

Mathematics and the Liberal Arts

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Abstract

The Liberal Arts deal with the human being as a whole and hence with what lies at the essence of being human. As a result, the Liberal Arts have a far greater capacity to do good than other fields of study, for their foundation in philosophy enables them to bring students into contact with the ultimate questions which they are free to accept (or reject). Even if these questions have little or no ‘market value’, it should be obvious that the way they are taught and learned is going to have a powerful impact upon the future of the students and society. It is suggested here that mathematics has an integral role in the study of the liberal arts in a first degree at a university where the ‘meal ticket’ is subsequently studied in the graduate or professional school.

Keywords: Metaphysics, liberal arts, trivium quadrivium, humanism.²

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1 Introduction

The English musical composer, Emily Howard had a piece, “Calculus of the Nervous System”, performed at the 2012 BBC Proms, inspired by Ada Lovelace, Lord Byron's daughter, who tried to develop a mathematical model for how the brain gives rise to thought and nerves to feelings. Emily has combined cello-playing with her academic love of mathematics. She is a graduate of the University of Oxford (Lincoln, 1997). She says that “many of my compositional techniques are derived from mathematics or science, and these ideas give structure to my work. ‘Calculus of the Nervous System’ works as a sequence of memories emerging. Like thoughts there is no continuous narrative; memories occur and recur in different ways. Questions about memory processes play an increasingly important role in my work” [1]. Mathematics and the perception of beauty is just one part of the jig-saw which liberal arts form in education.

If the question had been “can mathematics have a place in the liberal arts?”, then the recent paper [2] should have answered the question for you. “Does Mathematics have a Place in the Liberal Arts” on the other hand can only be answered after we have considered the nature and scope of the liberal arts. As an academic with interests in number theory and logic [3], I am in favour of both mathematics and the liberal arts, for their own value as well as for their applications and general utility and inherent beauty.

What this paper attempts is to unravel the role of the liberal arts and to illustrate their value in education *through* liberal arts as well as through training *in* mathematics. *Why* this is attempted is because of a danger of university research league tables encouraging the development of highly trained technocrats at the expense of deeply educated professionals. *How* this is done in this paper will be quantitatively more about liberal education, but, in a sense, qualitatively it will be on mathematics spurred on by the challenge of ‘to what mathematics should the educated professional of the twenty-first century be sensitized?’

2 Liberal Arts

The Liberal Arts deal with the human being as a whole and hence with what lies at the essence of being human. It is a common mistake to blame the current materialism and moral decline of the Western world on its extraordinary technological achievements, as if a scientific-technological outlook on life were incompatible with the supremacy of spiritual values. The decline has occurred partly because of the gradual displacement and internal disorientation of properly conceived liberal arts programs which should occupy the foundation of secondary and tertiary education.

I can recall a philosophy teacher of mine who considered both *liber* (free) and *libra* (balance) in the etymology of “deliberate” in lectures on free-will. There is a sense too in which these words can be applied to Liberal Education which should free the mind to be open to a balanced view of the things that matter in life so that people can make decisions freely with information [4]. Nussbaum puts it well when she says that “cultivated capacities for critical thinking and reflection are crucial in keeping democracies alive and wide awake” [5].

According to Professor David J. Walsh, one often finds in American higher education no clear idea of the end result to be aimed at. In most universities there is “an assemblage of incoherent, fragmentary disciplines and sub-disciplines... without any clearer guidance than some vague commitment to methodological requirements within the separate fields” [6]. In short, there is no “unifying sense of direction” [7]. But this phenomenon is not only a crisis of educators; it is a “crisis of knowledge.” Contemporary education is frequently confused because, despite often vast knowledge in particular fields, many scholars lack knowledge of what matters most of all, namely the purpose of human existence, a question from which too many wish to flee.

Again according to Walsh, “the clearest evocation of paradigmatic excellence” has traditionally been found within the cluster of disciplines called the Liberal Arts. Today, however, “education in the Liberal Arts has sadly very little to do with the formation of existential purpose; ... it has generally devolved into an increasingly irrelevant discussion of ‘ideas,’ ‘theories,’ methods and techniques.” In other words, teachers of the Liberal Arts have lost their sense of vocation. Too often, so-called liberal studies can merely be a smorgasbord of subjects from which students can choose and which they tick off as they meet degree requirements. There is little sense of their inter-relations and intimate connections which a genuinely integrated program can provide.

