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ATLAS MOOC - ENJOY SCIENCE Using YouTube for developing MOOCs in Science Education

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ABSTRACT: The *ATLAS MOOC – ENJOY SCIENCE* YouTube channel constitutes a Massive, Open, Online Course (MOOC) for teaching a series of abstract science concepts and theories of nature of science in a creative, attractive and authentic way. This science course on the web contains 26 educational short films for science education that seek to re-contextualize the nature of science in useful science knowledge integrating key-interests of ordinary citizens. *ATLAS MOOC* lasts for 12 weeks for anyone who wishes to attend it. Its first aim is to provide a friendly and enjoyable online environment for teaching and learning science and to become a focal point for meetings, communication and collaboration between teachers, children, teenagers, citizens and researchers in science education. The content, structure, demographics and function of *ATLAS MOOC* have been analyzed using methodological tools such as the *GNOSIS* research model, SPSS and discourse analysis software focusing mostly on: a) the content of *ATLAS MOOC*, b) questionnaires distributed, c) interviews carried out, d) a series of developed short movies by pre-service teachers attending *ATLAS MOOC* and e) the Google/YouTube analytics of the channel.

KEYWORDS: MOOCs, web-based learning environments, science education, nature of science

I. INTRODUCTION

The aspects of the nature of science need to emerge by re-shaping the image of science that is usually harsh and rigid. Presenting science content accompanied by aspects of the nature of science as something useful and understandable, is a first step to create an image of science that is interacting, shaping and developing into its social, political, economic and cultural background. The *ATLAS MOOC – ENJOY SCIENCE* YouTube channel constitutes a Massive, Open, Online Course (MOOC) for teaching a series of abstract science concepts and theories accompanied by nature of science inputs in a creative, attractive and authentic way. This science course on the web contains 26 educational short films for science education that seek to re-contextualize science knowledge and nature of science aspects in useful scientific knowledge integrating key-interests of ordinary citizens.

MOOCs constitute a new asset for digital educational design on the web. Since 2008, MOOCs have experienced an enormous web impact attracting interest of researchers and Universities (Klemencic & Fried, 2007; Kolowich, 2013; Milheim, 2013). Unlike other online courses, MOOCs have two key features (Pappano, 2012; Stewart, 2013; Breslow et al., 2013; Yuan & Powell, 2013):

- a) Open access: anyone can participate as it is a free online course.
- b) Scalability/expandability: they support an unlimited number of participants.

The dynamics of these creative web based learning environments are considered to be *open* and compatible to education. Particularly in higher education, MOOCs provide free access and quality learning for as many learners as

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possible (Lambrinos, 2005; Kop, 2011; Marshall, 2013; Liyanagunawardena, Adams, & Williams, 2013; Exarchou, Klonari & Lambrinos, 2015). Although MOOCs are newcomers in education, there is an increasing demand for free university courses on the web, creating new space for promising research on the evaluation of learning outcomes and the integration of pedagogical principles (Vest, 2004; Voss, 2012; The Economist, 2013; Perna et al., 2013; Papadakis & Kalogiannakis, 2014).

In our research we try to use the current opportunity the web offers to communicate science to people covering a big range of both ages and interests. Through the promotion of science online and by utilizing the features and benefits of live web based environments, we attempt to present science concepts in a more understandable, accessible, pleasant and attractive way (Beagle D. 2000; Jones M.G., et al., 2002; Nummenmaa, M., 2007). The science education community acquires a new dimension as researchers, educators, pre- and in-service teachers and pupils are offered the opportunity to have a voice concerning what science is appreciated, present their own perspective of science and explore a variety of learning methods (Leci & Seroglou 2016a; Leci & Seroglou 2016b). YouTube now appears to be a promising learning *new world* as it provides a forum for people to connect, be informed and inform, as well as inspire others across the globe. The platform distributes original content creators and has become, in approximately a decade, the most popular free video-sharing website (more than 900 million users per month) for user-created or user-generated content (<http://www.youtube.com/yt/press/statistics.html>). Taking science to the world of hypermedia and applications (apps) and creating a comfortable, secure and flexible interactive learning environment for young people, is the first step to communicate science using a familiar modern multimodal language people like and accept (Wong S. L., et al., 2010; Jones T., & Cuthrell K. 2011; Leci & Seroglou, 2017).

