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Geo-theatre as a Way to improve the Motivation in Science Education

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Abstract

According to Italian recent legislative, teachers are required to change the way of teaching in school. The recent Gelmini's Reform has found its theoretical basis in the Gardner's 'multiple intelligence criterion'. The frontal lessons don't improve critical thoughts. The Geo-theatre is an experimentation of the knowledge based on argumentation with the teacher-learner relationship as well as the learner-learner one..

Geo-theatre can be promoted as a psychological, organizational, methodological activity that it can link the learning process to the emotions. The intervention has been tested in a fourth class (17 years old students) of a traditional Italian high school. The teachers organized laboratory experiences and the students were divided in groups and they worked following the rules and canons of the flipped classroom. In a control class the same topics, without experimental methodologies, were carried out The students read the draft of the theathrical script and they completed it with personal researches. Then they played the script. The most sensible debating results was achieved in the experimental classes.. Audience data demonstrates that there was assimilation of specific knowledge in two topics, ("Orogenesis" and "Geosites"), the most-ones mentioned in the representation, around which narrative stories where inserted, like the Similaun Man and the story of the airplane B17. The results demonstrate and support the effectiveness of the narrative approach and strengthens the didactic proposal here formulated.

Keywords: geo-theatre, geoscience education, motivation, debating, protagonism

1. Introduction

"Learning is closely related to emotions and this is more true as the age of the learners is low" (Smorti et al. 2016). Emotions affect the learning process and act as a guide to the processes of making decisions and formulating ideas. In fact, Vygotskij (2006) claims: "Every construction of fantasy affects, in turn, our feelings, so that, though it is not a construction that, in itself, corresponds to reality, the feeling that it raises is a real feeling, really lived, which grabs the whole person." Also, Piaget (1973) underlines the importance of emotions (Piaget & Cook, 1952.): "From the pre-verbal period there is a close parallel between the development of affectivity and of intellectual functions, as these are two indispensable aspects of any action".

According to Gardner (1991), intrapersonal intelligence is in the set of capacities that make us able to form a trustworthy model of ourselves. Gardner annexes also great importance the emotions: the student who enthusiastically discovers a new world and is stimulated in his curiosity, will learn more successfully and with less effort than the one facing tasks that he considers not interesting. The crucial importance of emotions in learning is also highlighted by the connection between the same emotions and memory. In fact, experiences with high-level of emotional participation are catalogued in the our mind as "important" and are likely to be recalled later.

1.1 Theathrical experiences in the past

The first theories about theathrical science were born in Padua in Italy in 1594 as dissections of animals on stage. Later, similar examples to the Royal Society started in London in 1660, with modern scientific demonstrations. In the nineteenth-century, in France, shows were designed and staged, containing magic, science and entertainment, like in Britain with the sensationalism of the experiments. From a communication theory perspective, "Science Theater can be defined as a platform on which dramaturgical tools are used to convey (typically natural) science content to audiences of non-experts. Science Theater can be seen as a patchwork genre that fuses humanistic dramaturgical epistemology with natural science epistemology and content." (Chemi et al., 2015). In their study, these authors argue that the theathrical recitation combining music, colors and images to the oral text manages to reach the catharsis and the identification, intending to cope with the fun, as

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Aristotle conceives it and wit the identification of the transition from ignorance to the knowledge. On the other hand, Chemi et al., support that the stage of ancient Greece had an educational role and the same can be said of the medieval plays or Brecht's theatre

1.2 Goals of the research

The purpose of this work was therefore, to design a Learning Unit (LU) for a scientific theater experience, entitled "The man and the Mount Blanc mountain (cultural value from glacial history to human role)". The choice was made because a geo-tourism theme was used, which allows to contextualize the territory in which students live, enabling to link different disciplines at different time scales and to motivate the students through on-site excursions. The geological matrix seems to be a winning choice because geology is placed in deep times and enables to justify human choices to link different topics such as Literature and Mathematics, Physics, Art, Religion, even to understand a global natural and social plan. Geology represents a background scenario, in the past and in the future prospects. The project aimes also to impact on the school community and on the territory, to create citizens aware.

Frequently, in the full class the discussion follows a triadic model in which the teacher begins the discussion by asking a question, a student answers the question and the teacher then evaluates the student's response (i.e. IRE model Initiate-Response-Evaluate). If the goal is to engage the students in a situation in which they can learn by their mistakes another kind of speech must be implemented. Storytelling can be a way and the theater with all its features can be a strategy in which the students can play an active role that enhances their interest and motivation in a reflective experience by development of "collaborative Wikipedia" contexts. The activity is a multidisciplinary research of scientifically validated sources of documentation for finding facts, news, events (ARE methodologie Assertion- Reasoning- Example).