3 Liberal Education

Great literature speaks both to the heart and to the mind, as do all the arts when true to their proper nature. Great literature conveys a vision of truth and beauty and moral excellence capable of raising the spirit of the reader to unsuspected heights, even in the most unpromising circumstances [8]. This has been demonstrated time and time again. One recalls the dramatic effect the reading of Cicero's (now lost) work, *Hortensius*, had on the young Augustine, kindling in him a passion for wisdom that was to inspire his whole life [9]. For Cicero the liberal arts formed the basis of one's “*humanitas*.”

Anthony Shannon

In ancient Greek and Roman cultures the liberal arts referred to intellectual arts as distinct from the mechanical arts, the arts of the hand. It may be that the Greeks, in particular, exaggerated the distinction between the two kinds of art, and that the ancients in general demeaned manual work as servile. This appeared to be a mistake to many who came later, but they should not forget that the Greek conviction that reality is intelligible made possible the modern scientific revolution of which we are the heirs [10]. In ancient times the seven liberal arts were the trivium and the quadrivium united by metaphysics and theology, with Truth, Beauty and Goodness as the supporting tripod.

- The *trivium* consisted of
 - Grammar → basic systematic knowledge, the ‘what’
 - Rhetoric → the ‘how’
 - Logic → the ‘why’
- The *quadrivium* consisted of
 - Arithmetic → number in itself
 - Geometry → number in space
 - Music → number in time
 - Astronomy → number in space and time
- Illuminated by
 - Metaphysics → ultimate reality
 - Theology → ultimate end
- Permeated by
 - Truth
 - Beauty
 - Goodness.

We see how the quadrivium was fundamentally the mathematical foundation for the trivium. What should a modern quadrivium consist of for the educated professional of the twenty first century? Perhaps, by analogy with the ancient quadrivium:

- ❖ Discrete mathematics
- ❖ Projective geometry
- ❖ Astronomy
- ❖ Statistics?

This can, and should be, a source of debate and argument!

Mathematics and the Liberal Arts

The modern trivium can take care of itself in a sense, especially if we include fuzzy logic! Educated people like to think that they are literate, but do not seem to mind boasting at dinner parties that they are not really numerate. Nevertheless, contrary to the popular impression that the arts are a "soft option," true liberal education is actually very demanding. For this reason, few people have attained so noble and so realistic an understanding of human affairs as for instance, Thucydides and Aristotle. Educational reformers would do well to consider including *The Peloponnesian War*, *The Nicomachean Ethics*, and *The Politics* in the reading program of students who are bent upon careers in public (or civil) service which, fundamentally, is a noble vocation [11].

In the final analysis, Liberal Arts education is moral education - moral "in the most fundamental sense of forming the core of the personality, that underlying sense of direction and purpose from which the entire life's pattern of thoughts, decisions and actions arise" (Walsh, 1985). The intense moral vision of a single great artist has far more potential for changing hearts and minds than the pietistic clichés of a thousand preachers. For the artist speaks with the authority conveyed by suffering in the cause of truth, beauty and goodness and the realisation of one's personal mediocrity and even nothingness, a recognition that inspires struggle to rise above all limitations.

But perhaps teachers of the Liberal Arts have not met so well their task of putting students in direct contact with the minds of such great men and women. Have they, perhaps, interposed themselves, their lecture notes, their textbooks, between their students and true genius? Of course, if there is a fault to be found it is not theirs alone. Sometimes, too, required assignments are so heavy that students have little time to "waste" with books that require meditation more than memorization.

An even greater obstacle is the general lack of interest in today's world in genuine reading. No one doubts the capacity of most students to "read" - even far into the night - in order to pass an impending examination or to submit an urgent assignment. But librarians can attest that they rarely encounter university students engaged in serious leisure reading. Whether electronic or paper, newspapers, paperback romances or thrillers, and spiritualistic morale-boosters probably constitute the main course, and even the only course, of any extracurricular reading students do. Walking city streets is now hazardous because so many are being entertained by their "smart" phones! [cf. 12].

What *is* to be deplored, however, is the narrowly pragmatic attitude which reduces all of education to the "training of manpower" in the service of the national economy. For that attitude loses sight of the priceless value of every unique individual; no person can live "by bread alone." Degrees are often seen only as meal tickets for earning a living, not also as means for living.

