



## Write a Science Opera (WASO): Is there a Motivational Boost in Multidisciplinary and Creativity?

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### Abstract

*Following an initial presentation of WASO – Write A Science Opera - as a creative process based on simultaneous science and art discovery which relies on a dialogue base and acceptance of others' point of view to empower its participants, we pinpoint the concept of innovation as the groundbreaking force of the traditional pedagogical methodology in classroom. Creativity and multidisciplinary are the foundations of the WASO matrix, turning academic content in a process of personal and group build-up; knowledge is therefore emotionally appropriated by its participants, rather than passive acquisition. Emotion-based work developed by subjects is only possible if we regard motivation as the force that drives the evolution since the project's very beginning. We propose, then, to study the subject's motivation, comparing the before- and after WASO-scenarios and trying to set some relation between enrolling this project and perceived levels of motivation. A specific data collection instrument was built and applied to a sample of more than 90 students; results show that there's a significant difference between the levels of motivation before and after the WASO project, being the latter higher. Beyond justifying the presence of creativity and the active construction of knowledge, this opens further new horizons on studying the effects of such creativity based projects on school results, as motivation seems to grow when creativity enters into pedagogy.*

*Keywords:* Music and Art education, music and science, creativity, motivation, multidisciplinary.

### 1. General description of WASO projects

Developed originally by Oded Ben-Horin from Stord Haugesund University College in Norway, WASO – Write A Science Opera – is an established creative process for academic proficiency in sciences, using research in music teaching and music pedagogy to empower students, teachers, opera artists, scientists and musicians. Built on a contributive process from the single idea to the final staging of an opera, WASO tries to enlighten creativity as a common impulse between sciences and arts, so that the path to knowledge is similar in both areas. Furthermore, WASO necessarily requires collective idea generation and a solution-finding process which is dialogic in nature (Ben-Horin, 2014).

WASO is first and foremost focused on science discovery in a creative framework, inspiring a multidisciplinary artistic project. In a WASO project, a scientific theme is chosen to inspire a creative process in a school, culminating in an operatic performance by the pupils. The complete process is guided by teachers from within a variety of disciplines including both science and the arts. Characters, libretto, composition, stage design, costume, as well as PR and budget are designed by the pupils and realized during the project (Ben-Horin, 2014).

These WASO projects are an application of the widespread Write an Opera method, developed at the Metropolitan Opera in New York and then imported and further developed by the Royal Opera House (England). The implementation of WASO is groundbreaking in southern Europe, so we can have a faithful scenario of the project's scope in a different culture from that where it has been designed.

#### 1.1 WASO – innovative pedagogic format in the classroom

Europe is not able to motivate enough young people to fully embrace their innovation potential in crucial science fields. EU documents (e.g. Rocard, 2007) specify teacher skills as a focal point of potential improvement. On the other hand, inquiry-based, multi-disciplinary and holistic teaching environments have shown special ability to motivate, inspire and deepen educational knowledge in science, math and other fields for teachers and pupils alike.

The project's uniqueness lies in leveraging the emotional and cultural aspect of the arts in science learning. WASO then presents the following qualities: a) Fusing inquiry-based arts, science, and education in creative ways, thus providing an innovative look at opportunities of transversal activity; and b) providing potential framework for original ways of questioning and knowledge creation in the



classroom. Implementation is expected to enable the teaching community to experience innovative resources, tools and processes, which bring together science, technology and the arts within the newly developed WASO method.

## 2 Does WASO motivate students and teachers?

Following prior research by Mota (1999) concerning the determinants of musical development in a group of children, there are questions about children's musical self-competence and motivation to persist in music that put forth matters of music content and teaching style. It was found that the decline in motivation and the children's lower evaluation of their musical self-competence after 3 years of formal music education might be explained by an excessive emphasis on aural skills and conventional music notation, together with poor strategies.

On the other hand, if we recall the catalytic dimension of kinesthesia, the choice for an Opera format, rather than other simple and mono-stimulating work of art is easily understandable. Whitmer (2005) says that "music is laden with feelings, and because of that we will typically remember activities it accompanies. Conversely, when we hear certain music the memories attached to it easily emerge. In simple terms, this is because incoming information initially passes through the non-rational part of our brain and the brain must determine whether or not, and how, to recall this new information. Experiences with a high emotional content (either good or bad) will be most easily remembered. Using music as a means to communicate knowledge is particularly effective because the emotional content music carries will often ensure that the information will be remembered quickly and more completely".

