

What a mathematician might wish to know about my work

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Abstract

Mathematicians have contributed to confusions in the areas of logic, voting theory and the education of mathematics itself. While mankind may mistake abstract ideas for reality, mathematicians are not immune for this either. Part of my work has been to correct such mistakes. It would be useful when mathematicians study those corrections with an open mind, so that we can get better logic, more democracy and proper education in mathematics.

Introduction

Mathematics per se is not my target. Over the years I have written some texts that nevertheless may be of interest to mathematicians, like reformulations of logic, voting theory and calculus. These texts are not presented in ways that mathematicians may be used to. My work might be called *applied mathematics*, as it is not developed in an axiomatic context but is in the intended interpretation of some axiomatics that may still need to be developed. Hence some explanation is useful for mathematicians about what to expect about my work, since I would like them to study these books too. Without the explanation below we may expect neglect and misunderstandings from mathematicians, and this would be unfortunate.

I refer to my books ALOE, VTFD, EWS, COTP, EKWAGGG, SMJ / EWJ, see the references. Who is interested in logical paradoxes, will benefit from ALOE. Who is interested in democracy and voting theory, will benefit from VTFD. Who is interested in the impact of ancient mathematics and astronomy on religion, will benefit from SMJ / EWJ. Who is interested in the didactics of geometry and calculus, will benefit from COTP. Who is interested in education of mathematics, will benefit from EWS and EKWAGGG. The latter books also rely on economics, when they discuss the mathematics industry and advise to a parliamentary enquiry.

I am an econometrician (Groningen 1982) and teacher of mathematics (Leiden 2008). As a student I chose econometrics because I wanted to find decent solutions for world problems, and I considered the mathematical base as a *conditio sine qua non*. At the interfaculty of econometrics in the 1970s, we as students had our courses in mathematics also with students of mathematics, physics and astronomy. Clearly I consider mathematics important but I rather apply it. The didactics of mathematics is an empirical issue as well.

A context of quality

An indication of quality are two favourable reviews by Richard Gill (2008 and 2012) in *Nieuw Archief voor Wiskunde* with respect to ALOE and EWS & COTP. The European Mathematical Society website has two favourable reviews of ALOE and COTP too. Recently, Christiaan Boudri (2013) at the website of the Dutch Association of Teachers of Mathematics NWW calls for having an open mind here too. Koolstra and Groeneveld (2013) mention it in the Dutch math email newsletter.

A standard textbook is TSOM with ir. Karel Drenth (TUD, sadly deceased) (2000), as perhaps additional confirmation that I would be able to walk the standard path as well.

A point is that Gill is not specialised in logic and didactics as research fields. This also holds for me, though I did study the subjects that I write about. My subjects are elementary, so a specialisation to higher levels is not required. Still, the specialists in logic and didactics will tend to defend their specialisms. Everyone can check elementary errors, but will the specialists acknowledge those ?

Standard ways versus re-engineering

The point is now to explain the path into uncharted territory. There are plenty of cranks in the world, and standard mathematicians might tend to catalogue me as one of those, but if they would walk along with me along these new paths, then they might start to wonder whether the standard ways aren't a bit cranky themselves. An option is that they develop the required axiomatics, if that is required to make the new approach acceptable in the mathematics community.

Some mathematicians advise me: 'Present your proposals in various neat articles, phrased in the language that mathematicians like to read, and be done with it.' I am afraid that it doesn't work like that.

Above books *re-engineer* their subjects. In my analysis, standard views in those subjects are misguided in subtle ways. The best approach towards clarity is to reorganise the subject matter, start from scratch, and build on from there with an open mind.

Mathematicians contribute to confusion

A key point is that much confusion in these areas has been caused by mathematicians, who neglect the world and who focus on some *if-then* relationships, where perhaps the logic might be right in some respects, but where the assumptions are (subtly) confused about what the discussion is about.

My books intend to set the record straight, and to invite the mathematicians to reconsider their work, so that this fits in the whole, and thus to stop their contribution to confusion.

This observation is only a rephrasing of the earlier statement: my work is in the *intended interpretation*, the world of application. Thus mathematicians who consider such applications ought to benefit from this effort at re-engineering. Mathematicians are not my target, but the areas of application. Mathematicians interested in those fields better avoid confusion.

