

THE IMPORTANCE OF PREMISES: FROM AN ESSENTIALIST TO AN ANTI-ESSENTIALIST VIEW OF ICT IN MATHEMATICS EDUCATION

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This paper reports both the talk I gave at the BSRLM Day Conference - Loughborough University - and my reflections after interacting and exchanging views with the ones who attended it. The aim of my original talk was to outline my ongoing PhD project by introducing, through theories of technology, an anti-essentialist view about technology [1] and a way of viewing computing in educational policy through the same light [2]. Interestingly enough what seemed to be a major focus in the session was the matter of what an essentialist and anti-essentialist view of technology actually means. In this paper I discuss only what was discussed during my talk. The other issues, including the description of my ongoing PhD project, will be described later, in a future paper.

INTRODUCTION

Two theoretical avenues are involved in my PhD project: treating software packages (Cabri and Excel) as texts from an anti-essentialist view and looking at meanings being produced by secondary mathematics teachers for such texts. In this short paper, I will be exploring how the former theoretical avenue is taken in my work by clarifying what an anti-essentialism move means. The second theoretical avenue [3] and the junction of the two will be worked on, in a future paper and an example of how Grint and Woolgar's anti-essentialist view of technology has been applied in previous research will be discussed. This paper is restricted to what I have presented and discussed at the BSRLM Day Conference to give a flavour of how I am approaching and developing my ideas and my research project.

What does it mean to take an anti-essentialist view of technology (of computers or software packages)?

From my viewpoint, one way of answering this question is to understand what an essentialist view of technology means and what difference an anti-essentialist view can make. To describe that, I bring Grint and Woolgar into the picture. Both are sociologists working in the field of Sociology of Technology and both worked hard on defining an 'anti-essentialism move' about technology by treating technology as text, designers as writers and users as readers (Grint and Woolgar, 1997). To understand the anti-essentialism move it is necessary to talk about theories of technology and how certain approaches have been developed.

THEORIES OF TECHNOLOGY

Amongst many of the approaches to the social and cultural dimensions of technology, five of them will be briefly mentioned here: technological determinism; socio-technical systems theory; social shaping approach; socio-technical alignments; and actor-network theory. The 'technological determinism approach' actually did not take into account any social and cultural dimensions at all, by asserting that the most 'appropriate' innovations survive and only those who adapt to such innovations prosper (Grint and Woogar 1997, p. 11). Giving such a significance to technology suggests metaphors like the current computer technologies provide us with 'default positions' and 'interfaces'. For instance, for Veblen (1904) technology was not wild and irrational but amoral, cold and rational; it is in, not out of control. Hence, the technological determinism approach takes a radical essentialist view about technology by portraying technology as an autonomous development which determines social and economic organisations and relationships.

The first signs of response and resistance to such an approach is found in some writers such as Woodward (1958) and Blaumer (1964). From them and other writers came a model that became known as 'socio-technical systems theory' which included different elements to technology like: people, organisations, genders, interest groups and others. Although such a theory had been developed, aimed at not taking an essentialist view of technology, it carries the implicit assumption that the nature and capacity of technology remains beyond the remit of sociological analysis, i.e. in such a theory the nature and capacity of technology is treated as given, objective and unproblematic. Such an assumption is called 'technicism' by Grint and Woolgar.

A further set of alternatives to the technological determinism approach was developed with a generic label of 'social shaping approach' suggesting that the capacity of the technology is equivalent to the political circumstances of its production. Such approaches claim that social analysis must take into account the technology itself. However, although these approaches take an anti-essentialist perspective about technology there is a limitation placed upon the social aspects of technology within such approaches as only the design and implementation process is treated, causing an underestimation of the significance of actors' interpretations and uses of technology (Grint and Woolgar 1997, p. 21). For instance, we can take telephone technology as an unstable and not determinate object as the original use of telephone technology was to broadcast concert music and its use now is the result of interpretations and negotiations, not determinations. Hence, although the social shaping approach takes an anti-essentialist view of technology it does not take into account possible users' interpretations of technology.

A more ambitious macro-approach, called by Grint and Woolgar the 'socio-technical alignments approach', considers the significance of the alignment between technology and society. I will not go into details here [4] but amongst the approaches following this line, Harbermas (1971a, 1971b) and Hill (1988) have similarities in

their approaches as both assert that the effects of technology are the result of social and cultural forces rather than of the technology itself. Hill argues that technology should be considered as a 'cultural text', that is, an artefact can only be brought to life through a 'cultural text' - the rules by which we know how to use the artefact (Grint and Woolgar 1997, p. 27). What seems problematic in this approach is that by considering technology as a cultural text one can assume that the technology can be made transparent which implies that a consensual account of its capabilities can be established making it independent of any particular user or interpreter (*ibid.* 1997, p. 28). In a way, we end up with a similar problem to that found in the former approach.