But can "liberal arts" and "liberal education" be defended in a time of serious post-Covid-19 economic recession? Is it, perhaps, at best a luxury that society cannot afford at the present time? Yet Professor Christopher Wolfe of Marquette University defines liberal education as "an introduction to the ordered pursuit of the truth about reality". It "seeks knowledge of the inter-related and integrated whole, as against the study of isolated bits of information about the whole." Its aim is "knowledge for its own sake, a good in itself (like health), something intrinsically desirable" [13].

Thus, peculiar to the liberal arts is their cathartic function: they help people to look at reality – and especially at themselves - in the face. This not only dispels illusions but also does the constructive service of inspiring magnanimity and many other virtues which are indispensable in one way or another to development to development as a person, and therefore as a citizen.

The liberal arts also make an effective and unique contribution to human communication. We do not need to be reminded how many official pronouncements and statements written by public functionaries are notorious for their ambiguity, vagueness, and banality. By contrast, we also know how one well-conceived cartoon can get more across than dozens of speeches. It is precisely because good art is such an effective communicator that there are circumstances when it is the best way to engage in social criticism and the best defence against tyranny. As Aleksandr Solzhenitsyn has said, "Wherever else it fails, Art always has won its fight against lies, and it will always win... The lie can withstand a great deal in this world but in cannot withstand Art" [14].

4 Metaphysics

Nevertheless, if the arts undoubtedly express values and make them shine, they cannot create or justify those values. The great artist is simply the one who can see more deeply into reality than the rest of us, who can catch some hidden truth, and successfully translate it into understandable language. The arts are not an end in themselves; they naturally point us toward a realm above them, to philosophy and its pursuit of the ultimate causes of all things. It is the "first philosophy" (metaphysics) which leads us to the foundation of those values which the liberal arts endeavour to explain and illustrate.

Metaphysics is at the heart of that liberal education which prepares the student for living. "Metaphysics is not just one among many subjects in philosophy. Unlike other fields, such as epistemology and aesthetics, metaphysics takes priority. Furthermore, metaphysics is a unique field of knowledge for culture and civilization. Arguably, the very identity and well-being of a civilization depends on whether it accepts metaphysics as a

fundamental way of knowing... metaphysics, in its effort to grasp reality, is ultimately responsible for *explaining* how reason knows what is real” [15].

Metaphysics provides the rational basis and the ordering scheme by which all of the arts and sciences can be understood in their rightful internal autonomy. It does this by clarifying the first principles which each discipline takes for granted as it pursues its proper objects [16]. Here they have the reason why Aristotle reserved for metaphysics the title of Wisdom. This was later expanded by the medieval thinkers into the maxim, "*non est consenesendum in artibus*" (one does not grow old in the arts) [17]. If, as they thought, the beginning of wisdom is to be found in the liberal arts of the *trivium* and the *quadrivium*, Wisdom itself was only to be reached (on the level of human knowledge) in metaphysics.

The discipline of philosophy enjoys so little esteem and is understood so poorly that most people will laugh at the assertion that wisdom is only to be found within it. It cannot be surprising that philosophy invites little respect when the Liberal Arts in general are not regarded as very serious subjects. But if this matter is so important, so fraught with consequences, we must try to pursue the reasons for such superficial views. Why have education specialists and educational reformers failed to appreciate the supremely formational role of a liberal education capped by philosophy? Why do so many supposedly well-educated people resort instead to "spiritualistic" sects based principally on sentiment?

History can help us here by contrasting the esteem in which the liberal arts were held in remote times and places. Raymond Klibansky is referring in the following passage from the early medieval School of Chartres: “The seven liberal arts together give man both knowledge of the divine and the power... to express it. But in doing so, they fulfil at the same time another purpose. They serve *ad cultum humanitatis*, that is, they promote the specifically human values, revealing to man his place in the universe and teaching him to appreciate the beauty of the created world” [18].

And what was the “humanism” which the medievalist Richard William Southern considered not only typical of the period from 1100 to 1320 but even as the catalyst of what later came to be known as the Renaissance? That humanism connoted for Southern an emphasis on human dignity and reason, a recognition of the order and intelligibility of nature [19].

