



Teaching Math Classically with Andrew Elizalde

Lesson 2: How to Improve Math Education in the U.S.

Outline:

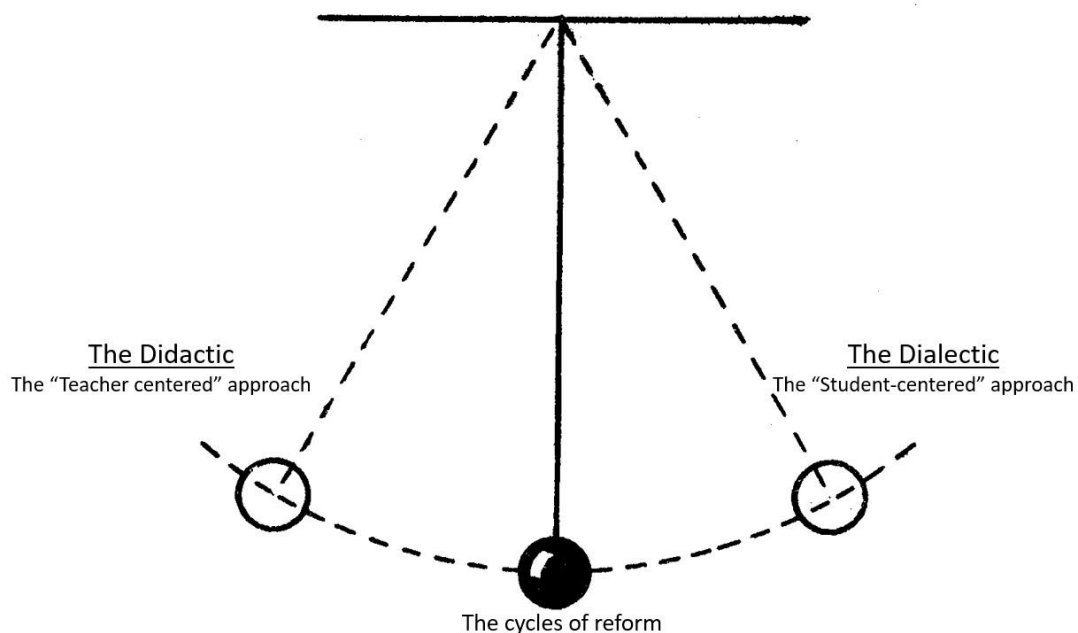
How to Improve Math Education in the U.S.

- *What is being advocated currently?*
- *Do we need to be careful?*
- *What is missing from these conversations?*

What is being advocated?

- Two of the loudest voices in the conversation are the “*flipped classroom approach*” and the “21st Century skills” approach
- The flipped classroom
 - *The increasingly popular student-centered approach where the teacher acts as a facilitator while the students are engaged in active, collaborative learning. Anything that can be digested through reading/watching a lecture can be done at home, while the class period is one of discussion and discovery, of contemplation and struggle.*

Visualization of the Pedagogical Pendulum





- The changes and reforms in education style in America can be visualized on a pendulum, where at this point America stands on the extreme end of the didactic side.
- Therefore, a move towards the dialectic side would be **helpful**, but it is **not the answer**, as to swing it entirely to the other extreme would simply bring on a new set of problems such as the ones the early progressives faced.
- A **balance** must be achieved between the didactic and the dialectic – from the structure of the didactic to the contemplation of the dialectic.

