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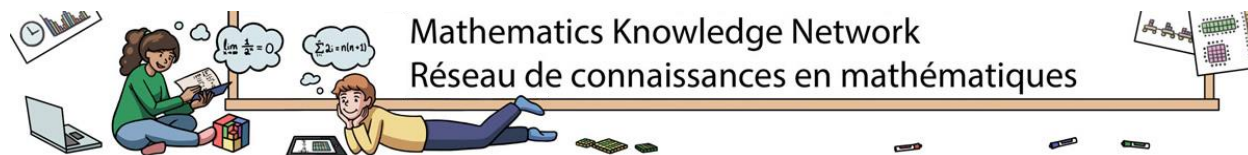
Has Mathematics Education misunderstood Homo Aestheticus?

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Myself

As a mathematician I am an artist.

As a teacher my job is to be an artist for my students so that they might themselves become artists.

In so doing I must also honour what we have called the didactic contract.

How am I to do this?

A serious problem

We are letting our students down—all of them

We are letting our teachers down

We are letting our wonderful subject down

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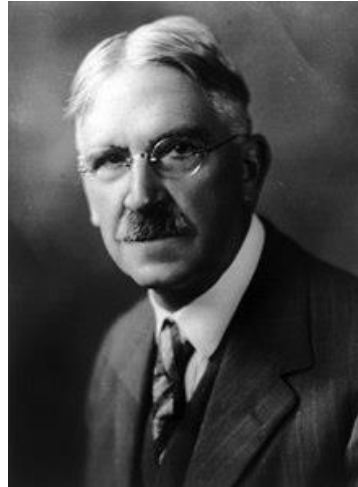
This is not a new story



Alfred North Whitehead

1861-1947

The Aims of Education (1922)
(1978)



John Dewey

1859-1952

Art as Experience (1934)



Seymour Papert

1928-2016

The Unconscious mind

Whitehead: *The Aims of Education* (1922)

“There is only one subject-matter for education and that is Life in all its manifestations. Instead of this single unity we offer children-Algebra from which nothing follows; Geometry from which nothing follows; Science from which nothing follows; History from which nothing follows...

“Can such a list be said to represent Life as it is known in the midst of the living of it? The best that can be said of it is that it is a rapid table of contents which a deity might run over in his mind while he was thinking of creating a world, and has not yet determined how to put it together.”

Whitehead's "rapid table of contents" is what we call the *laundry list*.

This is list of facts and procedures the curriculum document claims that a student must know in order to succeed.

Start with the list—create tasks that “teach” the list.

With rare exceptions, these tasks not true to the subject--they contain little mathematics.

And to add insult to ignominy, it is not the case that the students need the list.

And they are not based in meaningful activities, activities that are central to their lives.

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What is at the centre of their lives?

Homo Aestheticus

Aesthetics and beauty.

Dewey *Art as Experience* (1934)

By one of the ironic perversities that often attend the course of affairs, the existence of the works of art upon which formation of an aesthetic theory depends has become an obstruction to theory about them.

In common conception, the work of art is often identified with the building, book, painting, or statue in its existence apart from human experience. Since the actual work of art is what the product does with and in experience, the result is not favorable to understanding.

The very perfection of the works, the prestige they possess because of a long history of unquestioned admiration, creates conventions that get in the way of fresh insight. *When an art product once attains classic status, it somehow becomes isolated from the human conditions under which it was brought into being and from the human consequences it engenders in actual life-experience.*

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Experience!

Globe and Mail, Facts and Arguments, Thurs. Feb 6. 1997.

“How was the math?” I had remembered her despair when she came home from that exam.

Oh just about what I figured--60 per cent.

I retrieved the exam, and it was as I too had figured—a collection of small technical routines.

I only had time to answer three quarters of the questions.

“Don’t forget,” I reminded her, “That none of this is mathematics. This has nothing to do with your success in math. I know this because I am a mathematician, and these things are definitely not what I do.”

I know, I know!

“So, what else?” I asked, rummaging through the pile.

80 in English. Hey, not bad! Let’s have a look.”

It was a nice exam.

Hmm. Interesting.

“In each of the following three works, a serious character flaw exhibited by the main character contributes to chaos, unhappiness and even disaster in his or her own life or in the life of loved ones. Discuss this idea and compare its significance in two of these works: Othello, A Man for all Seasons, The Stone Angel.”

What struck me with real force about the two exams was their difference in sophistication. There was nothing on the math exam to touch the sophistication of that English question—not even close!

Jo Boaler *Mathematical Mindsets* (2016)

When we ask students what math is, they will typically give descriptions that are very different from those given by experts in the field. Students will typically say it is a subject of calculations, procedures, or rules. But when we ask mathematician what math is, they will say it is the study of patterns that is an aesthetic, creative, and beautiful subject (Devlin, 1997).

Why are these descriptions so different? When we ask students of English literature what the subject is, they do not give descriptions that are markedly different from what professors of English literature would say.

This wide gulf between real mathematics and school mathematics is at the heart of the math problems we face in school education. I strongly believe that if school math classrooms presented the true nature of the discipline, we would not have this nationwide dislike of math and widespread math underachievement.

Papert 1978, 1980

Poincare's theory of how the aesthetic guides mathematical work divides the work into three stages.

1. A deliberate, conscious analysis.
2. A stage of unconscious work—an active unconscious—aesthetic principles.
3. Delivery back to the conscious.

Aesthetic experiences power mathematical activity and thought in many ways.

More Papert (1978)

If mathematical aesthetics gets any attention in the schools, it is as an epiphenomenon, an icing on the mathematical cake, rather than as the driving force which makes mathematical thinking function.

Anne Watson (Sinclair & Watson 2001) has a nice comment on this: cs

I had a growing disaffection with this pedestrian approach to awe and wonder in mathematics, as if there were common sites for expressing awe, like scenic viewpoints seen from a tourist bus, whose position can be recorded on the curriculum as one passes by, enroute for something else. Spontaneous appreciation of beauty and elegance in mathematics was not, for me, engendered by occasional gasps at nice results, nor by passing appeals to natural or constructed phenomena such as the patterns in sunflowers or the mathematics of tiling.

Papert's Soap Sculptures

In a 1991 paper, Papert says that while working in a high school in Massachusetts, he often saw children working to make soap sculptures in an art class. He noticed that these students would be busy for weeks building their sculptures, exploring different ideas, taking the time to think about their work to admire, to change ideas, watch and comment on the work of others, etc. He became very interested in the differences between this class and that of mathematics. In mathematics, students rarely pursued projects allowing them to highlight their inspirations and fantasies for several weeks; rather they were given small problems to solve in a short time.



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This is a huge challenge for the secondary system

teachers

students

writers

This is also a huge challenge at the tertiary level

In fact, the universities have lost their way.