II. DEVELOPING *ATLAS MOOC - ENJOY SCIENCE* ON YOUTUBE

ATLAS MOOC aims to: a) provide a meeting point between citizens, students, pre- and in-service teachers and researchers in science teaching for collaboration and learning, b) discuss about the nature of science in open, friendly and interactive communication, c) produce educational material about science concepts and phenomena situated in their socio-cultural background, d) re-contextualize scientific knowledge.

The *ATLAS MOOC – ENJOY SCIENCE* incorporates short educational films with a variety of science topics on a YouTube channel platform. Documentaries, dramatized documentaries, fiction and action films, animation and stop-motion digital narratives are some of the types of web educational material developed in order to bring together science concepts and theories, nature of science and their socio-cultural background. Each film has been produced in fragments and the final editing has come out with a synthesis that balances the presentation of aspects of nature of science such as the nature of science content, the nature of science context, the synthetic nature of science as a product, the nature of the evolution and methodologies of science, the nature of the interrelations of science and society, the nature of attitudes expressed through science and the nature of values fostered by science.

For the layout of *ATLAS MOOC – ENJOY SCIENCE*, the channel art, the channel icon (profile), an introductory video with an alive, elegant and entertaining character and five main playlists with 4 to 6 videos each have been designed and developed (Figure 1 & 2).

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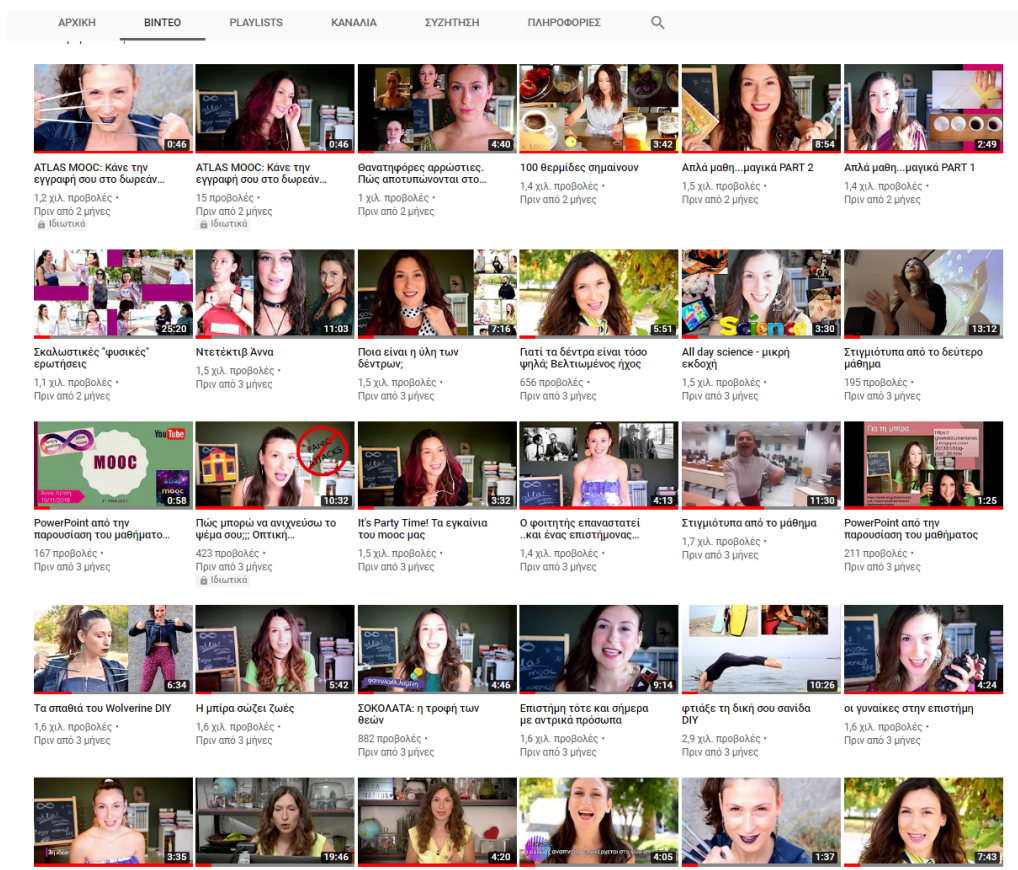


