Chapter 2
A Conversation with Alan Bishop

Philip Clarkson

Abstract We wondered, why does the mystery of mathematics seem to disappear from students: Is it because teachers have never experienced mathematical mystery? We wondered would more use of projects and investigations promote a range of mathematical values than is possible when only traditional teaching approaches are used? We wondered do teachers and students need to reach some threshold of mathematical knowledge if they are to see the inherent mathematical values that help to hold the potential disparate elements of mathematics together? These and other wonderings emerged as Alan Bishop and the author engaged in conversation that culminated some 25 years of pondering mathematical values together.

Keywords Alan bishop · Mathematics · Mathematics education · Values

2.1 Introduction

It was in 1976 when I first made contact (by snail mail) with Alan, then at Cambridge University, when I was studying for my Master of Education degree. From then on our paths occasionally crossed until Alan came to Australia in 1992 to take up a position at Monash University (Clarkson 2008a). I was by then at Australian Catholic University (Melbourne campus). Hence opportunities for working more closely together became a reality. One issue that our conversation both on and off the golf course kept returning to was values and mathematics. These notions had come into stark relief when each of us quite separately spent time in Papua New Guinea interacting with students and teachers. For Alan "it was his own experiences while living in Papua New Guinea (in 1977) that transformed (his) thinking. No longer for him were the social, cultural and political issues of some importance; they became *the* important issues with which he needed to try and come to grips, as far as teaching of mathematics was concerned"

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(Clarkson 2008a). And these issues still need to be dealt with to this day (Vilson 2017).

The rest of this chapter will have excerpts of the last conversation that we had in Australia, audio-recorded in my office. Most of the references have been added later. I had compiled some 'starter ideas' with which to structure the conversation, and these are shown as figures. When contemplating these ideas before the conversation, Alan had made some notes and these appear in italic typeface. My post conversation reflections appear in plain typeface and are inserted at places as appropriate.

2.2 The 'Original' Six Values

We began our conversation by returning to the six values that Alan had used in his seminal book (Bishop 1988).

PHIL: I am talking to Alan Bishop just before he returns to England after 25 years in Australia. It is probably the last conversation we will have about values and mathematics in Australia.
ALAN: Yes I think that will be right. I have been thinking about your starter statements for a month or so. I have written out some notes that overlap with those ideas.
PHIL: I read through the starters again this morning. I guess I started thinking about the original values again after a particular conversation we had playing golf 6 months or so ago. I had forgotten about the notion of investigations and projects (Fig. 2.1), which did not feature heavily in the VAMP[1] project (Clarkson 2008b; Clarkson et al. 2010).
ALAN: I also thought about 'Starter 1' and wondered whether the six math values and their sequencing still made sense. And it still does to me. Yes 'Starter 1' made me think about quite a lot of other things. The book was much more to do with students. So we focused more on the teachers in VAMP and that still goes on.
PHIL: Well remembering back to what started our discussions that we have sustained over the years, there are still many threads to explore that come from these notions.

Starter 1: In our work of the last 25 years or so, we have not emphasized the teaching of projects, which you originally linked to the societal component of your model, as well as investigations, which you linked to the cultural component. Both teaching approaches certainly break the mould of traditional teaching in that students have to keep at the one thing for multiple lessons. That in a way has left traditional teaching approaches you associated with the symbolic component. I suppose in the VAMP project we were deliberately leaving it to the teachers to 'teach in their normal manner'. Do you still think that projects / investigations are a useful context for those four values?

Fig. 2.1 Starter 1 for our discussion

[1]VAMP stands for the *Values and Mathematics Project*. This was a project Alan and I ran from 1997 through 2001. It was in part funded by small and large Australian Research Council (ARC) grants.

ALAN: Yes that's the case. My reading of the Starters has reinforced my thinking more deeply about teachers and curriculum. That's where some of the original ideas we have generated come through. The notion of the 6 values in 3 pairs; that was good:

The following are at the pedagogical level:

Projects teaching approach => societal components: control and progress
Investigations teaching approach => cultural component: openness and mystery
Traditional teaching approach => symbolic component: rationalism and objectism.
The other structural element in the book that was important are the five levels; cultural; societal; institutional; pedagogical; individual.

We then started discussing real life possibilities for teaching using investigations and projects.

