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### **Blockbusters at School: Film as Didactic Medium in Science Education**

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Blockbusters like *THE DAY AFTER TOMORROW*, *BLADE RUNNER* or *MATRIX* deal with issues that are of concern to natural science classes. In *BLADE RUNNER*, for example, clones fight for their 'life', trying to live on past their set expiry date. Yet, are these clones to be seen only as machines or as people after all? Gene technology poses questions of relevance not only to biologists. In *MATRIX*, the protagonists' lives, and along with them the fate of the whole human race depends on the question „What is real?“. As these examples – and I believe you can think of some more – demonstrate, scientific questions and problems lie frequently at the core of a blockbuster's plot. Thus, film uses its medium specific options to explore such critical circumstances; in so doing, the cinema sometimes offers solutions, be it realistic or unrealistic ones. In film, abstract theories, scientific paradigms or axioms take on form in a spectacular and plausible way – bear in mind the example of *MATRIX* and the questioning of reality – making it hard for the classical classroom to compete with such illustrative powers. Yet, why then not use such films in scientific teaching? These days, an increasing number of researches turn an open mind to the idea of introducing feature films in science education. I would like to mention the CISCI-project, financed by the EU (2005-07) which tested films for their potential of exploring and explaining natural science, leading to a number of suggestions for the integration of film in the teaching of science. The goal of CISCI has been to get more young persons interested in natural science and to achieve this by means of such a popular medium, which might turn lessons more attractive. The EU worries about a predicted lack of experts in natural science in the near future; a study conducted concerning this matter states that one reason of youth's disinterest in science is the lessons they had experienced. In my presentation, I would like to show how films can spur interest and how blockbusters can be included in class in a way meeting the requirements of EU's favoured inquiry-based method.

#### Experienced Science

One of the films taken on board by the CISCI-project has been *THE DAY AFTER TOMORROW*. A newspaper article sees this film as the reason for the revival of the climate change and environment protection debate, as topics like greenhouse effect and forest dieback had been, since the 1990s, discussed only in economics. *THE DAY AFTER TOMORROW* takes scientific data

and theses and combines them with action and drama; but let me illustrate how the film can be employed in teaching.

[Excerpt of DAY AFTER TOMORROW]

The film's opening sequence is, by the way, also featured in Al Gore's AN INCONVENIENT TRUTH. However, in Gore's utilisation, the flight to the research camp is cut short even before the research camp comes into view, instead, Al Gore explains why the ice is melting. The feature film, on the other hand, *renders* the consequences comprehensible as the audience experiences it quasi 'at first hand'. Discomfort emanates when the crackle of the breaking ice starts to be noticeable. Suspense builds up as the spectator anticipates the looming catastrophe the protagonists are unaware of. Then, when suddenly the ice breaks under the driller, the audience winces despite the anticipation of events. Spectators fear for the life of the researcher who takes great risk in rescuing his samples: he attempts the impossible and jumps over the yawning gap. The spectator is involved with all senses. So, how to now direct the students' attention from the filmic event to 'today's teaching topic'? How to bridge from the immersion into the film to the rather dry subject matter of temperature and carbon dioxide (CO<sub>2</sub>)?

To illustrate what is new about the soon to be presented concept of blockbusters at school, I at first have to step back in film history before addressing the above posed questions. The usage of film for teaching is almost as old as the medium itself. However, in the pioneering days, the focus was on disciplining the medium of film, on guiding and controlling the pupils' attention and reception. Also, for decades, the austere organisation of the film material and exhibition praxis shaped not only the structure of scientific films, but also their reception, that is, how they were being read.

### Disciplining Moving Images

As many of you will be well aware of, at the beginning of the 20th century, cinematography's reputation was more than questionable. When the first movie theatres were established in the cities, it was first and foremost the youth – as with all things new – that was drawn to them, and thus, the bourgeoisie feared for the moral and intellectual well being of the youngsters. Criticism was based on the assumption that filmic events would leave an immediate impression in the

