool to assist the learning of other subjects (Romanelli, 2009).

### **3. MATERIALS AND METHODS**

The methodological approach used to understand the learning generated by the project was the application of questionnaires in the form of open interviews with the two students participating in the "Work n'Roll: singing the work" project.

The questionnaire is an investigative technique composed of a set of questions that are submitted to people with the aim of obtaining information about interests, feelings, knowledge, beliefs, behavior, etc. (Melo, 2015). Building a questionnaire basically consists of translating research objectives into specific questions. The answers to these questions provide data required to describe the characteristics of the researched population or test the hypotheses that were constructed during research planning (Gil, 2009). The questionnaire is a type of interview and, as such, there is no exact measure that guarantees that its objectives are achieved. However, there is a logical sequence of steps that the researcher can follow, such as: planning what will be measured; formulate questions to obtain the necessary information; define the text and order of questions and the visual aspect of the questionnaire; test the questionnaire, using a small sample, for omissions and

ambiguity; and, if necessary, correct the problem and carry out a new pre-test (Aaker et al., 2001).

The questionnaire was constructed with open questions, with the aim of bringing to light elements of the learning process experienced and perceived by the project's students. We sought to highlight questions that showed the difference between a traditional classroom teaching process and the process experienced by the current project. Therefore, five questions were formulated, shown below: 1) Describe in your own words how you consider the project brought learning about ergonomics content; 2) In your opinion, what are the main differences in the learning process between traditional methods (in the classroom) and the methods provided by this project?; 3) Despite all the effort and time required to execute the project, and knowing that it is not worth a grade and does not have any objective evaluation, describe why you decided, anyway, to remain in the same project over time; 4) Give concrete examples of how learning was built through the project; 5) Describe here what was most relevant during this process.

The questionnaire was administered at two different times, in February 2018 and July 2019, so that we could understand the difference in students' perceptions over time. The responses from the questionnaires were analyzed and processed, and are shown below.

## 4. RESULTS

The results presented below are descriptive analyzes obtained from student responses to the questionnaires carried out. These analyzes are accompanied by excerpts from the responses of one or both students, which illustrate what is being exposed.

### 4.1. Motivating and stimulating project

Firstly, the students expressed that the project in which they are involved is motivating and stimulating due to the fact that they are active subjects in its preparation. Characteristics such as “challenging” and “engaging” were explained, emphasizing the importance they themselves had in the process of designing and building the project, and in the study they had to carry out to complete this stage. Therefore, it was not a ready-made, pre-defined proposal, with clear rules a priori, but a joint construction with the students, involving them in the process and, in this way, motivating them to actively participate in it, as shown in the verbalization below from student 1.

“Work n' Roll gave me another perspective on the conventional way of learning in the Engineering course. The project, from the beginning, seemed to me both challenging and engaging, dealing with subjects covered in specific undergraduate subjects, but also making use of extracurricular skills. The entire process, from the elaboration, was the responsibility of all participants: the search for songs, structuring the repertoire, investigations of the historical context and conception of arrangements were shared responsibilities. It's not as if the teacher just informed what should be done or understood, but it was up to me to look for knowledge and consider what could be relevant to the work. So, I needed to evaluate what I already knew and what I needed to learn to achieve the results. It was an obvious opportunity to develop skills such as argumentation, creativity and flexibility with divergent ideas.”  
Student 1.

### 4.2. Art as a pedagogical tool

Then, the importance of art and music as teaching tools was greatly emphasized by the participating students. According to them, artistic and musical elements facilitated the learning of concepts worked on in Ergonomics disciplines, such as: “task”, “activity”, “accident”, “work organization”, since the interpretations made of the songs worked on in the project led to in-depth reflections on these concepts. Below are statements from both students in this regard.

“By being part of the Work n'Roll – Cantando o Trabalho project, I became aware of this educational characteristic of art. The songs function as reports from workers, a conversation that reveals feelings, frustrations, pain, conflicts, historical contexts, human-human relationships, human-machine relationships, technological revolutions, cultures. Some examples:

- The song “Tenha Pena de Mim” (1937) by Cyro de Souza and Babau is a samba that shows the historical context of the first half of the 20th century, reporting a view of work as suffering, representing popular classes who worked a lot with no prospect of change, trying hard to live honestly.
- “Bonde São Januário” (1940) by Ataulfo Alves and Wilson Batista is a reflection on the antonyms “worker x scoundrel”, shows an exaltation of work and has in its history an example of the political interference present in the Vargas era. Samba could no longer have as its theme the vagrants and rascals of Lapa, we were at the moment of creating the so-called samba-exaltação.
- “Construction” (1971) by Chico Buarque presents us with a context of civil construction, the mechanization of man and the devaluation of life, the symptoms of a distressing

repetitiveness that affects mental health, family relationships and behaviors in the workplace

