

**Science Communication and Critical Pedagogy – A pathway to include children as
subject of rights, politics and knowledge**

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Abstract

The EU-FP7 funded project “SiS Catalyst – children as change agents for science in society” is analysing the interrelationships between science communications as a practices of social exclusion or a practices of social inclusion taking into consideration two perspective in science: science as a knowledge that serves people or science as discursive formation that control people.

Analysing the history of children’s right, the separation of children from public life and the demand for active participation and citizenship, introduces the demand for paradigm shift in science communication toward a dialogical attitude in science communication which considerer children as subject of knowledge, rights and politics

Principles of Critical Pedagogy, Theatre of the Oppressed and The Pedagogy of The Oppressed are introduced as references to reinterpret the work with children in science communication and develop a space for critical reflection and redevelopment of Science in Society Activities based on values of equality, differences, equity and democracy.

The Dialogic Approach to SiS Catalyst toolkit based of Critical Pedagogy, Theatre of the Oppressed and The Pedagogy of the Oppressed offers an insight to invent new ways of engaging with children and developing a balanced relationship considering asymmetrical differences.

Science has had a great impact in human life and its development has reshaped the earth changing the landscape of the world, destroying natural resources but also

proposing way of preserving environment and making life sustainable. Since the Copernican revolution Science has change the way one relates to oneself and to the others. The Copernican Revolution was the paradigm shift from the Ptolemaic model of the heavens, which described the cosmos as having earth stationary at the centre of the universe, to the heliocentric model with the Sun at the centre of the Solar System. Beginning with the publication of Nicolaus Copernicus's *De Revolutionibus*. The astronomical discoveries associated with Copernicus, Galileo and Newton had revolutionised Western man's perception of his position in space.

Charles Darwin established that all species of life have descended over time from common ancestors, in his scientific theory, that this branching pattern of evolution resulted from a process that he called natural selection, in which the struggle for existence has a similar effect to the artificial selection involved in selective breeding. Darwin denied that mankind owed its existence to a special and unique act of wilful creation.

The science suddenly has occupied religion's place, religion that had a central position in producing all the truth about human beings and about the universe was replaced by science. The scientific discourse took over the position of power from the religious discourse. The scientific method based on doubt and evidences superseded a believe system which support a power structure in society. Therefore science has become a force which contributes to the democratization of information in society.

However one might argue that science has occupied the place that religion had in the past in two ways by producing knowledge relative to certain condition, which can be questioned and verified by others. But also replaced religion becoming also a believe system that produce knowledge based on trust and faith, science perhaps has become also a religion system.

Michael Foucault's work demonstrate how science became a believe system that sustain a power structure in modern societies. The concept of biopower explains this injunction of power and knowledge, Foucault fostered the concept of biopower, he argues that biopower is a technology, which appeared in the late eighteenth century for managing populations. Biopower is about managing the births, deaths, reproduction and illnesses of a population. Science has been presented as an argument to intervene in

people's life taking them deprived of any rights as Agambem put it barelife. Agambem notion of barelife are human subjects reduced to a naked depoliticized state without official status and juridical rights.

In book *The History of Madness* and later in *Discipline and Punish* Foucault describes a movement across Europe in the seventeenth century, which saw the establishment of institutions which enclosed people who were deemed to be 'unreasonable' based on scientific discourse. This included not only mad people, but the unemployed, single mothers, defrocked priests, failed suicides, heretics, prostitutes, debauchees, delinquents. Children were confined in orphanages, schools, juvenile prisons and mental hospitals. Science in this sense is presented as an instrument of control, exclusion and oppression.

Children as Subject of Rights

According to Aries(1978), the idea of childhood separated from adult life is a invention of the 19th century. Ariès argues that childhood was not understood as a separate stage of life until the 15th century, and children were seen as little adults who shared the same traditions, games, and clothes.

This is a very controversial idea which received several critics however what Aries underlines which remains unchallenged is the separation of children from public life: "a long process of segregation which has continued into our own day, and which is called schooling' and he talked in this connection about 'this isolation of children, and their delivery to rationality.'" (1978, p. 16) Through out this process children have lost their position as participants in society. The voice of children has been silenced in the public realm and in its institutions.