2. Methods

All the science teachers of the school were involved in the project with a survey to explore their approach in teaching different scientific topics, in particular on the orogenesis and the mountains. The second step was a survey to the students to explore the misconceptions about the mountains. After the SWOT (Strenghts, Weaknesses, Opportunities, Threats) analysis the activity was planned: during these activities there was the observation of the students in motivation and of their progress in argumentation process. At last there was the product' s evaluation (performance). The intervention implemented in a fourth class of a Italian High school was designed on the users' needs. The class council for six months worked for two hours a week according to a timetabled schedule. The hours was planned that would fall back on all the disciplines of the classroom, alternately. The students worked in groups of four members with the flipped classroom methodology. The groups are matched on the basis of the affinity emerging from the analysis of the initial students questionnaire. The teachers had the role of guide and tutorial support. There were several versions of the script made from time to time, loaded in aplatform. The final script was designed to build a unified vision in the order of the contents (Elliott, 1993). The script is composed by six acts. In the first act returns Kant, Carducci, Shelley's throught their works introduce the concept of the sublime, majestic and unattainable related to Mont Blanc. The second act illustrates human events linked to the mountains. In the third act we understand that mountains can change. In the fourth act famous rock-climbers allow the creation of a man-environment relationship. However, only a deep geology knowledge can develop a responsible attitude. The fifth act presents deforestation as the cause of serious repercussions on the natural system that provokes landslide. The sixth act is an educational-formative message.

3. Results

To evaluate the students' progress in the argumentation modes , two researchers independently defined a list of eleven criteria (Table 1). During the experiment two classes worked at different scientific topics by open questions: one experimental and control classroom. The analysis of the open answers by different evaluators was critical for the research, since the range of different ratings generally as wide, however unacceptable. After discussion and sharing ideas the researchers formulated a grid. (Table 1) .

Criterion		Description
C1	Number of sentences	How many sentences are used
C2	Specific words	Related to the topic
C3	Complexity	From a premise to get a result using different forms of the propositions: coordinates and subordinates
C4	Formal correctness	Correct verbal forms, use of the subjects,
C5	Justification	To maintain consistency between hypothesis and theory using the logical evidences
C6	Statistic data	Percentage, average
C7	Bibliographic references	The sources of facts or data or references are cited
C8	Opinion	Personal opinion
C9	Scientific data	Data reported by scientific research
C10	To argue both for and against	To refer to at least one point in favor and one against
C11	To argues schematically	Using bulleted lists, tables, lists, etc.

Table 1 - Criteria grid of debating

The most sensible debating results was achieved in the experimental classroom. The results showed a significant progress for the criteria from C1 to C8. In particular, there was a significant result on the number of sentences (C1). This variability is also related to time in both groups, regardless of the treatment, and the interaction between time and group's membership. This could be interpreted as an introduction to teaching a teamwork mode. Figure 1 supports our hypothesis that a creative writing laboratory promotes in all students the skills that support the "scaffolding" (Bruner et al., 1976) of the competence. C2 is the criterion related to the use of scientific terms and even in this case there is a significant increase in the experimental group compared to the control line that proceeds linearly with the exposure time to the treatment.

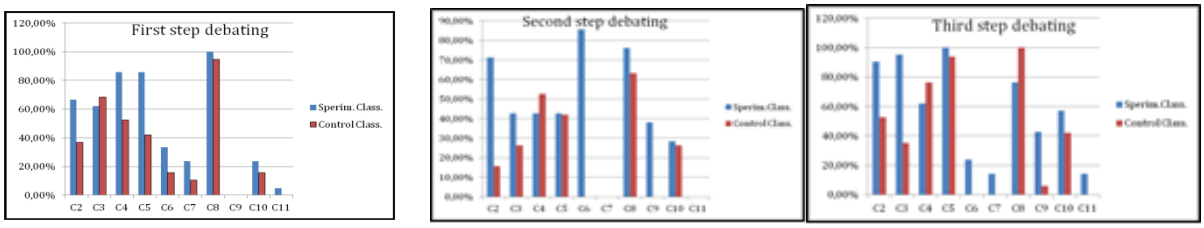

Fig.1 Results of the debating in three different steps

As regards the didactic pathway the observation of behaviors at all stages of preparation and the performance has allowed us to record very positive attitudes. Audience data undoubtedly confirms an increased general interest in the contents, while the case-by-case comparison for each public student on the measurement of the assessment purchases compared to an individual starting level (estimates of the period prior to treatment) indicate a significant increase for two predictors ("Orogenesis" and "Geosites"), the ones mentioned most, the ones we worked on more thoroughly.

4. Conclusion

This experiment isn't finished here. The experience of the scientific theater was so engaging for students as well as for all the staff of the Institute (parents and technical administrative staff) to the point that the experience will continue as a Geo-theatre extracurricular project .

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