WASO then, provides an example of the breaking down of traditional orthodoxy of teaching strategies in the classroom, moving the focus from the scientific content to the pedagogic actors: teachers and students. This doesn't mean that academic content is less important, but it is no longer an anachronistic gift from the teacher to a group of passive students. Knowledge must be active, built from a series of questioning and empirical critics both from the teacher and the student. And this latter image is a higher goal in itself, as we aspire for knowledge to be (pro)active, applicable and meaningful. Academic content thus gains an emotional mark embodied on the built knowledge, permitting the subject to easily identify, recall and manage those images as they are embodied by particular emotions, establishing a proficuous double-way between knowledge and emotions.

The management of this whole process necessarily concurs to define the self, in terms of efficacy and motivation, internally or externally. If attributions of efficacy can determine a pattern of evolution, it's the motivation that drives every action taken, from those basic - as sleeping and eating - to the higher ones, related to completeness of the self. It is this particular dimension that WASO would like to explore.

Portuguese academic curricula are often heavy, poorly organized in terms of time management, non-articulated with other subjects and specifically written test-oriented. Students are fully identified with the traditional way of "giving" lessons; teachers don't have the necessary space, institutional support and formation to try new approaches. WASO tries to inject the time, the space, the need of creativity and communal cooperation, crossing over disciplines and aiming at fruition as a meaningful motivation to complete the task of teaching/learning. Previous WASO projects realized thus far haven't had a statistical approach, but merely a preliminary empirical analysis which has revealed a solid tendency on motivational gain.

## 3 Methodology

The implementation of WASO was generically assessed with a specific instrument of data collection – a questionnaire, constructed later in 2014, and tested among those trainers involved in this project and some students not affiliated with this project in any way. This instrument involved two different sections: the first, dedicated to the characterization of our sample; the second, a number of 44 statements which every subject had to mark their degree of accordance in a scale from 1 to 5, where 1 meant "totally disagree" and 5 "totally agree". These answers will be used in order to identify differences in motivation before and after the project, trying to establish a paired t-test between the expected motivational boost and enrolling in this project.

95 Students participating in this portuguese WASO have answered this questionnaire, which took place during two instances: before the implementation of the process, without any knowledge about the WASO dynamic is made known; after the final staging of the Operas, a moment in which participants can recall and evaluate all the work achieved. This enabled us to perceive which dimensions are valued the more within this new path to knowledge as well as enabling us to access the participant's point of view about any possible changes due to the WASO Project.



#### 4 Results

Pupils tend to agree that creativity is not necessary to learn science (statement 4). For  $d'f= 39$ ,  $T=-0.0368$  for a critical value = 2.0227. After undergoing this project, it seems that students strengthen their first impressions about the use of creativity in learning sciences. But, on the other side, they regard this WASO as a means to teach science ( $T= -4.91$  for a critical value= 1,9743). Note that prior its application, students didn't have any idea about WASO teaching science, and the spotted difference has statistical meaning.

When answering statement 8, "Creativity is a common thing between Music and Science", the results after-WASO show a trend in accepting more solidly this assumption. There is a stronger feeling when linking music and science through creativity after the subjects went on this project. Indeed, when answering to statement 9 "Music does not help to learn Science", students seem not to understand in a strong way that Music helps to learn Science ( $T= 2,69$  for a critical value= 1,9748). There's actually a trend in the opposite way, but it doesn't have statistical length for us to say it is significant. Looks like students enjoy manipulating creativity by itself, but can't build bridges between areas using creativity as a tool for a "secondary" purpose.

Creativity arises relevant questions following these results, but all end in one clear assumption: students don't have (yet) the skills to deal and manipulate in an effective way with creativity within the learning process. Maybe they are too young to deal with such a powerful tool, but it is obvious that students couldn't deal with it productively. In fact, the students say they're less creative after passing this WASO, but the mean difference encountered is not significative, this is to say, the "loss" of creativity doesn't have statistical meaning ( $T= 2,98$  for a critical value= 1,9778). Probably the subjects have rearranged their images and expectations after going through this project.

Speaking of motivation, the results have much more statistical strength than the ones related to creativity. Students were almost unanimous saying this project made them motivated (statement 14), and there is statistical significancy in that perceived motivation boost. This WASO project seems to have accomplished in motivating students. Students also have become more motivated by the idea of writing an opera, showing higher levels of motivation at the end, being this a strong relationship with statistical meaning ( $T= -5.86$  for a critical value= 1,9830).

In a global way, WASO shows us that it can be a powerful tool to enhance motivation in those enroled students. However, more work has to be done to enlighten the paths that creativity opens, this particular referring to science teaching and learning. As an artistic fruition linking science and music, WASO completes its purposes; it would be interesting to see if this method can be helpful in academic achievement, as motivation to science related themes tends to grow robustly.

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