Hopefully, you see the problem. Once we enter the world of application, one must study reality and not just mathematics. Selecting only bits and pieces to find *if-then* relationships can contribute to confusion. A mathematician better be precise what the contribution is, and help to clarify what the application really is. Read my books and see how mathematicians have gone astray. They provide lessons on how to communicate on real issues, partly using the language of mathematics, but still focussed on the real issues.

Modesty

My books are modest. They are only what they are about, and not something else. It might sound curious to speak about 're-engineering logic, calculus and voting theory' but the purpose of this description is not to sound curious but to indicate what the books do.

An editor at the journal *Euclides* of NVVW worried that this description of re-organising subjects uses 'big words' but agreed with various points and did not specify what would be wrong, so it is not clear why that description would not be correct. I do not claim that I know everything. I do not claim that I am infallible. I just explain where mathematicians go astray at key points in key applications.

My books explain where Hans Freudenthal was in error, and suggest a better alternative, without returning to the old ways of teaching Euclid. Many other authors have promising suggestions too. Let parliament abolish the Freudenthal Institute and create the Simon Stevin Institute, where researchers from various fields can test what works for pupils and students. I am amazed that ICMI has a "Freudenthal Medal" while he has been disastrous for the education in mathematics, with his abstract mind in conflict with empirical reality. He rightly said that education is engineering, thus involves reality, but he was no engineer himself.

My position is *not* that my books explain how things must be, and that parliament must impose this on the mathematics community. That would be a gross misunderstanding. What works in education is up to the pupils and students themselves. Parliament must step in to make the funds available for research.

Little contact with mathematicians

As a writer, I have hardly any contact with mathematicians. It is my great regret that these books have been written mostly in a context where mathematicians were not willing to discuss the issues. The book on logic was written in my student days, at first in some interaction with some teachers in logic, but fairly soon in bitter antagonism from their side and with their unwillingness to listen to criticism. The book on voting theory first had some interaction with some mathematicians, but fairly soon in bitter antagonism again. For the book on calculus I have assumed neglect, perhaps I was wrong, and in reality there would have been keen interest. However, one review confirms bitter antagonism again.

The books on the education of mathematics EWS, COTP and EKWAGGG have been written with little interaction on these with my colleagues teachers of mathematics. My colleagues have all been fine and capable teachers and pleasant to work with. The focus of our work was on teaching the established programme. My ideas developed over time in notes, but I had little reason to discuss them, since this would distract from the overall focus on the established programme. For the same reason the books were written outside of school, and have not been presented at school. Clearly I want to avoid that colleagues might get the wrong impression that I would teach something else than the established programme. The discussion is best done in a context where improvement of the programme is on the agenda. Clearly, I haven't found that environment yet, given the neglect by such commissions (cTWO and NOCW).

The books essentially are invitations to be read and discussed, and if someone has a good counterargument, I will be the first to correct.

In the journal *Euclides* two reviewers of EwS and COTP have selected to start slandering. I have filed a protest with the editors. See my website for the slander and my reply. The reply was not published in the journal. They have decided not to review any book of me anymore. This now holds for EKWAGGG and SMJ / EWJ. Slander and now censorship. And these people teach mathematics.

The book editors of *Nieuw Archief voor Wiskunde* recently rejected SMJ / EWJ for review, with the argument that it would not fit the readership but that indicates that they have not studied it.

I have submitted some short papers to journals. Editors respond by saying "I do not understand it" and then reject the paper. It would help, and be more decent, to specify what one doesn't understand.

Some original contributions

My books also contain some bits of original contributions to mathematics, but these might perhaps only be understood in the reconstructed framework. They are already available in those books, so there is little advantage in trying to extract them as separate articles. The chance is slim that they might be understood without that reconstructed environment.

Apparently when I want to relay a message A then I also want more internal consistency in the mathematics $M(A)$ that underlies that message, and then I find myself solving problems in $M(A)$. While a pure mathematician would focus on $M(A)$ and think about a possible message A only in a second stage or not at all. Perhaps pure mathematicians might never discover $M(A)$ since they don't see A in the first place. This partly explains why pure mathematicians may have a hard time to accept $M(A)$ anyway. But I do not claim to understand how pure mathematicians think. I can only say: the context and my manner of presentation in that

context tend to differ from what (pure) mathematicians may be used to. If they are inflexible then they miss out on some key findings.

