

## **Perspectives on use of artifacts in engineering education – Applying insights from philosophy of technology and theories of mediated action**

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### **Abstract**

For more than ten years I have been involved in designing "conceptual" labs and laborative learning environments, as part of design based research in physics and electrical engineering education, with the aim of fostering a functional understanding in these domains. A common denominator in the design of these learning environments is the insightful and careful application of computer based measurement technology as a mediating tool. Our research has shown that the way these tools are designed and implemented is critical for learning outcomes.

Human experience of our world is shaped by physical and symbolic tools (mediating tools). The concept of mediation and mediating tools could analytically be described as:

Human  $\Leftrightarrow$  Mediating tools  $\Leftrightarrow$  World

Philosophy of technology deals with such questions as what role does technology (artifacts) play in everyday human experience: How do technological artifacts affect the existence of humans and their relations with the world and within our world? How do artifacts produce and transform human knowledge and how are human knowledge included in artifacts? What are the acts of artifacts?

In education it has for a long time been common to use a metaphor for learning as the *acquisition* of knowledge. In traditional approaches for teaching the student was seen as a rather passive recipient of knowledge transmitted by the teacher, but also in discovery learning the student was commonly seen independent agents of acquisition. Another metaphor for learning is that of *participation*. Student learning through participation that is phrased in terms such as "cooperative learning" or "fostering communities for inquiry". In the first model learning is seen as an individual enterprise and in the second as a social one.

However in the sociocultural school the dualism individual versus society inherent in the models mentioned above is transgressed. Central in this school is the role of artifacts (mediating tools) for learning and thinking. Artifacts are seen as simultaneously ideal (conceptual and bearers of culture and cultural knowledge) and material. Thus not only the dualism individual – society but other dualism such as mind – material world were done away with. Central in both the sociocultural school and in most traditions in the philosophy of technology is the study of human action (praxis) and the attempt to avoid Cartesian dualism.

In my paper different applications of computer based technology in learning environments will be related to work within philosophy of technology and theories of mediated action. Especially I will relate to the work of persons such as John Dewey, Lev Vygotsky, Don Ihde, Michael Cole, James Wertsch, Larry Hickman, Alex Kozulin, Carl Mitcham and other.