

THE ROLE OF CINEMA INTO SCIENCE EDUCATION

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Abstract

Reforming science education – from educating educators, to developing standards, to improving access for all – is a worldwide challenge that is essential if overall improvements are to be made. In science education, it is more and more widely discovered that “horizontal teaching” – when teachers take students by the hand and lead them on a voyage of discovery, stimulating their observation and experimentation skills, imagination, curiosity and reasoning capacity - enhances students’ intellectual and manual capacities enormously. This purpose discusses the role of cinema as a tool for the science education. The target was to explore the effect of using movies on the learning and retention of simple and integrated science knowledge. New educational approaches and methods that are inter- and transdisciplinary and issue-driven need adopting, and participatory practices and methods must be endorsed, to prepare young generations to live in a world of constant change. Based on the socio-interacionist approach by Vygotsky, it is acceptable that an audience can interact with the characters and share their emotions and actions showed in an audiovisual language. On this way we analyze some movies considering the potential of audiovisual, scientific and common languages to be used as a tool to mediating science teaching and learning. Furthermore, the audience can learn values, information and knowledge present into the movie discourse and thus, the cinema shows the science in a society. Moreover, audiovisual language may be important mediating variables that determine the effectiveness of cinema for enhancing science teaching and learning. If science and society want to get along they must learn to communicate more and better. No one says that it is easy, but it is the price today in a mature democratic society.

Key words: audiovisual language, science, context.

Introduction

We are living in a period of very rapid growth in scientific knowledge, much of which is quickly utilized in the creation of new technology. Science and technology are in the present day the greatest factors in changing the way we live. They have also made the world very small, so that we are longer live in the confined world of our town, region, or country isolated from what is happening in the rest of the globe (Härnqvist & Burgen, 1997).

While there are changes in the views of the nature of science and in the role of science education, the increasing prevalence of Information and Communication Technologies (ICT) also offers a challenge to the teaching and learning of Science, and to the models of scientific practices teachers and learners might encounter.

The scientific view of the world and of objects within in has arisen by the application of a complex of observation, theory and experiment, seeking always to find a better understanding of the problem under study. Due to its progressive nature, in which new findings are continually added, the explanations offered by science are not fixed but subject to refinement.

If we accept that some knowledge of science should be part of the education of every child, we need to think how best to provide that education.

Arroio (2006) indicates that the problem of educational innovations in science education might be properly treated by analyzing the complexity on the basis of methodology of teaching. The preservice science teacher should have deep knowledge of the objectives on the classes, type of classes, topic of the course, preparation of students and other factors, that influence directly and indirectly the results of the educational process. The preservice teacher should know theoretically and practically each one the modern methods and to apply them correctly in practice, together with other methods and technologies.

Motivation, to be successful, and science education is no exception, has to rely on a rich repertoire of experiences on which to build conceptual learning. These experiences pave the way to the construction of meaning, which in turn supports learning. It also helps to entertain, create or re-create a sense of wonder, which becomes the true incentive for learning.

It is therefore important to think of education systemic term, not limiting the student's experiences to what can possibly take place in the classroom. The role of alternative learning environments therefore becomes critical as a prelude, a complement a follow-up to the school-based learning process. Experience comes from interaction with a learning environment.

This purpose discusses the role of cinema as a tool for science education. Exploring the effect of using movies on the learning and retention of simple and integrated science knowledge.

Methodology of Research

Audiovisual sources has an undeniable influence on the quality and quantity of experiences which make up the cognitive domain of youngsters today, given that watching TV, for example, is the second activity, after sleep, to which children devote most time (Fisch at al, 1997). Hence there have been calls from different walks of life for the need to provide students with a form of "audiovisual literacy" so that they can correctly process this information.

Movies are very popular for the youngsters, so here we report a movie analysis based on the film analysis (Jahn, 2003) but considering a vygostkian perspective (Vygotsky, 1978) about contextualizing the scientific contents. First, we select some commercial movies looking for how we could take educational advantage of them. It is necessary a primary view focusing on the audiovisual language to realize if this movie are able to communicate with the audience, youngsters in special.

After that, the second view is focused on scientific contents presented on scenes of the movie. The third view is focused on the way that how these scientific knowledge's are presented and it have to be checked about possible mistakes to think about how we can contextualize it on science classroom. The forth view is important to select and edit some short sequences more suitable to use to teach and learn science.

The next step, we can use these episodes to organize classroom's activities based on selected episodes of the movie as a cultural tool to contextualize the scientific content and motivate students to our science classes.

We report a movie analysis of Erin Brockovich focused on the environmental problems. Nowadays we consider the environmental problems are a contemporary discussion, especially about Climate changes. So this movie is really an important tool to contextualize and engage students to this scientific content that have a strong influence in our life.