ALAN: A couple of days ago I heard a very good talk about gambling. It was very interesting. I raised the question that 'does the presence of the poker machines emphasize the negative sides of gambling?' You know there is just a little step between those poker machines to other (games) machines that kids are playing with these days. How much is there a gambling factor in that? I reckon it could be a very strong factor. The challenge of the games injects a bit of competition for the kids.
PHIL: Yes
ALAN: And kids love the competition
PHIL: Playing on them (the game machines) might be sort of a bit of 'digging of the field' or preparation before they get into the gambling. And ah clearly there is always the probability that you will win but you also learn that the house will never lose. Overall the machine will never lose. The machine will always make some small profit and as time goes on that is enough for them to keep the whole circus going.
ALAN: Yes; *Bringing down the house* (Mezrich 2003). Have you read the book? Lovely book. And the movie too; *21* (Spacey et al. 2008).
PHIL: But those sorts of things get at some of the sorts of values of thinking through investigations I guess … As long as the teachers have in mind some of the mathematical values that could be taught through this, as well as societal.

Afterwards I reconsidered the issue of teaching using investigations and projects. In these teaching contexts some crucial issues need to be addressed which may not be at all obvious for young teachers, and for teachers whose confidence in teaching mathematics is low. Students do need to be given choices, not necessarily regarding the issue that will be the focus of the project or investigation, but certainly within it. But their choices will not be 'real' if students cannot make personal connections with the issue. So projects that bring out great mathematics, but really only have interest for adults, perhaps are not appropriate. Hence I am not sure that gambling would be an appropriate topic until late primary school. I never used it until early years of secondary school.

But choice of this sort needs to be balanced by reality. There is a school curriculum to teach, and possibly nation-wide testing focused on specific skills and content.

Hence although at times there might be a wide choice given to students, at other times choices may be constrained by content that must be covered in a particular time frame.

Another issue is that projects and investigations can often focus just on the answer. So primary schools students who produce wall charts or power points often only tell what they have found. But how they progressed to that end point is not so well expressed. And yet it is the doing of the mathematics in the long run that is the more important issue. It is not only the skills to be learnt and honed that is crucial: The general ability of how to go about solving a problem and the joy that can come from being involved in such a process is what will have more long lasting importance for students. And clearly there may be times when the mathematical values that were part of the doing, can be named.

ALAN: I do want to comment on something else. My sense is that the science people know much more about group projects and investigations. I always liked it when I was teaching at school; we had science practical and science theory: theory was in the morning and afternoon was science practical. And the practical always related to the theory and I wonder whether you could do the same with maths. You could have maths practical and you could have maths theory. Maybe we would need to change those words and have projects. I think that partly one of the difficulties for teachers to take on board some of these ideas is it is expecting them to work out how to do it. You know 'Suppose we want to do all this? Would we want to have projects at a certain time of the day?' … I took over the timetabling for Education at Cambridge. First thing I did was to block out all of Wednesday for Math Method. It was terrific. Suddenly you had a whole day to devote to a whole range of projects: Which we did. So I wonder why couldn't we do something similar in schools.
PHIL: In some ways I think you have been envisioning this for secondary schools. I reckon this would be much easier done in primary schools. You know they are far more flexible with time in that it is one teacher or a group of 2–3 teachers, that have got that group of children to teach. And they've got their space. They can tend to be quite a bit more flexible than their secondary colleagues with that and with how they organize their time as well. So it might well be a possibility there.
ALAN: It would be nice to know from some teachers … I'd like to do some case studies where teachers are trying to do new stuff with this flexible approach of using investigations and projects and doing something about values.

2.3 The Interplay of Confidence, Competence and Values

We want to have students on the cutting edge of their knowing: They need to roam their unknown. Teachers need to expect that students will indeed roam and move beyond their edge. Sadly many teachers tend to stick to one way of presenting problems that they find comfortable: a solving strategy that works for them. Another possibility is to use a variety of solution strategies for a problem and then give stu-

Starter 2: There are many teachers in primary schools who are not confident and some not competent in the mathematics they teach. Similarly, teachers in junior secondary years for whom mathematics is not their choice of teaching subject, but they are drafted into teaching mathematics (Clarkson 2016). But can these teachers who may not know their way around the mathematics apart from at an instrumental level, also work through a meta analysis of what they are doing to allow the valuing they will indulge in to emerge?