- “Electronic Brain” (1969) by Gilberto Gil reports a period of technological advances, the concern with the replacement of man by the machine. And it analyzes the man-machine relationship in a comparative way, valuing man's ability to doubt, get emotional, reflect, make mistakes, gain experience.
- In “Alucinação” (1976), Belchior invites us to truly understand reality by establishing a critique of theories and abstractions. This “theory x practice” relationship is very present in the most diverse fields, including the context of occupational safety. The formulation of rules and procedures by people who do not perform and do not understand the real activity can generate numerous problems. This involves the need to develop empathetic thinking, with less judgment, placing the worker as the holder of knowledge that must be valued;
- “Capitão de Industria” (1996) by the band Paralamas do Sucesso, the mechanization of man is also evident, it is reported with a lament about the lack of time and opportunities to have moments of reflection, leisure or even rest”. Student 2.

“The reports contain a strong reflective and emotional potential. When performing a song, a character is incorporated, who tells a story and exposes feelings. In a way, this allowed me, in an organic way, to do the empathetic exercise of understanding the work from the perspective of those who do it.” Student 1.

### 4.3. Ease of learning historical and technical content

As the project was considered motivating and stimulating, as well as the music considered a pedagogical tool by the participating students, both expressed greater ease in learning the historical and technical content involved with the Ergonomics disciplines.

Historically, students reported the context of work in the first half of the last century, its relationship with slavery, the role of music as an act of political resistance in moments of oppression (such as during slavery itself or the military dictatorship), the relationship between work, censorship and music, and the place of music and work in the 1980s and 1990s, a period of great economic opening in Brazil. The verbalizations below, from both students, illustrate this discussion.

“Brazilian music, poetry and popular art play a fundamental role in the country’s history. They serve, in addition to entertainment, as a questioning instrument, as a representative of our cultures, as historical tools, as an instrument of political resistance and social formation. Samba at the beginning of the last century, as well as other types of peripheral music that emerged from a people who were recently enslaved, was once the main means of survival and resistance resource for many who were prevented from entering society. MPB (Brazilian Popular Music), an acronym for a genre that emerged in the 1960s with the second generation of bossa nova, played a great role as an instrument of opposition to the military regime (1964-1985). These characteristics have spread over time in Brazilian music, with the rock movement, which was quite controversial, in the 1980s and 1990s and the hip-hop and funk movements very present in the 2000s and today. Much of what I know about different historical periods in Brazil and about the reality of other people and cultures is the result of the curiosity that many artistic works caused in me. Art and culture playing an educational role”. Student 1.

“The project proposal as an integrator of previously learned content and an explorer of new knowledge, ensured that teaching was a permanent process. Through investigations in readings or documentaries, information improved the subjects studied. For example, the censorship suffered by Wilson Batista and Ataulfo Alves in the 40s who, under the influence of the government, had the lyrics of their music changed. What was once a disdain for work, “the São Januário tram takes another stupid partner, I'm the only one who won't go to work”, turned into an exaltation: “the São Januário tram takes another worker, I'm the one who goes to work”. A similar fact about the song Caxangá, which in the 70s was censored and originally released with vocal modulations by Milton Nascimento to convey the emotions that

the censors had suppressed from the text in partnership with Fernando Brant - only years later to be fully recovered in a recording of Elis Regina. The study of the historical context of the songs proved to be fundamental to situate the theme analyzed by the project, deepening the discussion and also guiding the interpretations of the songs". Student 2.

In addition to the historical elements about the work, a motivating and stimulating project added to the potential of art as a teaching tool, also enabled the learning of technical aspects of the discipline, according to the students' reports. Concepts such as "activity", "regulations", "tacit knowledge", "variability", "man-machine relationship", "difference between the prescribed and the real", "absence of workers in the processes of management" or "in the creation of standards" were reflected and explained by the students through the analysis of the songs, as can be seen in the verbalizations below.

"Other topics present in studies, such as activity, regulations, tacit knowledge, could be addressed through songs like that of Gilberto Gil who, in an encounter between man and machine, offered the opportunity to reflect on the limits that prevent the "brain electronic" to deal with variability that emerges during work activity. A theme from 1969 that remains current: how to formalize tacit knowledge and transmit it to a machine if this knowledge concerns the work environment, but also personal experiences, emotions and senses that the machine does not experience? Questions like this, which recur in classes, are presented in a light and objective way by the song. This also occurs in Belchior's song about the real and the illusory, which could lead to the debate about the difference between what is predicted in offices and organizations and what is found in the factory. A difference that in many cases seems to match the song's title, Hallucination." Student 1.