Some abstracts

There is a risk in given abstracts of these books since some subtleties might be lost. The human mind however needs some anchors. ALOE re-engineers elementary logic. It solves the liar paradox after 2300 years, and corrects Gödel by showing that his verbal statements and interpretation do not cover his mathematics. VTFD re-engineers voting theory for democracy, and shows that Kenneth Arrow on his *Impossibility Theorem* for collective decision making gives a verbal interpretation that does not cover his mathematics. COTP re-engineers plane geometry, and shows that derivative and integral are algebraic concepts. This is the fundamental understanding that can be used for highschool and first year math for non-math majors, while it remains an open question what Weierstrasz and non-standard analysis add to this. SMJ / EWJ suggests that religious concepts on the divine are as abstract as mathematical concepts like line and circle, with similar epistemological questions for existence and current research on mind and brain. It is conceivable that religious differences and perhaps even religious wars relate to misconceptions about Van Hiele levels of abstraction as in mathematics education. EwS and EKWAGGG also discuss the mathematics industry and errors in didactics, with a proposal of a parliamentary enquiry to resolve confusion and stagnation.

Parliament

The Dijsselbloem Parliamentary Commission on Education made the distinction between *what* and *how*. The government determines *what* will be in the programme (say Dutch and math) and the teaching community will determine *how* the subjects will be taught. It is fine that parliament has decided that the school programme has to include math. The problem is that "math teachers" present something as "math" which it isn't, see Colignatus (2013a). For example, two-and-a-half is written as two-times-a-half ($2\frac{1}{2}$) while it is better to stick to $2 + \frac{1}{2}$, and learn to see that addition as an end-station, in the same manner as $\exp[2]$ can be symbolic and doesn't directly require the use of a calculator. We can understand the use of $2\frac{1}{2}$ from some historical development, but we would all be silly if we were to accept it as decent mathematics. Jan van der Craats solves the issue by mostly using $5 / 2$, but this loses the useful feature of a mixed number. Hence, re-engineer the subject. Hence, let parliament investigate the mathematics industry.

To repair ages of wrong didactics will be a costly affair. Do we have to wait till the USA is open to my analysis, or might Holland take the lead ? I see little other ways of resolution than that members of parliament look into mathematics education. It suffices that they have had a highschool education with mathematics and then we can explain the current curriculum and the improvements in my books. This will be fun but also necessary for the improvement. I cannot see why mathematicians would be against teaching members of parliament more about mathematics. If they think that my suggestions for improvement are silly then it should not be difficult to show this. The members of parliament can also query users of mathematics like economists, physicists and biologists. Finally, note that my target is to establish doubt and to release funds for research. What is an improvement in didactics is an empirical question, and cannot be established by my books only. The error of the current math curriculum is that it relies on tradition and it is time that we see that didactics is an empirical issue.

The economic and ecological crises

Econometrics is: to translate economic theories into mathematical format and test these by statistical methods. Another word is "economic engineering". As an econometrician I have discussions with economists, mathematicians and statisticians. Misunderstandings in one realm may contaminate misunderstandings in another realm. This would not be logical, but a human thing to do. Mathematicians will not be able to judge details in economic theory, but may still think dark thoughts about my economic analyses, given their apprehensions about my books on the education of mathematics. Economists can get insecure if they think that my mathematics would be improper. The best response is to ask everyone to do their job and to

be specific about what one can judge about. My position as an econometrician suffers from maltreatment by the various subprofessions and this better stops. The world is in economic and ecological crises, my econometric analysis would help a resolution, and it doesn't help when the subprofessions malfunction.

Let me refer to Colignatus (2013b) on bottlenecks against science. Jos de Beus (1952-2013) was a professor of politicology, student of professor of economics Hans van den Doel (1937-2012), student of Jan Tinbergen (1903-1994), student of Ehrenfest, founder of econometrics and winner of the Nobel Prize in Economics. Mathematicians have long stories about that Prize etcetera. Point is that Van den Doel didn't quite understand Kenneth Arrow's *Impossibility Theorem*, see Colignatus & Hulst (2003, PDF page 85). Jos de Beus was misguided too. These misconceptions have influenced ideas in government circles. It would be such a relief when mathematicians would accept that they contributed to the confusion themselves too, since Arrow gave wrong verbal interpretations to his mathematical result, and others have been copying that. Kennisnet.nl and booklets of Epsilon Uitgaven still report inadequately, see Colignatus (2013c).