Fig. 2.2 Starter 2 for our discussion

dents reflection time to discern the differences between the strategies. And within those discussions, encourage students to understand what values are embedded in their reflections.

Alan and I have been involved in university primary and secondary pre-service education programs. In one study we found that the notion of values and mathematics was nowhere apparent in such programs (Clarkson et al. 2010). Hence, part of our on-going conversation dealt with the education of teachers (Fig. 2.2).

Alan had written three points regarding this Starter:

What kinds of teachers do we need teaching mathematics? Perhaps looking at Finland might be a useful example? What support do our teachers need?

And then added another three that dealt more with us as researchers:

What do teachers currently do? What are teachers normally like? Are there examples that help us understand where are the gaps in our knowledge?

PHIL: Well one of the things about teachers choosing values … is how much mathematics do they need to know. When I wrote 'Starter 2' I was thinking about primary pre-service teacher students. Clearly there are some that come to university knowing their mathematics. They are good at maths. But there are many more … ah, well, their understanding is a bit 'iffy'. And then there is a small group of students that you really have to work with on what they do understand maths to be, and math concepts, let alone skills etc. And it did prompt in my mind, 'can they appreciate mathematical values if they are battling with just what mathematics is?' Thinking for example about say mystery as one of the values; with little grandkids, well mystery is sort of just natural for them. But is it natural for the teachers? I suspect it is not. And I think if you said 'mystery' then 'mathematics', they'd say 'What?' They would not get the connection in the way we see it. I suspect because they haven't done mathematics … It is not that they have not done enough mathematics. I suspect they have not done mathematics in a way that exposes them to these possibilities of mathematical values.

ALAN: I think you are right. But it is not just a matter of the teachers not doing what they should be doing, or at least what we think they should be doing … I'd like to think a bit more about the pressure on teachers and well how this links to 'choice'.

PHIL: Yep

ALAN: Who has the goodies that's going to be stimulating the teachers and make them brave enough to take on the challenge if you like? So, yes I think that choices

are there. But I think they're (the possibility of making choices) probably for most teachers, hidden. My experience of in-service work is teachers saying 'Well that's all very well but I've gotta do the plan, I've gotta do this, I've gotta do that.' I felt this keenly when I was doing this study for ACER with Lawrence (Ingvarson et al. 2004). We were looking at different structures for (school subject) departments in secondary schools. I was quite influenced by thinking about how to characterize departments. I chose various words that to me described what a particular department was about. Maybe this happens more in primary schools, I'm not sure, but some of the ideas we toyed with then I thought were very good and the notion that you could have a maths department, with a head of department, this is very (well was) very strong in the UK (I guess I will soon see what it is like now in the UK) and strong ideas of the group notion to be important so that the teachers don't feel alone, and are made aware of the choices that are open to them and they are party to discussions.

PHIL: Yes that notion of 'groupness' in primary schools in Australia: the early years P-2 teachers often work as a group: as do the years 3–4 teachers, and the 5–6 teachers. You know the year 3–4 teachers for example work together as a well-knit group on planning, etc. So there are avenues there as well. But it is not like the mathematics group (or department in a secondary school). It is the group of year levels teachers. It is a different structure of the school. One of the real difficulties in primary is to have a teacher who is recognized in the school as the leader of mathematics. Invariably they have a Literacy leader, but for the next by far biggest block of teaching time, mathematics, most times there is no-one designated as the leader. That's totally surprising to me, but it is a rare thing to have.

ALAN: Yes it brings up again the issues that surround teachers in terms of curriculum choices and methodological choices that they have to face (Seah et al. 2016). And this is where as you were saying the choices may be recognized but they are not appreciated in the way that maximizes the potential of the subject as a value-laden subject.

PHIL: I gave that talk to teachers up in North Queensland this year (Clarkson 2017). It was more of a workshop rather than a keynote lecture that they asked for. We started with content; what are the 'big ideas' of mathematics and so on. And then halfway I inserted the notion of values and you could see quizzical looks going round the room.

ALAN: I bet you did.

PHIL: But I think from the feedback of various teachers during the remainder of the day, the notion of values was recognized as being part and parcel of the subject but, in one teacher's words, 'I've never activated it. I've never activated that part of the subject. It's real food for thought.' But the notion that it is part and parcel of this subject area I think that was something that many of the teachers present actually started to recognize. Some of them for the first time, others knew it, but no action.