memory. The German solicitor Albert Hellwig, who coined the term ‘Schundfilm’ (in analogy to pulp fiction in literature, i.e. ‘Schundliteratur’ in German), writes in his book *Schundfilme, ihr Wesen, ihre Gefahren, ihre Bedeutung* (published in 1911) about the offences given by youngsters after the consumption of ‘according’ fictions. In Hellwig’s understanding, moving images imprint themselves into the memory of the children in a way that turns them into thieves after consuming a film depicting theft, while the ‘experience’ of a love story on screen will lead to the onset of precocious puberty. This opinion was widespread among members of the educated classes and led them to form the cinema reform movement to fight united against fictional films and movie theatres. Nonetheless, parallel to the cinema reform movement, progressive pedagogues of the same standing started to include in their teaching documentary images, passages from travelogues, or corporate films. This group also came together and formed the instructional film movement, a tool brought to life to influence film production and to initiate facilitation of documentaries. In 1926, in Basle, the first European conference on educational film took place. Topics were such questions as regarding formats, structure, choice of themes, didactics, and so on. Ernst Rüst, a Swiss professor for photography at the ETH Zurich, modelled the paragon instructional film, a status confirmed at the third conference, this time being held in Vienna in 1931. Rüst’s model film was so designed as to eliminate anything that could distract the students’ attention from the film’s core topic. The film’s title was DIE LACHMÖVE (meaning ‘the black-headed gull’), a film consequently reduced to the essential. Altering shots were edited one after the other, with intertitles structuring the material. A viewing experience of the overall sequence – as it became typical for the narrative film – was almost completely blocked, thereby making the presence of a mediating authority figure indispensable.

[Excerpt: DIE LACHMÖVE.]

The film solely focuses on the gulls; anything else that was part of the biosphere got eliminated. The shots “Szenen einer Familie” (scenes of a family), “Wenden der Eier” (turning of the eggs), and “Schlüpfen der Jungen” (hatching of the chicks) follow each other without creating a coherent sequence. Each shot remains isolated from a narrative point of view. The information gathered from the images lies in the hands of the mediating authority figure. The medium film was thus tailored in a way as to make it impossible for a spectator to immerse into the filmic

event in an uncontrolled, i.e. inner psychic way. The editing guides the audience's attention so strictly as to pre-calculate the reception. In the silent movie area, as it was the case with Rüst's film, a film narrator external to the film was the norm, whereas nowadays this agency is inherent in the film. The omniscient narrator – „the Voice of God“ in Bill Nichols' term – takes over the function of the external narrator.

### Making Meaning – the Role of the Spectator

The supremacy of the mediator's authority, or, of the word over the image respectively, is what Geneviève Jacquinot criticised in her 1977 book *Image et pédagogie*. She bemoaned that this kind of pedagogically designed films force the spectator into passivity, as the audience is faced with only one possible interpretation of the images. However, her understanding of the spectator as passive consumer contradicts the cognitive processes stressed by cognitivists' theories.

According to David Bordwell – one of the prime advocates of cognitivism in film theory – „the perceiver [is] not a passive receiver of data but an active mobilizer of structures and processes which enable her to search for information relevant to the task and data at hand“; in short: “meanings are not found but made“ (*Making Meaning. Inference and Rhetoric in the Interpretation of Cinema*, 1989, 3). In the cognitivist's view, spectators gather filmic information to construe a steadily growing 'jigsaw puzzle', that is, they take the plot fragments and re-construe the story's (chronological) chain of events, i.e. the narrative. Scanning the film for relevant information is not the only input to this process: spectators also refer to their general knowledge of films and genres, as well as to their every day experiences and common sense, to formulate hypotheses and to fill in gaps of the plot. The active drawing on world knowledge forms the basis for cognitivism theory which describes the reception process as a filmic perception process with integrated feedback mechanism: filmic data is constantly been put in relation to already inscribed schemata, like, for example, prototypical scenarios. Peter Ohler, for example, defines schemata as sources of information presenting typical properties of objects, situations or events. So, schemata are representative for the experiences of the recipients in certain sections of the world (see Ohler 1990: 50/51). Hence, the invoked experience and world knowledge influence the perception of the film, they infuse the interpretation of the presented events. Making meaning is thus the spectator's affair. Processing the presented data continuously, i.e. adding the 'new' enfolding data on screen and merging it with the spectator's pre-existent

world and film knowledge, hence the interaction of divergent areas of knowledge, are essential for cognition. Combining that line of argument with the goal of benefiting from blockbusters in the classroom, results in the idea to make use of the processes set in motion by the film scenes in the classroom. So let me now turn to the question how that can be accomplished.

