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**Mathematical études: embedding opportunities for developing procedural fluency within rich mathematical contexts.**

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Summary: In a high-stakes assessment culture, it is clearly important that learners of mathematics develop the necessary fluency and confidence to perform well on the specific, narrowly defined techniques that will be tested. However, an overemphasis on the training of piecemeal mathematical skills at the expense of more independent engagement with richer, multifaceted tasks risks devaluing the subject and failing to give learners an authentic and enjoyable experience of being a mathematician. Thus, there is a pressing need for mathematical tasks which embed the practice of essential techniques within a richer, exploratory and investigative context. Such tasks can be justified to school management or to more traditional mathematics teachers as vital practice of important skills; at the same time, they give scope to progressive teachers who wish to work in more exploratory ways. This paper draws on the notion of a musical étude to develop a powerful and versatile approach in which these apparently contradictory aspects of teaching mathematics can be harmoniously combined. The author illustrates the tactic in three central areas of the high-school mathematics curriculum: plotting Cartesian coordinates, solving linear equations and performing enlargements. In each case, extensive practice of important procedures takes place alongside more thoughtful and mathematically creative activity.

*Classification:* D40 C30 D50

*Keywords:* Cartesian coordinates; enlargement; fluency; learning for understanding; practice; solving equations; task design; traditional and progressive approaches to the teaching of mathematics

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