CONVENTIONAL RADIO, THE LATEST MOTIVATION TO LEARN SCIENCE AMONG EUROPEAN YOUTH

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Abstract
Radio has been with us since the 19th century and it maintains the ability to capture your unconscious attention, transmit and disseminate innovative ideas. In the 21st century it has been observed that although broadcasting radio continues to have the same effect on society, it is not always channeled in the right direction to use its fullest potential. Radio is one of the inventions that has been constant and now is when European Young People will be motivated to choose Science, Technology, Engineering and Mathematics (STEM) as the topic of their daily conversations. The lack of exhaustive structured literature analysis on radio broadcasting in STEM education is now motivated by the golds of the STIMEY Project. STIMEY (Science, Technology, Innovation, Mathematics, Engineering for the Young) is a multi-level educational environment that aims to make STEM education more attractive to young people from age 10 to 18 years old by bring science and society together. This paper presents the results of a structured literature analysis on the use of broadcasting in STEM education. Our findings describe the broadcasting from multiple aspects like: STEM Radio as a supportive element, a stand-alone instrument, it's motivating and stimulating factors in making STEM friendly and accessible. Programming style, length and broadcasting hour with respect to factors such as emotional, engaging and belonging. We conclude this study with a discussion of the directions for further and future research for the design of STIMEY 24 hour STEM Broadcasting Digital Radio.

Keywords: STEM Radio, Radio Innovation, Education, Motivation, Learning Tool, Media, STIMEY.

1 INTRODUCTION
Radio has been a valuable mass communication medium since decades. It allows the dissemination of information in a fast and inexpensive way almost everywhere in the world.

Radio has few important functions: it informs, entertains and educates. These functions and roles of radio, especially conventional internet, radio overlap with those of other mass communication media, like newspaper or television. The popularity of radio is due its positive characteristics. The information may be shared fast using radio. A radio is easy to use, portable and inexpensive. Besides that, radio does not need high electric power supply and one does not need to be literate to listen radio.

Radio may be applied to support and expand the formal submission. Especially in Third World countries radio collaborates not only with the impulse of educational instruction of large communities, but also, and more generally, constitutes an option for change and social development.

Educational radio can be understood from a perspective of non-formal education allowing creativity to become "an individual right for each individual to discover their possibilities and, with the initiative, resources and confidence, unblock the inhibitions that reduce their perspectives.

Radio has been a widely used in the education already almost 100 year [1]. Recent studies and reports on education show that radio broadcasting is still widely used in the education both in developed and undeveloped countries [2, 3]. One reason for this popularity is that radio offers a variety of positive qualities for education. It allows the creation and broadcasting of content to specific groups of audiences. This possibility of a goal group orientation enhances the value of radio as an ideal medium in education opening a number of possibilities in networking both locally and globally.

As an educational medium radio may be applied standalone or it may be used jointly with print material or with fieldwork. Besides its educational use, radio is effective also in creating awareness regarding many social issues and need for social reformation, developing interest and initiating action.
The combination of entertainment, social awareness and education opens the opportunities for this research paper. As radio do not need your undivided attention, is to say allowing one to listen to the radio while doing other tasks or just relaxing makes it ideal to be used as a catalyst for creative thinking. It is also a good tool for spontaneous short intrusive STEM tips and motivating programs that lingers in the subconscious mind. In this work we present the result of a literature study focusing the use and potential of radio broadcasting in education.

2 METHODOLOGY

A Structured Literature Review (SLR) was conducted using the following guidelines created by the STIMEY Research Team. 100 random articles from randomly selected journals were systematically analyzed using previously designed research questions. The “Random” method was used to avoid pre-judgement and allow diversity. Several bibliographies were consulted and data retrieved was analyzed.

2.1 Research questions

Broadcasting radio has being used in distance education for quite some time now. Its effectiveness has been well researched and documented. This Literature review is motivated by the golds of the STIMEY Project for the development of its 21st century STEM Broadcasting Digital Radio. The designed research questions are as followed:

- Q1: What’s the effect of Broadcasting Radio Programming our society?
- Q2: What’s the perception of radio in STEM education?
- Q3: How young people in Europe can be motivated through digital radio broadcasting to get involved in STEM?