ALAN: Yes that's the question: Why have they done nothing about it? You know I tend to fall back I'm afraid onto the defensive argument of, 'life's tough and ah' …

PHIL: And it is so. Certainly is for teachers!

ALAN: You can't get away from the time pressure. You actually do need to get some sensible, serious, good mathematical work done. Yes it is a difficult thing.

PHIL: But doesn't that also go back to what we were trying to talk about in that paper we wrote with Annica and Wee Tiong (Seah et al. 2016), gf that it is also the way you conceptualize the curriculum and it is also the way you conceptualize mathematics and what's important about it. If you re-conceptualize it, think about it in a different way, then it becomes a notion that 'you don't have to teach more. That this (values) is not an 'add on' and you've gotta make time for it.' It becomes more of 'you've got to teach differently'.
ALAN: Yes … what's the argument for doing that? Why do I have to teach differently?
PHIL: The Bishop told you to! Sorry. Been at the Catholic University too long!
ALAN: It seemed like a good idea at the time!!
PHIL: Well … one of the reasons you should is that you are actually getting down to the fundamentals of what mathematics is when talking about these values.
ALAN: Yep
PHIL: It is one of the reasons. It is not the only reason by any means. But is one of the reasons that actually gives it sense. Now when you talk about weaving you put the thread through the basic framework made up of the tense warp; you know those strands are the basic stationary threads that run this way. And then you put the weft through it in the pattern that you want on the fabric. But unless you know that those basic structure of threads, the warp, are there through which the weft has to go, you end with nothing. It is the warp that holds the whole fabric together: And so with the values imbedded in mathematics. No wonder so many of our school teaching colleagues think mathematics is very 'bitsy'. You do a bit of this and a bit of that and a bit more over there; and that's mathematics.
ALAN: Yes mm that's good.

This part of the conversation made me think again of issues which we had raised in the VAMP project, but still need thinking about; What stories do teachers tell regarding critical incidents in their teaching? What impact do they see of values in these moments? Do they see valuing as part of the mix in the decision process at the time, post incident, a long time after the critical incident? (Clarkson 2008a).

2.4 Mystery

I have written before on one of the six mathematical values that Alan listed, *rationalism* (Clarkson 2004). However, one that to me is undervalued is *mystery*. Many people either regard mathematics as mysterious because they do not understand it, or dislike it and hence do not want to understand it (Andersson and Wagner 2018). And yet as Alan suggested in his book it is the sense of *mystery* and its counterpart *openness* that bring understanding to the bigger picture of how mathematics sits within our broader culture. These two values go beyond the symbolic component (*rationalism/objectism*), which allows students to grapple with mathematical ideas "we think are worth knowing about", and the societal component (*control/progress*), which "shows how ideas are used" (Bishop 1988, p. 114). *Mystery* and *openness*

Starter 3: I wonder whether little kids have more of an understanding of the mystery of mathematics and that this seeps away as they age? I am pretty sure there are many students who do not get that rationalism is part and part of doing mathematics.

Fig. 2.3 Starter 3 for our discussion

allow students to reflect on mathematics as a whole. "Valuing mystery … (can lead to) thinking about the origins and nature of knowledge and the creative process, as well as abstractness and dehumanized nature of mathematical knowledge" (Bishop 2016, p. 50).

Others too have thought that mystery is important in capturing students' (and teachers') interest through their imagination. This leads to a deeper appreciation of just what mathematics is. Mason (2015) notes the delight, surprise and curiosity that he was trying to invoke, and did, in his teacher audience as he involved them in various activities; surely all aspects of mystery in a good sense. Ernest (2015) in defining the beauty of mathematics includes surprise, ingenuity and cleverness, which seem to me to also speak of the mystery of mathematics that a student might (should) be experiencing.