"It was interesting to note how complex matters can be simplified, facilitating the transmission of knowledge to other people who are not used to these discussions. In the song by Milton Nascimento and Fernando Brant, for example, with lines like "See well, my boss, how good it can be: would you work in the sun and I bathe in the sea? I fight to live, I live to die. Until my death comes, I live by fighting against the king"; or, even, in Caetano Veloso's song, "while men exercise their rotten powers", the reflection of the class struggle is an opportunity to discuss the absence of workers' participation in the company's management processes, ignoring their field knowledge. This indifference towards the workforce can bring consequences similar to those expressed by Raul Seixas in Fool's Gold: dissatisfaction with life even after getting a good job and satisfying social expectations. Also in the verses of the Valle brothers, "I wake up to work, I sleep to work, I run to work" the complaint that there is no time to have, nor to be "beyond the smoke" in a life conditioned to only one possibility. When considering work as a central dimension in human life, it is essential to think about the consequences when it does not offer quality of life and well-being, in line with the view regarding organizational and psychosocial issues that, as a student of health and safety engineering, I am encouraged to have in their professional activities". Student 2.

"Music made the learning process attractive, fun and permanent, stimulating reflective analysis and expanding knowledge. Issues discussed in classes, such as considering the worker as a unique individual, with complexities and not just another cog in the wheel, were highlighted in songs such as Construção. Singing the story of a fatal accident, Chico Buarque exposes the character's dehumanized condition in precarious situations, repetitive movements like a machine, stuck in a routine that makes him lose his vivacity, in addition to blaming the victim. These are elements of reflection addressed in classes on quality of life and workers' health. Thinking about topics such as occupational illnesses and accidents through musical appreciation brought another perspective on this content." Student 2.

“In the project, a series of concepts that are studied in a very structured and theorized way in the classroom are complemented and exemplified through these reports. Concepts that involve worker participation in the creation of standards, the relationship between tacit and explicit knowledge in the workplace, the variability present in worker activity and others. This exemplification allows for greater understanding and appreciation of the concepts studied, it is a way of showing the student that there is a connection between the content and reality”.

Student 1.

## 5. FINAL CONSIDERATIONS

It was by contextualizing the traditional teaching and learning process, as well as the relationships between educator and students, that Paulo Freire created the "banking" conception of education. In this concept, "instead of communicating, the educator makes 'announcements' and deposits that the students, mere incidences, patiently receive, memorize and repeat. (...) the only margin of action that is offered to the students is the of receiving deposits, storing and archiving them" (Freire, 1987, p.33). There is an increasingly profound and serious inadequacy between "banking" and compartmentalized education – developed by traditional teaching methods – with the transdisciplinary, transversal and global reality of the world around us. By maintaining "banking" type education, where the student is a passive receiver of information, complex sets, interactions between parts and essential problems become invisible (Morim, 2003). The bell rings, the students sit down and start writing countless words, the meaning of which they do not understand well, which do not seem to interact with each other and which are far from everyday life (Duarte Jr., 1994).

In every man there is a creative impulse and education is more authentic the more it develops this ontological impulse to create. Education must be uninhibiting, liberating – and not restrictive – and art has an important role in this process, as expression through it triggers a process in which the improvement of the individual occurs, in terms of their own re-education, and seeking their emancipation (Silva, 2008). Thus, education through art is a liberating act (Freire, 1987).

The project "Work n'roll: Singing work" enabled new ways of learning for the students involved, enhancing the students' previous skills and their passion for music and integrating them with the content discussed in the Ergonomics disciplines, in order to make them participate in the project, not as those who passively receive the tasks, but as active protagonists of the construction process. This method led them to deeply engage in the project, to understand art as a pedagogical tool and to achieve the fundamental objective of any academic work: learning.

Finally, although it was not the objective here to discuss the impacts of the project on the teacher involved, it can be said, through spontaneous verbalizations of the same, that the effects were very similar to those of the students, namely, an important involvement, recognition of art and music as a teaching tool and learning about the technical content and the constructed pedagogical process, given that in any process of exchange and interaction the student learns from the teacher, but the teacher also learns from the student or, in other words, "those who teach learn and those who learn teach by learning" (Freire, 2009, p.25)

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