

Abstract Submitted  
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**Applying Hands-On Activity Concepts to Advanced Mathematical Instruction for Physics** WILLIAM DIETERLE, California University of Pennsylvania — While the use of hands-on instruction by constructivist principles has been extensively documented and is covered in great detail in the New Faculty Workshops run by APS, most examples discussed in this series apply to the introductory course level. Many of the same principles can be applied at the upper division level, but topics that are normally considered purely mathematical do not readily lend themselves to such an approach. A common complaint of students first studying vector analysis in an upper division course is the fact that they can't relate the divergence, curl, and gradient to real life. This talk discusses a method of presentation emphasizing the physical significance of these mathematical entities, with laboratory exercises for a two-dimensional gradient and for the divergence theorem in three dimensions. The approach has been successfully utilized in the first weeks of an upper division electricity and magnetism class.

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