2.2 Search Strings

Specific terms like "education", "radio", "broadcasting", "STEM" and these terms "motivate", "young people", "Europe", "European", were added to define/limit the search results. The search was conducted using the search expression as shown ("radio in education" OR "using radio as an educational tool" OR "broadcasting radio in STEM education" OR "effect of broadcasting radio in education in Europe" OR "the effect of broadcasting radio on European young people") OR "young people motivated by radio broadcasting" OR "distant learning".

2.3 Studies Selection

The search resulted in 100 papers. The selection was carried out in several steps:

- Step 1: selection based on the titled the paper.
- Step 2: selection based on an analysis of the abstract.
- Step 3: selection based on a full exhaustive analysis of the paper previously selected for their relevancy to the research at hand. The 28 papers most relevant to the investigation are listed in the previous table.

2.4 The Criteria for Inclusion or Exclusion

The STIMEY Team designed the inclusion and exclusion criteria for the data / information to be used in the final studies and these criteria was executed during the research.

The process of extracting information from the primary studies followed an inclusion and exclusion criteria. Primary studies were included according to the following criteria: Written in the English and Spanish languages, published within 1985 and 2016, accessible online and support or refute the research questions defined earlier. The studies excluded were the ones that were duplicated, white paper, prefaces, tutorials and summaries or not related to the objective of the research nor create an alternative objective in the author’s assessment of data already retrieved.

2.5 The Process Validity

The main dangers to the validity of the process are the selection of the papers, possible inaccuracy in
the data extraction, and non-correct classification of studies, possible flaws in the research methods and types, and potential author bias. In order to ensure that the process of selection and inaccuracy in data extraction was unbiased, authors used the recommendations and guidelines of the STIMEY Project.

No solid definition was assumed for the terms used in the search studies. During the study's selection, classifications and findings, at least three authors discussed each paper. When disagreements surfaced, the issues were discussed and if necessary an independent partner was invited to participate in the discussion. All discussions were concluded when a consensus was reached. We could conclude that the possibility exist that during the extraction process some inaccurate data may have been included.

3 RESULTS

The answer to Q1 includes a brief description of the history around broadcasting radio and its effect around the world - its growth, usage and power to connect the society and form communities. Q2 was answered by showing the present state of broadcasting radio answered and its perception in education. Q3 answer reflects the future of radio broadcasting and how young Europeans can be motivated to pursue the interest of STEM.

3.1 The historical effect of broadcasting radio (Q1)

Broadcasting radio was invented as a means of communication based on the science of emitting audio signals through the airwaves. This definition is still used for referring to the sending of audio signals by methods other than radio waves. This is evident in the case of digital internet radio broadcasting. Undisputedly, from our forth fathers, our society has not ceased to find ways to communicate with their peers. The existence of Oral communication has been with us for over 30,000 years, while cueiform alphabet is dated from 3,000 B.C. In this way, the assumption is made that the first civilizations to develop writing reflected their news in written form. However, the first recording in this regard belongs to "daytime minutes", published daily in the Roman Forum from the 1st century B.C. by order of Julio Cesar.

After the invention of telegraph in 1836 by Samuel Morse, the gateways were open so that years later the German physicist Johann Philip Reis, was able to transmit musical notes, which gave way for the Anglo American inventor Alexander Graham Bell to invent the microphone in 1877. This compelled him a step further to invent a phone to transmit and receive human voice. In 1895 the Italian, Guglielmo Marconi, impacted us with the invention of the first apparatus that managed to send signals over several kilometres using a directional antenna. In the following year the Russian, Alexandr Popov, presented to the Russian Physical Chemist Society a radio product. It didn't take long for the first radio broadcast to take place in the United States (1906).