### ***Film as a Didactic Medium in Science Education***

So, the digression into film history has brought us back to *THE DAY AFTER TOMORROW*. The reading of the opening sequence is accompanied by questions. Thanks to genre knowledge, identifying the film as an action movie does not cause problems and accordingly prompts particular expectations. Yet, what are these three men doing in the ice desert? Why are they drilling holes into the ice? And why are these tubes so valuable that one man even risks his life to fetch them? To make sense out of the men's action the audience needs specific knowledge. What is in the tubes? But why ice? What information does ice contain besides consisting of frozen water? So, how can that data be extracted from the ice? Are these men biologists, meteorologists or glaciologists? This trail of thought leads us amidst *inquiry based approaches*. In the Rocard-report 2007 for the EU-commission, inquiry-based science education is being described as follows:

By definition, inquiry is the intentional process of diagnosing problems, critiquing experiments, and planning investigations, researching conjectures, searching for information, constructing models, debating with peers, and forming coherent arguments (Linn, Davis, & Bell, 2004).

Hence, films can trigger/ elicit inquiry-based cognition and learning processes by opening up a thematic field. To grasp the meaning of the sequence brings about a bundle of questions, calls upon the spectator's experience and world knowledge. These are fragments, particles of knowledge gathered in other media, maybe in the classroom. So, what is set in motion in the spectator's head has to be turned explicit in the classroom and has to be encouraged and guided. Is the interest once aroused, the questions will lead – inductively – deeper and deeper into the subject matter and to the relevant scientific problems. Maybe a film offers even a potential solution. Yet, to be able to judge the plausibility of the suggested solution, knowledge has to be gathered at first.

Subsequently, the screening of a feature film can, by all means, lead to serious contemplation of themes of scientific relevance. Blockbusters like *THE DAY AFTER TOMORROW* might provide a bridge to connect between youth culture and the scientific world. The authors of the Rocard-report give as one of the main reasons of youth's prevalent disinterest in science the following explanation:

The reason why young people do not develop interest for science are complex; however, there is firm evidence that indicates a connection between attitudes towards science and the way science is taught (Rocard, Michel et al. (2007): *Science Education Now: A Renewed Pedagogy for the Future of Europe*, p. 8).

Glen Aikenhead sees today's youth's aversion against science as a cultural problem. Themes and questions of natural science are alien to them since they are not relevant to their everyday life. Forced by the educational syllabus to confront such topics, they try to find a way to counter that pressure by means of pretended partaking in the 'scientific game'. They might comply with the rules to get good grades, but withhold any personal commitment. The scientific culture with its system of symbols, norms and conventions seems to remain incompatible with youth culture. Yet, this presumed incompatibility is easily overcome by the researcher-protagonists who thanks to the narrative coating are part of the same culture 'even though' the scientific world with its values is generally regarded as outside youth culture. The work of scientists in films finds their recognition. They might even admire the researcher in *THE DAY AFTER TOMORROW* who opposes the vice-president and continues to warn of climate changes. The film's thesis that global warming will melt the polar ice caps, and that as a result the Gulf Stream will be reversed, is not presented as a dry theory, but loaded with affect and is thus immediately present as a bleak vision of the near future. In that way, *THE DAY AFTER TOMORROW* bridges the youth culture and the science culture. Aikenhead calls this concept *cultural border crossing*: the students learn to identify the different culture and learn to understand each in their own right – moreover, they learn to move from one culture to the other and back.

Brought to use in that way, blockbusters can provide the so far missing link to overcome cultural borders; they can help to leave behind science's dry image by highlighting its attractive aspects, thereby arousing true interest and commitment. According to the final report of CISCI, this is no

forlorn utopia, but blockbusters' hidden potential. Moreover, film can be used even more effectively when not only the content – i.e. film as topic provider –, but also its specific form – i.e. the medium of film and its perceptive and receptive processes – is being reflected. This is the goal of the follow-up of the CISCI-project, the sequel called CIDISCI I have been presenting today: Cinema as Didactic Medium in Science Education, focusing on content and form of blockbuster films and their perception/reception processes.