Figure 1: Layout of ALTAS MOOC on YouTube containing 28 videos for science education. (<https://www.youtube.com/channel/UC6DuxmIzi9D0vGXxUZmxCQQ>)



Figure 2: Channel art and icon of ALTAS MOOC. We developed channel art and icon (profile) as well as an intro video layout with an alive, elegant, funny and entertaining appearance to attract YouTube viewers.

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The themes of *ATLAS MOOC* have been organized in five projects that participants have to go through, study and develop tasks, papers and digital educational material as they attend *ATLAS MOOC*. In order to conclude and take a certificate of attendance, participants have to work on all the following projects:

Project 1

- Chocolate, the food of the gods - The short film presents the chemical compounds found in the cocoa tree and how they affect mental and physical health.
- How to turn your bicycle into an electric bike? - A short film presenting a step by step conversion of a simple bicycle into an electric one.
- Why are the trees so high? - A short film describing water aspiration from capillaries, osmotic pressure, water boiling and photosynthetic reactions in trees.
- Beer saves lives – A short film presenting a review on the history of beer production and the contribution of beer to preventing the spread of cholera in London (how the process of fermentation protected the inhabitants from death).

Project 2

- Make your own SUP (Stand Up Puddle) – A DIY film showing the materials and steps needed in order to create a SUB board.
- The male faces of science – A short film presenting male scientists and their work in brief (such as theories of Einstein, Ohm, Max Planck and Celsius).
- A rebellious student... and a scientist is born - A short film about Nils Bohr and his brilliant ways to solve scientific problems.
- How can I detect your lie? – A short film about visual transdermal imaging for detecting from innocent child lies to providing a new technology for health, education and justice.

Project 3

- It's Party Time for our MOOC – A short film with a play on words with scientists' names and scientific theories in with keyword phrases carrying hints.
- Women in science - A short film about women scientists and their research work. The film highlights the importance of their contribution in science and points out the cultural choice of women inclusion in science.
- Swords of Wolverine – A DIY film about creating the swords of Wolverine. The Marvel hero offers the opportunity to discuss about gene mutations and chromosomal abnormalities.
- Science Day – A short film visiting science exhibitions and festivals in Thessaloniki during a Science Day.

Project 4

- Start running! – A short film about chemical and biological processes in our body during jogging.
- What are trees made of? – A short film explaining the organic procedures in trees with interviews in the street.
- Who is guilty? - A short film with a black comedy around the interrogation about a crime.
- Weird science – A short film presents science concepts and people's reaction to them.

Project 5

- Maths like magic! – A short film with mathematical questions and puzzles.
- Make your own slowmation - A tutorial describing step by step the creation of a slowmation.
- 200 calories – A short film presenting a range of different foods that carry 200 calories.
- A short history of fatal diseases - A The signs that left lethal diseases of the past on the skin such as eczema and wounds, as well as their proposed treatment, are presented.

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III. IMPLEMENTATION

ATLAS MOOC lasts for 12 weeks for anyone who wishes to attend it. Its first aim is to provide a friendly and enjoyable online environment for teaching and learning science and to become a focal point for meetings, communication and collaboration between teachers, children, teenagers, citizens and researchers in science education. For 12 weeks in 2018, a pilot of *ATLAS MOOC* has been carried out in parallel with a teacher-training course at the Aristotle University of Thessaloniki. Each participant of this *ATLAS MOOC* trial created five original educational films and completed online tests in order to be certified. This first implementation of *ATLAS MOOC* led to:

- a) 154 YouTube channels developed by the pre-service teachers participating
- b) 720 short movies about science concepts and phenomena developed by the pre-service teachers participating.
- c) 5 questionnaires distributed to 143 *ATLAS MOOC* participants
- d) 85 interviews of *ATLAS MOOC* participants.

