The usefulness of mathematics studies through the eyes of electronics college teachers.

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There is a wide consensus about the necessity of studying mathematics in favor of engineering and hi-tech. It is clear that understanding and implementing electronics, for example, are based upon conceptual understanding of mathematics, and the ability to contextualize it. This explains why electronics practical-engineers take some calculus topics as an essential component of their training. It is interesting to examine to what extent the mathematics course supports the electronics studies in a practical manner.

Learning mathematics without a cognitive commitment results in pseudo-conceptual or pseudo-analytical modes of behavior rather than in true conceptual understanding (Vinner, 1997). These modes of behavior resemble the behavior that results from true understanding so accurately that most people do not distinguish between them. They are characterized by two elements. In pseudo-conceptual behavior, actions are mainly based on association of words with other words, rather than on association of words with ideas. In pseudo-conceptual behavior words are used and actions are taken without going through any reflective procedure, or self-critique.

The mathematics is contextualized if data is processed with an orientation to an external phenomenon (Janvier, 1996). This is expressed when a decision made how to solve a problem can be based both on the algebraic and numeral content of an expression, as well as on the external-concrete content.

Five Israeli college electronics teachers were interviewed, and opened a window to the ways they see mathematics education as part of electronics practical engineering training. They compared the students' knowledge with the knowledge needed, and pointed at the gap between them. They also pointed at the degree of instrumental behavior when solving problems. They argued against the lack of contextalization to their subject matter, and described the students' anxiety when calling on an advanced mathematical topic. The poverty of mathematical knowledge was described as a consequence of pseudo-conceptual and pseudo-analytical modes of behavior. These modes of behavior led to anxiety related to advanced mathematical topics, to non-conceptual understanding, and above all, to uselessness of these studies regarding a large portion of the students.

References.

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