The UN convention 1989 introduces the idea of children's participation as a mandatory human right. Participation is a fundamental part of citizenship. It is the process by which children and young people can influence decision-making which affects their lives to bring about positive change. Participation is not solely the act of expressing an opinion and having that opinion taken seriously, but of being able to construct that opinion freely through accessing information and meeting and debating with others, which is directly related to science and science communication.

The notion of children as subject of rights according to Fass(2013), it is something that comes out of an ideal of human rights that starts in the seventeenth and eighteenth centuries with the Enlightenment and it realizes truly in the twentieth century. But the idea that there are things that are owed to children really is earlier than that and it comes with the monotheistic religions of the West—Judaism, Christianity, and Islam all propose that children need certain kinds of protections and they have certain kinds of rights as points out Fass(2013).the monotheist religious traditions also provide children with certain kinds of rights embracing rights of inheritance, rights to shelter and to be taken care of and, in the case of Judaism and Islam, also the right to an education, a religious education.

The actual conception of rights, which is vested in the individual, really comes out of the seventeenth and eighteenth centuries with the Enlightenment and the emphasis on the individual, which was then developed through Locke and Jean-Jacques Rousseau in terms of children and the role of children in that philosophical tradition.

By the late nineteenth century, anti-child labor laws, which often go along with compulsory schooling laws, begin to see the child as having certain kinds of needs that both the family and in the absence of the family's ability to do so, the State should step in and provide for the right to be schooled, for example, and the right not to be exploited and not to be abused. It comes in the context of a sentimentalization of children, so children are endowed with certain kinds of characteristics; they are innocent, they are vulnerable, they are dependent on adults for care, a vision of childhood that requires that children be set aside in their own institutions. They are the rights of protection and the right to be treated as children and children are seen as other kinds of creatures; they are not at all adults and they need protection.

The two World Wars in the twentieth century were fundamental to the way children's right has been perceived today because the extreme violations of children's right and human rights that took place during the wars therefore the subsequent reaction and affirmation of these rights. These two wars really do set the stage for the shift that ultimately comes later, not with the initial and earliest 1959 declaration of the rights of the child but eventually with the United Nations Convention 1989, which sees that children themselves have to be invested with rights. It is not only the rights to be

protected, but active rights so that, if necessary, they can actually protect themselves, which is a radically new perspective, that children are subject of rights, having their will and interested protected by rights from the adult.

This notion brings a total new dimension to adult-child relationship in all spheres family, state and society. It interferes in the adult-child relationship, child-child, institution-child relationship, science-child relationship demanding a paradigms shift in education, science, parenthood, care and justice system. Children should be taken into consideration and their voice should be heard not only as object of adult/scientific discourse but as subject of knowledge, rights and politics. But the question that remains in how to promote this shift in a society, which were formed and shaped in another paradigm? How promote this change in science communication?

Science Communication

Science communication generally refers to public communication presenting science-related topics to non-experts. This often involves professional scientists and science communicators - organisers of the activities, facilitators, explainers, guides, demonstrators and scientists involved in presentations, workshops, lab visits and museums. Science communicators may use entertainment and persuasion including humor, storytelling and metaphors. Science communication might be a way to inform people about the process of producing knowledge and thus including people in the complex contemporary world, as well as a process of exclusion, by showing the scientific outcomes without sharing the scientific methods of producing these outcomes, therefore alienating people from understanding the process and turning them only believers. Often Science communicators and scientists perceive their audience as a group, which they should give information and convince with the science truth, placing them in a passive way. Science communication becomes only a process of transferring information. This model of education Paulo Freire calls the bank model of education. Freire uses this term to describe and critique the traditional education system. The name refers to the metaphor of students as empty containers which educators must launch knowledge into. This reinforces a lack of critical thinking and knowledge ownership in students, which in turn reinforces oppression and exclusion.

The growing of the scientific field creates the need of a communication scheme to disseminate its findings and attract more followers in society. This communication scheme relies on an apparatus of institutions such as Science Magazines, Science Museums, Children's Universities, Access programs, etc. One big challenge in this field is how to disseminate science through scientific means, especially when children are involved. The scientific method is based on observation, questioning, experiment, analysis, findings and doubt. It requires one's attitude, which involves patience, discipline, perseverance, disbelief and above all questioning. However very often SiS activities are offered under the slogan "Science is fun". This simple slogan presents two major problems. The first one is that Science is not fun or at least most of the time is not fun. The second is the assumption that children will only enjoy fun activities, which is also false. Children can enjoy activities, which involve concentration, thinking, reading, analysis and hard work. This assumption is very much related with an idea of childhood developed in last 150 years as it highlighted by Aries and it is also related to protective group of rights.