Conclusion

Mathematics as a profession is not my cup of tea. In my research on key topics in the real world I noticed that mathematics was applied in a wrong manner at key steps in the argumentation. It were especially the mathematicians who advanced such miscomprehension. One might think that people using logic or voting, or the teachers of calculus would be able to correct the misunderstandings of such confused mathematicians, but alas, mathematics also has an aura of authority. If things get complex, follow the specialist, and if a mathematician has a complex paper he or she might be that specialist. However, when I as an econometrician and teacher of mathematics present corrections, I find that mathematicians are not as open to criticism as one would wish. There are some sparks of hope now, but will there be a follow up ?

Let us hope that mathematicians will study my books, learn about the real world, see how important it is to communicate precisely. A sign of success will be when the confusions in voting theory are corrected. A sign of success will be when mathematicians start signing the petition for a parliamentary enquiry into mathematics education, and call on others to help them to save our children from misguided "mathematicians".

Thomas Colignatus is the science name of Thomas Cool, econometrician and teacher of mathematics, Scheveningen, Holland. <http://thomascool.eu>. The petition is at <http://www.ipetitions.com/petition/tk-onderzoek-wiskundeonderwijs>

References

- ALOE: Colignatus (2011), "A logic of exceptions", 2nd edition,
<http://thomascool.eu/Papers/ALOE/Index.html>
VTFD: Colignatus (2011), "Voting theory for democracy", 3rd edition,
<http://thomascool.eu/Papers/VTFD/Index.html>
EwS: Colignatus (2009), "Elegance with Substance",
<http://thomascool.eu/Papers/Math/Index.html>
COTP: Colignatus (2011), "Conquest of the Plane",
<http://thomascool.eu/Papers/COTP/Index.html>
EKWAGGG: Colignatus (2012), "Een kind wil aardige en geen gemene getallen",
<http://thomascool.eu/Papers/AardigeGetallen/Index.html>
EWJ: Colignatus (2012), "De eenvoudige wiskunde van Jezus",
<http://thomascool.eu/Papers/EWVJ/Index.html>
SMJ: Colignatus (2012), "The simple mathematics of Jesus",
<http://thomascool.eu/Papers/SMOJ/Index.html>

- Colignatus, Th. and H. Hulst (2003), "De ontketende kiezer", Rozenberg Publishers, <http://www.rozenbergps.com/files/CoolDEF1.pdf>
- Colignatus, Th. (2013a), "Brief aan Regering en Parlement over het Eindrapport van de cTWO", <http://thomascool.eu/Papers/Math/2013-02-06-Colignatus-nav-cTWO-Eindrapport.html>
- Colignatus, Th. (2013b), "Email n.a.v. de bijeenkomst n.a.v. het overlijden van Jos de Beus", <http://thomascool.eu/Thomas/Nederlands/TPnCPB/Brieven/2013-03-22-BijeenkomstJosDeBeus.html>
- Colignatus, Th. (2013c), "Pas op met wiskunde over verkiezingen", <http://thomascool.eu/Thomas/Nederlands/Wetenschap/Artikelen/2013-02-14-PasOpMetWiskundeOverVerkiezingen.html>
- Boudri, Ch. (2013), "Wiskundedidactiek: een gevoelige zaak", Ned. Ver. v. Wiskundeleraren, ledenforum, en ook op <http://thomascool.eu/Papers/COTP/2013-03-15-Boudri-over-COTP.pdf>
- Drenth, K. & Th. Colignatus (2000), "Transport Science for Operations Management", <http://thomascool.eu/Papers/TSOM/Index.html>
- Gill, R.D. (2008), "Book reviews. Thomas Colignatus. A Logic of Exceptions: Using the Economics Pack Applications of Mathematica for Elementary Logic", NAW 5/9 nr. 3 Sept.
- Gill, R.D. (2012) "Book reviews. Thomas Colignatus. Elegance with Substance. / Conquest of the Plane", NAW 5/13 nr. 1, March.
- Koolstra, G. and T. Groeneveld (2013), "WiskundeE-brief bericht over Conquest of the Plane", <http://www.wiskundebrief.nl/629.htm#13>