Using modularization to thicken the knowledge-representation network in CAS enhanced teaching

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Doing mathematics and certainly learning mathematics have always consisted of simultaneous acquisition of both conceptual knowledge and algorithmic skills. Mathematical concepts - similarly to other concepts – are embedded into one's knowledge as reorganized schemes. These cognitive schemes (epistemological-, thought schemes) are such building blocks of our thinking that are meaningful by themselves and have independent meanings. In addition, cognitive schemes are actively direct one's cognition and thinking while they are continuously changing according to the acquired knowledge. Furthermore, cognitive schemes are not independent components of one's consciousness, but they establish an ever changing relation-system called knowledge-representation network. Thus, the efficiency of mathematical knowledge can be approached by evaluating the organization of such knowledge elements. It can be assumed that a concept has been comprehended if the concept is well represented and bonded by other knowledge elements. Consequently, the thickening of the knowledge-representation network is a result of the development and modification of interrelated cognitive schemes.

Both the field of mathematics and the mathematics curricula can be structured with modules. We can define module as complex and interconnected elements of knowledge that can be recalled from memory without consciously being aware of its internal structure. One of the fundamental problems in the use of CAS in teaching is how to successfully develop cognitive schemes and a knowledge-representation network for particular learning modules. We will examine various opportunities of CAS use to thicken the knowledge-representation network utilizing appropriate modularization of the curriculum.