For the next 60 years community antennas were raised to improve the reception and the broadcasting industry took off and with the invention of television radio has learned to redesign itself to the changes and invention in our society. After the first public email demonstration by Arpanet in 1972 (USA), in 1983 the Internet was born, as part of Arpanet, which short lived as such until 1989. Meanwhile in Europe (1984) the European Broadcasting Union (EBU) published the specifications of the broadcasting system known as Radio Data System (RDS) using surplus in bandwidth used to provide the listener with digital information. It didn't take long before the British computer scientist, Timothy Berners-Lee, developed the World Wide Web (WWW) for the European Organization for Nuclear Research (CERN) in 1989. Back in the United States the Federal Communications Commission (FCC) assigned a part of the radio spectrum to be used for Satellite Digital Audio Radio Services (SDARS). Since then numerous digital systems keep popping up, such as Eureka 147 Digital Audio Broadcasting (DAB) and Digital Radio Mondiale (DRM) in Europe and In Band One Channel (IBOC)/ (IDAB) in the USA. DAB and IDAB are widely used today. Digital Audio Broadcasting (DAB) [4] store 22 channels and provides great stability with the capacity to overcome all kinds of obstacles and failures in transmission and reception. This ensures higher quality when the signal is reduced than its counterpart the FM reception.

As Ana Marta Ersoch [5] says in her review of "Radio in the digital age" (Martinez Acosta, 1997) "the Decade of the nineties being protagonist of a revolution of singular significance in the radio medium (...) the DAB is a digital broadcasting system developed in the project Eureka 147 of the European Union in order to create a valid digital sound broadcasting system for terrestrial networks and satellite
fixed and mobile (...) arises as well to meet a number of needs identified in the middle." And "it is regarded as the first great technological change of radio from the development of the frequency modulation, stereo, and transistor (...) the DAB is rather more (...) must understand it as a part of the digital integration of all media requiring telecommunications”

3.2 The perception of broadcasting radio and education (Q2)

The quality of personal, academic and professional decision-making depends on maturity and training based on complex educational process that fosters capabilities and competencies to be able to act with autonomy and responsibility to choose between different alternatives [6]. In a society that focuses on the quantity, quality and effectiveness of education, no one can call into question the need to improve the principles of sharing, engaging and implementing training for students of different educational levels. We are moving toward a teaching-learning-integrating society in Europe that fosters the need to establish a multilateral communicative educational system. The different European cultures, customs, beliefs and lifestyles surface the need for a unification catalyst. The Erasmus Plus program funded by the European Commission has taken the role as such catalyst to bring European youth through education to accelerate the unification process.

Science, Technology, Engineering and Mathematics (STEM) were normally taught in formal institutions throughout Europe. The media and information technologies are sources of messages that can serve as support for sharing and collect data. STEM is one such data that can use this means of dissemination to reach all levels of our teaching-learning-integrating with Conventional Digital Broadcasting Radio (CDBR)

We cannot be oblivious to the fact that, the presence of technologies of information and communication (technology ICT) in today's society has risen new schemes in the relations among young people through Europe to the point of becoming a high speed train of persuasion, influence, consumerism, manipulation, fashion, lifestyle, information, knowledge, entertainment, interpersonal encounter, dissemination, participation, etc. A combination of these trends, in many cases, generate attitudes of dependence and misuse of the media, subtracting protagonist of the initiative, criticism and personal reflection, due to a lack of guidance. The STIMEY Team thinks that Conventional Digital Broadcasting Radio (CDBR) could serve as that guidance.

The need to acquire communicative competence to deal successfully with audiovisual and technological discourse that surrounds us is somewhat challenging. The educational and social achievements from informal formation not only serve for choosing lifelong careers but also contribute to rational and irrational behaviors with our pairs. The technological resources are currently growing at an unbelievable pace, with very higher expectations for future short and medium term effects on the society. Each year new technologies are applied to education and communication which have resulted in great changes and profound transformations. These technological resources can be used as an informal educational and social guidance applying strategic dynamic participatory interactive learning processes with radio broadcasting could be the ideal tool for motivating European youth to speak STEM.