Results of Research

A movie is a multimedia narrative form based on a physical record of sounds and moving pictures. Movie is also a performed genre in the sense that it is primarily designed to be show in a public performance. Whereas a dramatic play is realized as a live performance by actors on a stage, a film is show in a cinema, is not a live event, and can theoretically be repeated infinitely without a change. Like drama, film is a narrative genre because it presents a story (a sequence of action units).

In a world where heroes are often in short supply, the story of Erin Brockovich is an inspirational reminder of the power of the human spirit. Her passion, tenacity and steadfast desire to fight for the rights of the underdog defied the odds. Her victory made even sweeter by the fact that while helping others, she in turn helped herself. Erin Brockovich a 2000 movie which dramatizes the story of Erin Brockovich's first fight against the West Coast energy giant Pacific Gas & Electric Company (PG&E).

We are assuming that a movie, like a play, is mainly a performative genre, that is, a genre designed to be performed, a genre that "comes to life" in a performance. Watching a movie, like watching a play, are a collective public experience and a social occasion. We have to remember that, experience comes from interaction with a learning environment.

Erin Brockovich is an unemployed single mother, desperate to find a job, but is having no luck. This losing streak even extends to a failed lawsuit against a doctor in a car accident she was in. With no alternative, she successfully browbeats her lawyer to give her a job in compensation for the loss. While no one takes her seriously, with her trashy clothes and earthy manners that soon changes when she begins to investigate a suspicious real estate case involving the Pacific Gas & Electric Company. What she discovers is that the company is trying quietly to buy land that was contaminated by hexavalent chromium, a deadly toxic waste that the company is improperly and illegally dumping and, in turn, poisoning the residents in the area. As she digs deeper, Erin finds herself leading point in a series of events that would involve her law firm in one of the biggest class action lawsuits in American history against a multi-billion dollar corporation.

Movies viewers' come with a large number of (mostly unconscious) expectations about how the filmic medium presents a real or fictional story. Above all, one generally assumes that the film creates a verisimilar or at least likely world, a world that runs on laws of nature and logics and is, by and large, compatible with what might count as a fact or a possible experience in our own world. It is the film's reality effect (Barthes, 1982).

As we can notice, the character Erin is a normal person like everybody, and most of the people can establish a relationship like identification process with this character. Her problems are the same to our everyday problem. It is real, the problem like one that we can have in our neighborhood. She is human like us.

Although the local citizens are initially leery of becoming involved, Erin's persistence and the personal interest she takes in their lives makes them listen. A kindred spirit, Erin is one of them, and her ability to connect with them on their level makes them comfortable, ultimately earning their trust. Helping her out is her next door neighbor George, a Harley Davidson biker whose friendship and support allows her the time to pursue the case. Going door to door, she signs up over 600 plaintiffs, and Erin and George, with the help of a major law firm, go on to receive the largest settlement ever paid in a direct-action lawsuit in United States history \$333 million. By triumphing over insurmountable odds, she is able to prove herself, and reinvent her life.

We learn science to improve our life, not just to get success on the school exams. Analyzing this movie, we can show where it is possible find science outside the school and how science is important to us. Science is a complex of specific, situated human social and cultural activities. Science as a total system of social activities is not merely research science; it includes all the use of scientific practices in the workplace, in the home, in the environment. It is science as science is done and used by those who are trained to use it according to the norms of our society.

The fact that Erin Brockovich was not a lawyer and did not have any formal education or experience as a law clerk or a paralegal, made her victory that much more impressive.

These assumptions are very helpful because we can actively exploit them when we are facing difficult, incomprehensible, or illogical data. The most common strategy in this case is to "naturalize" the information so that it becomes interpretable according. Now we present scene description where it is possible to discuss scientific content especially the problem of corrosion and chromium pollution.

Erin visits a professor at a nearby college to learn more about chromium and finds out that there are actually a couple kinds of chromium and that the harmful chromium 6 can cause a wide variety of very serious health problems in the case of prolonged exposure. The professor also tells

Erin that chromium 6 is in the water used to cool piston engines at factories to prevent corrosion.

We have an opportunity to discuss some specific content with students but in a contextualized way. It is possible to contextualize the corrosion process showing it as a result of reactions between a material, typically a metal, and its environment, resulting in an oxide (eg. MgO) or salt (eg. MgCl₂) of the metal. This causes the metal to become weak. In an industrial setting, this must be protected against to preserve the machines that are used and are often made of metal.

Chromium is a transition metal which can have different oxidation states that result in different properties and reactions with other chemicals. When the professor describes in this scene that hexavalent chromium also referred to as chromium 6, chromium (VI), or Cr⁺⁶ is very dangerous form of chromium. Two common forms of chromium are trivalent chromium (Cr (III)) and hexavalent chromium (Cr (VI)). Trivalent chromium is more common in natural settings and commonly found in soil whereas hexavalent chromium can be found in industrial settings and is not as safe as Cr (III).

The emotions, is another way to engage students to class activities. It is possible to purpose discussion about health problem from environmental pollution. The movie show different medical cases of residents that are brought up and many of these side effects are present.