Sometimes historians are accused of advocating a return to the past. That, of course, is neither possible nor desirable [20]. But one can advocate the recovery of an attitude which is open to past achievements and in particular to the understanding of wisdom as the most perfect, the most noble, the most useful, and the most joyful of all human pursuits.

In a pragmatic and relativistic society such as ours, the effort to restore metaphysics and a realist philosophy in general might seem doomed from the start. Nevertheless, one who is disposed to make the attempt can surely gain inspiration from the reflection that reformers always have to swim against the tide of contemporary fashion and prejudice. A remarkable example of upstream swimming is provided by Robert Maynard Hutchins, President of the University of Chicago between 1929 and 1951, and an advocate with Mortimer Jerome Adler of “The Great Books of Western Civilization” [21]. A few words on Hutchins can serve to emphasise these points in the context of this paper [22].

Soon after becoming President of the University of Chicago, Hutchins took the highly unorthodox and unusual decision “to leave undone a vast number of things that university presidents can do” in order to dedicate himself to self-education and research. He had become convinced that despite being a graduate of Yale University and Yale Law School he was still “uneducated,” and that “as a man to whom had been confided one of the major educational posts in the country, he should begin by trying to get an education.” He thus set about educating himself “with the help of some great books that have endured, and with twenty to thirty undergraduates as fellow students, selected from each incoming class for their promise.” This was the beginning of a four-year course in the Great Books.

This self-imposed course enabled him to bring about within the University of Chicago an intellectual and educational revolution that would make that university one of the best, not only in the United States but in the world. (Gress has a slightly different view on the Great Books approach to Western Civilisation which is well worth noting but it would be too much of a digression to pursue here [23].) Hutchins stressed that the great works of the distant past provide a scale of values against which to judge the activities and educational offerings of his own age, and that these older values have an intellectual and scientific solidity which the contemporary pragmatist and relativist mentality can hardly imagine. He believed that metaphysics, as conceived by Aristotle, can help people have the foundations for the acquisition of wisdom in ways that applied studies, which are concerned with the particular, cannot.”

5 Conclusion

Henri Bergson once said, “The body, now larger, calls for a bigger soul.” This remark seems very relevant to education in the western world today. The material structure of education is now much larger and more elaborate than it was when I was an undergraduate. But our material growth has not been matched by a corresponding spiritual growth. I assert that one of the reasons for this is the neglect of the liberal arts and failure to delve deeply into the purpose

Mathematics and the Liberal Arts

of education which has characterized educational planning in recent years. The ultimate purpose should be the starting point of such planning!

But to put this situation right, it will not be enough merely to give more prominence to arts subjects (it is not the quantity that matters); it will be necessary to see the liberal arts – and the sciences, as well – as parts of an integrated larger whole, capped by philosophy (“first philosophy”). Philosophy and mathematics can be natural companions in undergraduate education, and I was fortunate enough to have experienced this at the University of Sydney in the 1950s.

In this way it is possible to achieve what otherwise might seem impossible, namely “not growing old in the arts,” but remaining true to the dreams of their youth [24], being truly young at heart. In the last analysis, immersion in the liberal arts in a connected way is a strong foundation for any profession and is at the heart of the humanities, a means of living a full human life.

All of this begs the question about who can teach in an integrated liberal arts program? Based on the foregoing such teachers should not only be scholars in one of the strands of the Liberal Arts but also be able to demonstrate an appreciation of the integration of the strands appropriate to a Liberal Arts program. The whole program has to be greater than the sum of the parts, in much the way that strands of string can produce a strong rope. It is not a matter of ticking the boxes as subjects are passed. This happens in a la carte liberal studies courses in some universities.

In answer to the question which was posed at the beginning of this paper it should be clear by now that the answer is “yes”, but it depends on how it is taught, who teaches it, and how it is integrated with the rest of the curriculum. An example of this would be someone like the great British mathematician, G.H. Hardy, a number theorist who tried to put rigour into analysis, who was a pure mathematician whose guiding light was beauty and elegance, with strong links to history and logic, necessary ingredients for passion and inspiration in a teacher [26]. Ironically, much of the work of this very pure, pure mathematician was superseded by the Bourbaki movement, and he is most likely to go down in history for an application [27]!

(The sentiments and structure of the reflections in this conclusion are based on John Joiner White, a founder of Strathmore University in Kenya, that country’s first multiracial educational foundation.)

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Mathematics and the Liberal Arts

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