It is not rare to find Science communicators acting as science preachers, engaging with children in a top down logic and presenting science as the ultimate truth to believe. The science experiments are very often presented as miracles to be adored. The scientific discourse becomes a monologue, which takes children as a mere object. As a result, science, which may be defined as a process of challenging and changing reality, placing individuals as subject of knowledge, is presented as a reality to be adapted, placing children as object of knowledge.

In Freirian terms, this approach develops on children two types of relationship with the world: magical consciousness and naive consciousness. Magical consciousness is when people adapt themselves defenselessly and passively to the expectations of a superior force: they are not conscious of the socio-economic contradictions within this society. they accept life for what it is and don't question injustices done to their lives. They are silent and docile.

Naive consciousness involves gaining insight into and becoming aware of one's own problems, but without making connections with the world outside, in other words, individualizing problems. Problems are more or less seen as coincidences, accidents.

For Freire a process of education should develop a critical consciousness on children. Critical consciousness is when people stop looking at problem as mostly individual accidents but see them more as structural problems. Critical consciousness involves making connections with the socio-economic contradictions in society. It means looking at reality and recognizing such contradictions as a fact. But, the question is how to develop a critical consciousness? How we move from a monologue to a dialogue? How do we change ourselves, our practice our way of thinking and our institutions?

There is an anecdote where Boal(1998) tells the story of a scene that took place in a psychiatric hospital, in England, where, through the Theatre of the Oppressed, they were exploring the act of dialogue first explaining what was a monologue. So, the facilitator showed a visual aid that said 'a monologue is when one person, a single person, is talking on his or her own...'. So, then, Boal asked: 'what's a dialogue?', to which one of the patients eagerly answered 'it's when there are two people talking on their own...'. After that, Boal asked himself and us 'does dialogue ever truly exists?'

Dialogic Approach in Science in Society Activity

As part of SiS Catalyst project the Dialogic Approach in Science in Society a training for a toolkit scientist has been piloted in several countries in Europe. The first part of the training is designed to challenge adults educational practices and values. This set of games and exercises provides a series of experiences in order to produce the demand on the adults to rethink their practices and values related to the way they relate to children.

The second part of the toolkit is a reflexive game, which includes a set of cards which helps adults to plan an activity, an workshop or an institution based on principles and values such as democracy, participation, equity, difference, equality among others. By handle the cards and reflecting on their own practice adults can develop activities including children in active role and present science as knowledge to be questioned. This

training provides people not only an reflection about participation but a actual experience on it which is analyzed through lens of children's right and critical pedagogy.

Proposing a power balanced relationship scientists are invited to plan a SiS activities based on equity considering the difference of between adult and child but also the equality. As professor Boa Ventura Souza Santos put it: "We have the right to be equal whenever difference diminishes us; we have the right to be different whenever equality decharacterizes us."

In the regards of children and adults relationship there are no final answers but a continuous questioning which should involve both parts to reflect and find way of balancing the asymmetrical relationship.

Freire's ideas of education in which teacher and student are subject of the action of learning. Freire did not view education as the mere transmission of content from teacher to student. On the contrary, he viewed it as the establishment of a dialogue. This means that while teaching, the teacher also learns. Traditional pedagogy affirms this ideal, but Paulo Freire placed the educator in a position to learn from the learner, in the same way that the learner learns from the educator. Thus, no one could be considered definitively educated or complete. Each person, in his or her own way, together with others, could learn and discover new dimensions and possibilities from the realities of life. Education becomes a process of collective and continuous formation.

The last part of the training is a session of theatre forum that offers an alive experiences of a dramatic dialogue. Forum Theatre is a true question that a person or group of people ask the audience. The audience has an active role in Forum Theatre, during a workshop or a play the audience sincere dialogue. The spectator become the spec-actor – spec the one who see and the actor the one who acts.

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