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We report on the results obtained in the first four years of a five year National Science Foundation Math/Science Partnership project. These results include significant increases in the conceptual math knowledge (CMK) and math knowledge for teaching (MKT) of the participating middle school math teachers. We then describe our plans to use knowledge gained from this project to transform the undergraduate middle school pre-service mathematics teacher program at our large state university. The transformation will involve creating and implementing six upper division mathematics courses designed to meet the specific needs of the future middle school mathematics specialists. The six courses will cover topics from Algebra, Geometry, Probability and Statistics, History of Mathematics, Mathematical Modeling, Mathematical Technology, respectively. All materials will be original creations of mathematicians in the Department of Mathematics and Statistics at our university. The content of each text will be influenced by the forthcoming Conference Board of Mathematical Sciences Mathematical Education of Teachers II (CBMS-METII) document, and the philosophy inspired by L.P. Ma's observations that these teachers of mathematics need have a "profound understanding of fundamental mathematics". (Received September 07, 2012)