ALAN: Someone, a scientist, said to me, 'Why have you put mystery in? Mathematicians are not terribly interested in mystery. Whereas in science, that is our bread and butter.' And that made me think … well that is, maybe the case.
PHIL: I am now playing with two grand children who are three and four. They do ask why questions, and they do get interested, and to me they sort of are really exploring at a cutting edge for them, and it is all engaging and it is a bit of a mystery for them (Fig. 2.3). 'Look what I have … Grandpa look what I have made.' 'Well of course you have made that kid, it's gotta be that way because …' I think but do not say.
ALAN: Because 'that's the way it works'.
PHIL: '… that's the way it works'. But they don't see the pattern and the obvious eventuality of if you have square blocks then you've gotta have those smooth sides … then it will end up that way. But they see it as a mystery: 'Gee look what I made! It's a mystery. How did that happen?'
ALAN: Yer yer
PHIL: I wonder whether there is something about it that we don't evoke mystery at all in our teaching of mathematics. It seems for many (most?) students if you're not sure where your work for this mathematics problem is going, then you've gotta be wrong.
ALAN: Mmmm Yes
PHIL: You sort of gotta know the end product. You can't just go and explore.
ALAN: That's right.
PHIL: I think, I reckon that it is pretty sad.
ALAN: There was some discussion after the film *The Man Who Knew Infinity* about the Indian mathematician Srinivasa Ramanujan came out. I had some interesting conversations about that. I was trying to explain to some other colleagues that he was very good at making these conceptual leaps (Pressman 2016). In the film, one of the

Cambridge mathematicians was saying "How do we know that's the case? You've got to justify this. You just can't … just can't come up with these ideas and keep going. You've got to be able to prove. You've got to be able to substantiate this.' And yer, that was quite an interesting sequence I think. It seemed to me one could bring a little bit more of that into this conversation a bit more of that idea.

Actually in the film I thought there were two points of mystery. One was certainly the one Alan noted. But another was that Ramanujan just seemed to accept the mystery of his insights (which very occasionally did not turn out to be provable). The traditional Cambridge mathematicians could not accept the 'leaps of faith' Ramanujan made and it was a mystery to them that he accepted his leaps without question. The intervention of Hardy, facilitating the communication between the two groups, was in itself fascinating.

2.5 Students' Competence, Choice and Values

Our discussion had focused on teachers and not so much students simply because of the pressure of time. Hence our discussion of 'Starters 4 and 5' was limited (Fig. 2.4).

When thinking about 'Starter 4' I recalled that during a teacher professional learning session I summed up one point with 'Never interrupt kids who are talking maths. If students are talking mathematics, then as the teacher you may gain some insights into the thinking that is going on, but equally on reflection you may understand more of the valuing that they are choosing in that context.' We know that there is always a huge range of knowledge within a class group (Clarkson 1980). And the same is probably true for the valuing that students are choosing at any one time. But as a teacher both are important to plumb.

PHIL: I wonder too whether you had any more thoughts about the MWB construct we built some time ago now (Clarkson 2010). And whether that is a useful thing for teachers? It really has not taken off with colleagues.
ALAN: No. It's a pity that it hasn't because I think it focused quite clearly on what teachers were about and what they find rather difficult. It could still be useful I think.

Starter 4: How much understanding of mathematics, and/or doing mathematics, do students have to have before they can start understanding the roles mathematical values play? That's not year level dependent. It's the language we used in the Mathematical Well Being[2] (MWB) construct. Is there some sort of threshold of being able to do, and know you can do, mathematics before you can move to a meta-analysis state and sort out something about your values?
Starter 5: Choice is a crucial aspect of valuing.
a. Do students recognize what valuing is? What age does this kick in? Do they recognize that this behaviour is also associated with doing mathematics?
b. Students will have been making choices ever since they started doing mathematics.

Fig. 2.4 Starters 4 and 5 for our discussion

Maybe keeping the two areas of mathematics and values in mind is going to push the MWB a little bit: I think that'll be useful. So I think we have a potential dichotomy, for teachers perhaps, but not necessarily in a problematic way.
PHIL: Well this dichotomy: The MWB was always trying to build a bridge between what has been set up as a dichotomy of content and values. But if you think about the different MWB stages, both were always represented in each stage: The doing mathematics, talking about it and being confident in explaining, etc. BUT the values are there as well. How could it be otherwise? They are part and parcel of the maths. That needed to be appreciated. So the two are really one, but aspects of the one.

Alan did write in his notes under 'Starter 5':

What guides choices in the classroom? Education is all about choices?

Teachers make choices before lessons, during lessons, post lessons and with regard to the holistic context within which specific lessons are located (curriculum, assessment, resources, etc.). There are also choices students can make, but they are normally within a classroom context and hence students are often constrained more in what they can change. So what choices can students make in the classroom? What are their options and what are the constraints? Indeed what allowances do we make for students to express values, compare values, and indeed think about values?