It is showed one problem with chromium (VI) when it is ingested by the residents in the area due to its presence in their water. Among problems caused by ingesting chromium (VI) are various forms of cancer, respiratory diseases, kidney failure, gastrointestinal problems, reproductive problems, as well as nosebleeds, headaches, benign (non-cancerous) tumours, and hair loss. Workers in plants where chromium (VI) is present also experience problems with inhaling it and as it comes in contact with their skin.

When ingested, hexavalent chromium can cause problems in various systems of the body, including but not limited to the liver and kidneys, the reproductive system, and the respiratory system.

The STS (Science-Technology-Society) (Zoller & Wattson, 1974) strategies are illustrated in this movie, the social, economic and environmental relationship with science. As suggested by the professor in the movie, the Cr(VI) is added to the water that is used to cool the engines. This is what caused the contamination of the ground water of the areas surrounding the PG&E plant. The hexavalent chromium is used in the industrial setting to make dyes and pigments as well as bricks for furnaces, and also to tan leather and preserve wood. In Pacific Gas & Electric Company (PG&E) it was used in their piston engines to prevent corrosion.

Another advantage is that on this way we are preparing students to read the movie, because read is more than just watch. Read to get information and they are able to have a critic view about mass media that use audiovisual language. Students used to spend many hours in front television for example, and this media is one of their source of information. Reading is not only the basic tool of learning, but it also has a practical role in everyday life.

According to Lemke (1990) classroom education may still have an important role to play. Especially for the youngest students, but even for those who are already full participants in adult society, the classroom can provide a time for reflection, for abstraction, for analysis of practice, for consideration of alternatives, for theory.

Conclusions and Discussion

Students can develop the ability of reading this media (movie). Ability of reading with understanding makes it possible to learn by oneself and achieving wildly understood the intellectual development of one's personality. This ability is the requirement of gaining good results in learning, as well as being successful and flexible in fitting into the modern world. That is why teaching this ability is a priority for teachers of all subjects since the first years at school.

The ability of reading with understanding is the most important factor in achieving knowledge at all levels of education. This process consists of: understanding the sense of words and sentences included in a narrative (text, movie, tv, book), recognizing the elements of the content, the selective choice of important parts of the content, finding the information and main ideas, searching and explaining the logical and factual relations between the elements of the content and integrating it, the ability to follow the author's way of thinking, making conclu-

sions and criticism of the content.

Based on the socio-interacionist approach by Vygotsky, it is acceptable that an audience can interact with the characters and share their emotions and actions showed in an audiovisual language. Socio-cultural theories of learning draw on Vygotskian theory can provide a way of considering these issues in terms of the way ideas developed on the broader social plane of the classroom may be appropriated by individual learners. According to Vygotsky, the language mediate the cultural transmission process of knowledge acquired by humanity, without the language, is it almost impossible that teacher's words make sense for students.

Reading with understanding can be receptive (identification and selection of the information), critical (criticism of the information) and creative (making problems and ideas). The extend of understanding the audiovisual text depends on many factors, for example: knowing the techniques of reading, knowing the meaning of words and expressions, the type of audiovisual elements and knowing the basic elements of audiovisual language. The ability to make rational judgment is needed by all people in society whether or not they will themselves be engaged in scientific activity.

The role of cinema into science education can achieve an ambitious target, the integration of natural science education. We can use this media as a cultural tool with multiple reading for each science field and integrate these fields. Ideas about integration of knowledge from natural sciences were adopted into education programs of international organizations with the support of UNESCO like Leonardo da Vinci and Socrates programs.

Integrating multiple reading, for example chemistry, biology and physics, in one movie, we can purpose to students to see beyond borders of their subjects, to understand the development of structures from these most simple up to the most complex and find integration viewpoints, therefore the solutions of this situation have to be searched for in the innovation of preparation of teachers of scientific subjects.

The use of audiovisual tools at the lecture allows catching student's attention and traditional approach to the same subject matter. Moreover by means of audiovisual tools we can demonstrate such effects or unique equipments that we would not be able to show in lecture otherwise. In conclusion we can say that the use of audiovisual tool as didactic tool in teaching-learning science process leads to the improvement of its quality.

Science alone will not make the world a better place. Learning the results and methods of scientific research will not in itself help students make better lives for themselves. We must all learn to understand how science and science education can help us help ourselves. Science education still has a great potential for good, but only if we take the true path of science ourselves, rejecting what has been and exploring together new ways of thinking, teaching, and learning (Lemke, 2005).

We noticed on this movie analysis the potential of audiovisual, scientific and common languages to be used as a tool to mediating science teaching and learning. Furthermore, the audience can learn values, information and knowledge present into the movie discourse and thus, the cinema shows the science in a society. Moreover, audiovisual language may be important mediating variables that determine the effectiveness of cinema for enhancing science teaching and learning. If science and society want to get along they must learn to communicate more and better. No one says that it is easy, but it is the price today in a mature democratic society.

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