

## Liberal Arts Education and Applied Mathematics

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### Abstract

A liberal arts education has for centuries been seen both as the pinnacle of education and the bedrock on which is founded good citizenship and exemplary leadership. In recent times, the liberal arts and the sciences have been seen as being in opposition, with educational institutions, governments, and students feeling forced to choose between them. But in our increasingly data-driven yet interconnected world, we believe that a new conception of the liberal arts is needed, one which blends the quantitative and analytical skills of a scientific education with the qualitative and communicative skills of a traditional liberal arts education. The ideal blend of these skills is to be found in training in applied mathematics.

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## Introduction

Every once in a while, we hear the claims that while liberal arts education is the best education we can offer tomorrow's leaders (Ono, 2019; Zakaria, 2015), it is in danger (Connor, 1998), an existential risk sometimes blamed on a recent focus on science, technology, engineering, and mathematics (STEM) education (Shal-neva, 2020). In this article, we argue that a narrow view of the liberal arts sets up an unnecessary conflict with the sciences, and that it is time we go back to the original ideals of liberal arts education. Even though a liberal arts training is much broader than specific academic disciplines, we will argue that there is an existing discipline which is suited for achieving the objectives of liberal arts education – applied mathematics.

Before we make our case, it is worth briefly stating the original ideals of liberal arts education. As outlined in Joseph's book (2002), the purpose of the original liberal arts education was to provide students a general set of skills considered to be important for city states in ancient Greece and for many citizenries in the intervening centuries. It is important to note that these skills are not specific to a particular profession, but rather had the broad education of an informed citizenry and civic leaders in

mind. Indeed, the belief was that citizens could only fully participate in a "government by the people" if the citizenry shared a set of intellectual, moral, and aesthetic skills. In other words, liberal arts education is not meant to provide training for craftsmanship, or to produce technicians, but to produce citizens and leaders. Indeed, training in the seven liberal arts was explicitly distinguished from that in the "utilitarian" (or practical) arts, and that in the fine arts (Joseph, 2002).

It is also important to mention that these general skills for liberal arts education may evolve while the ideals shall remain the same. They were historically the "skills of freedom" required for citizens and freemen, and nowadays the skills of freedom required to work in the rapidly changing modern employment environment. In ancient Greece, these skills were divided into two parts. In the first part, the trivium (from which we derive the word trivial, in the same sense of being preliminary), were grammar, rhetoric, and dialectic. The three skills in the trivium were considered the fundamental skills, and together they bestow the ability to speak correctively and persuasively. In the second part, the quadrivium, were arithmetic (the theory of number), music (the application of the theory of number), geometry (the theory of space), and astronomy (the application