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# Linking Programming to Representations

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Within the physics discipline exists a plethora of different equations, graphs, words, and gestures. Each of these are constructed to represent a specific aspect of a physical system or concept. One way to construct and manipulate representations is by programming simulations of physical concepts. The visualisations created from the simulations are constructed to capture and showcase a specific aspect of the physical concept. By using social semiotics and variation theory of learning to describe the role of programming in the construction of representations, and consequently, the role of programming in the meaning-making process, the affordances of programming may be described.

To fully describe students'creation and manipulation of representations, the framework of social semiotics had to extended with new constructs to better describe students'movements between different types of representations: Transductive Links and Active and Passive transductions.

This presentation aims to capture the ideas of Kim Svensson's PhD Thesis, with the same name, on the subject of physics education research.

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