Another approach, 'actor-network theory' (Latour 1988 and others), attempts to meet the requirements above by explaining the development and stabilisation of forms of technology. Whereas the socio-technical alignments approach focuses upon the results of alignments between social and technical aspects, the actor-network approach focuses upon the practical construction of these alignments. Although such an approach attempts to transcend the distinction between the social and the technical, it appears unclear how it succeeds in transcending 'technicism'. Nevertheless, such a theory "has the distinct virtue of at least pointing to the possibility of an understanding of the machine which does not depend on the presence of a god within". (Grint and Woolgar 1997, p. 31)

TECHNOLOGY AS TEXT: AN ANTI-ESSENTIALISM MOVE

What resolution is there to this problematic? How can technology be approached both from an anti-essentialist perspective and attributing the same significance to designers and users?

Orlikowki (1992) got very close to this point. She notes how the definition of technology has itself generated problems and also the struggle with the dualism between 'technology' and 'the social'. To overcome the dualism of objective and subjective approaches, Orlikowki attributes to technology a dual nature: "human actions are enabled and constrained by structures, yet these structures are the result of previous actions" (Orlikowki 1992, p. 404). But two problems have been pointed out in Orlikowki's approach: one is that she only refers 'mediation' to interaction with the technology rather than to a more general processes of interpretation of the technology. The other problem is that Orlikowki argues for a division between two different modes of human interaction with technology: a 'design' mode and a 'use' mode. Although she claims that such a distinction has only an analytical purpose, Orlikowki states somewhere that "designers have a greater capacity to attribute meanings to technology than the users because these capacities are themselves constrained by the interaction between technology and organisation" (*ibid.* 1992, p. 409). Again, we can see that the same significance to designers and users has not been given here.

The paradox that technology is simultaneously independent of human action and yet irrelevant without it seems to be overlaid rather than transcended by Orlikowski when she concludes that technology has a dual nature: as objective reality and social construction. To overcome such a paradox, Grint and Woolgar argue that it could be said that what counts as objective reality is itself a social construction. In other words, they argue that “objective reality and social construction are not two aspects of the same artefact - if they were it would imply we could separate out the two - they are different ways of saying the same thing.” (Grint and Woolgar 1997, p. 23)

It seems that Grint and Woolgar have achieved both points of treating technology from an anti-essentialist perspective and giving the same status or significance to designers and users, overcoming the problematic I have mentioned earlier. By treating technology as text, Grint and Woolgar believe it can be said that an ‘anti-essentialism move’ occurs by both taking technology not as an essence and treating designers as writers and users as readers of such a text:

“what a machine is, what it will do, what its effects will be, are the upshot of specific readings of the text rather than arising directly from the essence of an unmediated or self-explanatory technology. A technology’s capacity and capability is never transparently obvious and necessarily requires some form of interpretation; technology does not speak for itself but has to be spoken for ... the crucial role of interpretation and persuasion suggests we need to attend closely to the process of interpretation rather than assuming that we are persuaded by the effectiveness of the technology.” (ibid. 1997, p. 32)

FINAL REMARK: AN ONGOING PHD PROJECT

Although I have not discussed ICT in Mathematics Education, I kept such a title aiming to keep in mind that this is my research field. I hope that what I have written so far has not been painful to you but informative. Although it has been heavily theoretical, I do think it is relevant to define where one comes from and on what premises one’s line of thinking is based. What I mean when saying I am treating Cabri and Excel as text in my research project is that I am taking an anti-essentialist view about it, i.e. there is no essence in Cabri and Excel. In other words, I am looking at a Cabri and an Excel, that is, ‘the Cabri and the Excel of the teacher’, a Cabri and an Excel which reach the classroom. The way in which my approach differs from Grint and Woolgar’s is that I am looking at meanings being produced (Lins, in press) by teachers for Cabri and Excel rather than their interpretations of such software packages.

Endnotes

[1] Via treating technology as text Grint and Woolgar follow an anti-essentialist view about technology (1997).

[2] Selwyn moves away from educational computing research's determinist discourse to suggest an alternative approach which attempts a more complete critique of the computer and education (1999).

[3] an epistemological model developed by Lins (1992) for understanding what algebraic thinking is.

[4] see Grint and Woolgar 1997, pp. 25-27.

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