3.3 Broadcasting Radio As A Motivating Tool (Q3)

The integration of media and the change in attitudes towards innovation and technology in the society and among young people leaves no doubt that broadcasting radio would be the perfect tool for motivating young people. The European Union has realized this phenomenon and to its advantage it is stimulating the use of technological and innovative model in education through projects like STIMEY, with the expectation to unite and to innovate the different European educational system. All levels of society, especially its young people communicate and identify themselves with the music and audio programs they listen to. Digital Broadcasting Radio as its older counterparts has the ability through constancy has the effect to stimulate human behavior. As Moreno [7], "technological image and sound penetrate our lives and determine not only what we eat, drink or do, but even what we wish and dream, because the media have come to fill a series of substitutive satisfactions of direct and real experiences.” In this phenomenon it is even greater today with the technological advances in the broadcasting and social media. Through the study carried out during this investigation it was recognize the emerging power of socializing and sharing among young people. Ponce [8] insinuated that a child cognitive processing depends on information obtained from distinct sources and that is an important reason why the media has such impact on that child’s behavior. Ponce continued “…not only by the contents of the communication, but by the use which is made that information".
Organizations like UNICEF encourages this community to engage more in the development of programs to positively shape the society. Radio and television play a vital role in informing and raising awareness on global issues. In the same sense radio can be used to bring awareness to STEM in Easter and also Western Europe - a radio which sole purpose is to effectively promote STEM among children. Events like International Children’s Day of Broadcasting that is held annually on the first Sunday in March gives broadcasters around the world direct insight of the effects of broadcasting on young people. With that said, it is clear that a well-researched broadcasting strategy and methodology will motivate young people to include stand conversation and communication in their daily Communication. Recording Merayo [9] findings on the organization and grouping radios, nevertheless they all share one thing in common “… they try to achieve non-trade objectives and orient themselves specially and directly towards a social purpose”. Perona [10] when he speaks of the radio and new experiences for education “technological convergence and, especially, the consolidation of Internet as a platform for dissemination and inference of multiple contents textual, audio, visual and audiovisual (…)” In this way radio and internet through the STIMEY Educational Platform new experience will be achieved as the STIMEY radio drives new motivated user to STEM.

For this we should consider what Obama [11] rightly asserted in 2013: “One of the things that I’ve been focused on as President is how we create an all-hands-on-deck approach to science, technology, engineering, and math. We’ve got to do everything we can to make sure that we are giving these young people opportunity to pursue their studies and discover new ways of doing things… After all, the science fair projects of today could become the products and businesses of tomorrow.”

4 CONCLUSIONS

Specific target groups have been identified, as different audiences that will view the project under different contexts. Target group identification was based on potential users who are affiliated, potentially interested and/or need to be motivated towards STEM. Four classes of target groups could be created according to the interest and influence of the stakeholders. The classes are:

- a wide range of potentially interested stakeholders (school and academic institutions),
- the scientific and teachers community,
- STEM oriented companies and enterprises, and
- potential end-users, which are the most important target group of the communication and dissemination strategy for STEM contents: European young people.

4.1 STEM radio design needs

A STEM Radio would be an important tool that aligns with all communication channels.

To design an effective STEM Radio programming we needed to conduct several surveys, interviews and questionnaire to retrieve initial data regarding the routines that characterize European youth day to day activities. For this reason a series of a preliminary study based on different European countries, schools, extracurricular activities and family routines. A preliminary study will address following issues:

1. At what time young people wake up in the morning (ages 10-12, 13-16 and 17-18 years old)?
2. Is there a time for resting after lunch? SI/NO ¿ How long?
3. The school study timetables sport and break schedules. (Ages 10-12, 13-16 and 17-18 years old)?
4. Given a list of subject area to be ordered from most to least interest for young people (ages 10-12, 13-16 and 17-18 years old) Technology, Music, Travels, Reading, Cinema, RRSS, Training, Politics, Fashion, Employment, ONG, Leisure and Sports.
5. Given a list of Contemporary music area to be ordered from most to least interest for young people (ages 10-12, 13-16 and 17-18 years old) Pop, Rock, Tecno, Dance, Hip Hop, Latino, Classic, Punk and Flamenco.
6. At what time young people normally go to bed (Ages 10-12, 13-16 and 17-18 years old)?
4.2 STEM radio strategy

Among other studies, the data will be used throughout the lifecycle of the STIMEY Project to build the STIMEY STEM RADIO STRATEGY that aims to:

- Ensure that the vision, objectives, activities and results of STEM RADIO become widely known and understood from the major target groups, stakeholders and end users point of view.
- Deliver clear, concise messages to high-level stakeholders, decision-makers, and end-users and develop an effective channel for the exploitation of STEM contents and technologies.
- Create a gender balanced STEM oriented community that motivates, stimulates, and educated European youth.

ACKNOWLEDGEMENTS


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