Interestingly, students can choose to disengage in various ways even within the mathematical classroom context, which is rarely a choice for teachers. Even if students stay engaged they may well choose not to reveal their value choices and at times disguise their choices for a variety of reasons. Students are schooled at a young age to know that to reveal what they really value may not be acceptable to teacher or peers, so they may keep quiet or pretend otherwise. If this assertion is correct, this calls into question whether students' actions are a good indication of their values. For students, what they are allowed, or think they are allowed to do, may well override a chosen or intended value. So maybe classrooms are not contexts that are conducive for students to reveal deep value choices. What would we discover about students' mathematical valuing if we talked and observed students doing mathematics outside of the classroom? Almost certainly some mathematical values are learnt at home before schooling begins, and some values may well continue to be reinforced by home, even when they are at variance with what teachers espouse. How do we research that issue?

In the VAMP project we soon realized that language was an issue that we needed to address when working with teachers. Not surprisingly the more we talked with the same teachers about mathematical values, a shared understanding of key ideas emerged, and a shared language which enabled us to think more deeply together. Not surprisingly a similar situation arose when working with students (Atweh et al. 2010).

An assumption that has been at the heart of our work, a good one we believe, is that teachers do have some influence on their students' values. However the reverse question might also be worth exploring: Do the values of students influence teachers' values? A further worthwhile question might be; Does the teacher's influence over

curriculum, resources, assessment and teaching ethos have an impact on students' values?

If we are to make progress we might need to rethink what are good strategies for collecting data since there are so many constraints in play at any one time. Maybe we need to plan for lengthy periods of on-going data collection in differing contexts. Who asks the questions that drive the data collection should also be debated. Why should that always be the researchers? What questions would students ask? What questions would teachers ask? Why these?

2.6 Final Comments

ALAN: We have talked a lot about mathematical values, but there are the other values
PHIL: Pedagogical
ALAN: Yes and cultural values.
PHIL: It's interesting isn't it that we try to talk about mathematical values and yet being teachers we do tend to slip across to pedagogical and cultural values among others. I think that speaks to me of trying to compartmentalize these ideas. But to actually think about them in the real world of teaching there's a free flow between them. In the actual act of teaching you can't compartmentalize them. But coming back to the six values you wrote about all that long time ago, are there others?
ALAN: That's always the question.
PHIL: I think we have talked about this a number of times.
ALAN: I can't really answer that question until, until I feel comfortable with what the six are about. If you are asking me about value 7 or 8 I'd have to say, 'Hold it'; because I'm not going to give up those six lightly. I think they do strike a chord with people.
PHIL: And capture most of what you see as mathematics.
ALAN: Yer yes. I don't think that the technology has made them all irrelevant in some way. Yep I'll stick with the six for now.

2.7 Summary

This conversation has led me to ponder again the six values that Alan had articulated. In some ways the first of the three pairs (rationalism, control, openness) are most commonly acknowledged, although of these three, there seems to be more emphasis on the first and less on the third. I had originally thought of the six as somewhat discrete but now I realized my position had changed. They are each distinct but the boundaries between them are nevertheless somewhat fuzzy. For example, the description given by Bishop about *progress* and *openness* seem to allow these two to slot rather nicely together. Further the language one needs to express *progress* and *openness* overlap in particular; you do need to use logical connectives if you are

making generalizations or justifying. But then they are also needed for rationalism too. Thus the overlap is an issue that I suspect needs to be explored further.

I had wondered how *rationalism* and *mystery* could coalesce. But just as Bishop suggests although he still wonders about the mystery of Pythagorean triples, among other things, he clearly knows the rational mathematics of the triples. It seems to me that at times rational understanding seems to deepen mystery, not negate it. And yet so much teaching emphasizes only the rational. How can the emphasis on the rational continue, as it should, and yet allow elements of mystery to seep in too?

The issue of whether there is some threshold of knowledge before mathematical values can be appreciated in depth still for me stands as a crucial issue. The notion of students' (and indeed teachers') choices also remains an issue that needs detailed exploration. Choice is a foundational notion when considering valuing. But how can this be undertaken in the complicated context of a classroom?

This conversation did not result in many concrete positions that we agreed on. But more importantly it continued to open each of us to further and crucial notions to explore. One hopes the reader will also be challenged to think broadly on the notion of mathematical values, a crucial element of the foundational frame that holds what we understand as western mathematics.

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