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Abstract: The purpose of this paper is to describe an instructional sequence where students invent a method for locating lines of eigenvectors and corresponding solutions to systems of two first order linear ordinary differential equations with constant coefficients. The significance of this paper is two-fold. First, it represents an innovative alternative where the concept and calculation of eigenvectors precede those of eigenvalues. This "eigenvector first approach," which seems to more closely follow students' conceptual development, is a reversal of the typical approach where students first learn to find eigenvalues and then determine the eigenvectors . Second, we characterize the flow of this instructional sequence in terms of four types of activities: prediction , exploration, mathematization , and generalization. The approach of prediction , exploration, mathematization, and generalization represents a more general design heuristic useful for other topics in other courses.

KEYWORDS: ordinary differential equations , student invented methods, eigenvectors, eigenvalues, instructional design.