IV. EVALUATION TOOLS

The content, structure, demographics and function of *ATLAS MOOC* have been analyzed using methodological tools such as the *GNOSIS* research model, SPSS and discourse analysis software focusing mostly on: a) the content of *ATLAS MOOC*, b) questionnaires distributed, c) interviews carried out, d) a series of developed short movies by pre-service teachers attending *ATLAS MOOC* and e) the Google/YouTube analytics of the channel. The impact on nature of science understanding is analyzed by *GNOSIS*, a research model presented in Figure 3 (Aduriz-Bravo, 2005; Seroglou & Aduriz-Bravo 2007 - *GNOSIS*: Guidelines for Nature Of Science Introduction in Scientific literacy).

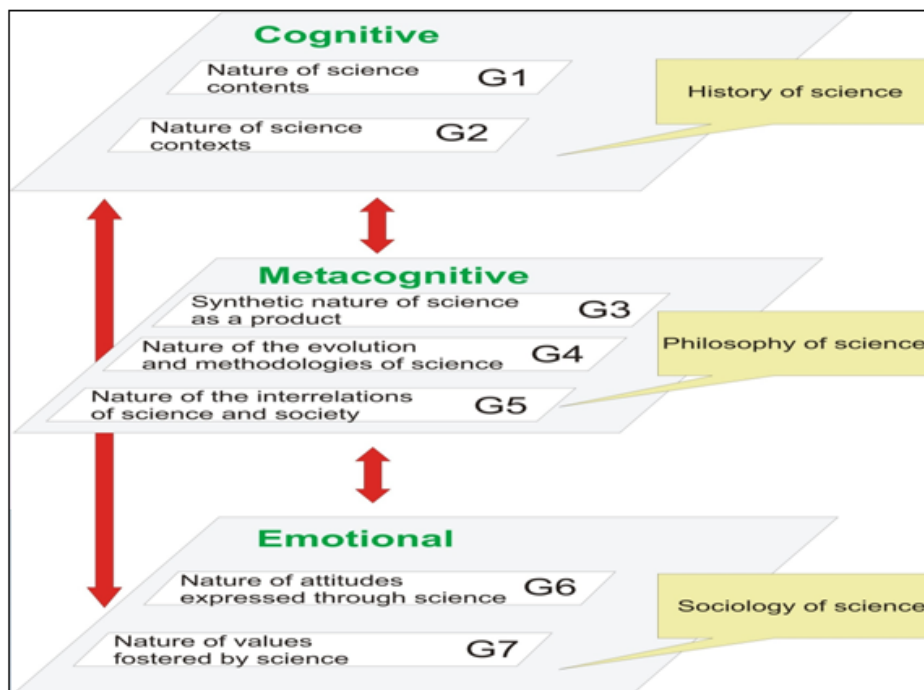


Figure 3: The *GNOSIS* research model is bringing forward the three dimensions of learning in science (cognitive, meta-cognitive, emotional) and seven aspects of the nature of science

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V. DISCUSSION

The analysis of the 720 short movies about science concepts and phenomena developed by the pre-service teachers using the *GNOSIS* research model is encouraging so far. *ATLAS MOOC* appears to act as a creative web based learning environment, that provides people with the opportunity to discuss and represent in their science narratives; not only science facts but the significance of scientific knowledge in people's lives. Pre-service teachers seem to express in their developed educational films cognitive and meta-cognitive output as well as attitudes and values concerning science. Moreover, they shift in a transformative learning experience from regarding science as something alien and remote to realizing the existence of science in the world around them and appreciating the importance of attitudes and values that are expressed through science (Mezirow, 1991; Leci & Seroglou, 2017; Seroglou et al., 2017). Web analytics provide us with fruitful quantitative and qualitative feedback to improve, change and renew the *ATLAS MOOC* environment and content, adapting it to the participants' needs. Members of *ATLAS MOOC* seem to find motivation, perspective and inspiration to learn science and then create their own amateur science movies. This structural transformation changes learning from one-dimensional and one-sided to multidimensional, interactive and never-ending knowledge management. The *landscape* of science education cannot be the same again. Researchers in science education have to confront a challenging demand to tune in the contemporary science culture and the new emerging creative learning worlds.

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