The 21st century skills

- *The 21st Century skills have been pushed as increasingly needed skills to survive in the 21st century environment and workplace, as universities are increasingly shifting their emphasis from just the degrees to actually preparing the students to be engaged citizens ready for the world*

Skills for the 21st Century

Information media and technology

- Information, media literacy
- Information media and technology skills

Learning and innovation

- Critical thinking and problem solving
- Creativity and innovation
- Communication and collaboration

Life and career skills

- Increasing flexibility and adaptability
- Initiative and self-directed
- Cross cultural skills
- Leadership and responsibility
- Accountability

- “I fear we have already prepared an entire generation of students in a manner that largely leaves them unable to solve or even comprehend complex problems. A contributing factor, if not the overriding one, is the failure of American colleges and universities to ensure that graduates have the intellectual tools necessary to make sense of the world in which we currently live... Having students receive a degree and not engage in the true meaning of becoming an educated citizen is unconscionable and should cease immediately.” – Steve Bullock, *Higher Ed Plays Key Role in New Age*.
- “Are we educating students for the world they’re entering to?” – Ken Robinson
 - With the exception of the information media and technology section, it can be argued that these skills are not as much 21st century skills as much as age old principles



- In the end, are these skills 21st century skills or just skills of greatly educated people?
- An increasing emphasis on life skills as opposed to very specific degrees is helpful, but calling these skills 21st century might be a bit of a stretch

Do we need to be careful?

- *Yes, as evidenced by America's history – we have seen cycles of educational reforms that made little impact at best, and swung the pendulum to another extreme at worst – we do not want to be another useless cycle. Instead, we need to take a step back and consider more comprehensive approaches. We should also consider other contexts and perspectives to find the flaws in current philosophies.*
 - While recognizing the value of what came before, we must be careful not to romanticize it, nor should we immediately discard what we have now – instead looking for what works within it.
 - We need to consider different perspectives to find if there are any voices we are missing, for example. In this case, the standpoint of a Christian educator, where flawed philosophies are rooted in misunderstanding of nature of the student.
 - The greatest problem any student has to solve is the problem his/her sinful nature, and deal with the fact that they are not naturally motivated to seek virtue.
 - Any suggestion of reform that does not acknowledge the nature of the child is going to be one that's fundamentally flawed.

What is missing from the conversation?

- *Andrew argues that a very large part of what is missing are the different perspectives on mathematics – mathematics as art, as something that can be enjoyed without utilitarian motives, as a language for understanding and describing creation – these perspectives which bring back the wonder and beauty of mathematics and grounds them in creation. What is missing is also an understanding of the historical narrative, which is full of discovery and universalities, and perhaps most importantly, a Christian understanding which underlies teaching and binds all these together.*
- The art of mathematics (Or, the consideration of the beauty of mathematics)
 - Let us not be obsessed with utilitarian motives
 - Perhaps the contemplation of the universals and beauty
 - Do we pass on what we love about mathematics to our students as opposed to merely fulfilling a checklist?
 - It's hard to measure appreciation, curiosity and joy.
 - We should return these elements of truth and goodness and beauty.
 - Must we force simplified justifications for learning mathematics?
 - Often what is taken away is not the equations but a new way of thinking and problem solving.
- The historical narrative



- Let us engage in the history of mathematics – that of discovering universal truths that are helping us to understand our world more and more.
- “An integrated curriculum must teach subjects, but it should do so by incorporating each subject, even mathematics and the hard sciences, within the history of ideas, which is the history of our culture. Every subject has a history, a drama, and by imaginatively engaging with these stories we become part of the tradition” – Stratford Caldecott, *Beauty for Truth's Sake*
- There are universal ideas that mathematics can draw our attention to and are worth contemplating and paying attention to.
 - It is not merely a mental tool that helps us to manipulate the world, with no relation to truth.
- The value of memorization
 - Returning to the ancient arts of memorization NOT rote memorization.
 - Conceptual understanding as well as computational efficiency
- The relationship between mathematics and creation
 - Mathematics gives us a language to describe the natural phenomena.
 - We have a language that is incredibly apt for invention and description in the regulations, symmetry and patterns, the beauty and brilliance of the universe's design.
 - Perhaps we might even contemplate God himself through mathematics.
- A Christian understanding of nature of child and project of education.
 - We need to understand the child and their natural inclinations, and take that into account when creating our individual philosophies.
 - We are ambassadors and witnesses of Christ in the classroom, we take part in the sanctification process.
 - As teachers, we are responsible for impressing the relationships between mathematics, truth and creation to our students
 - We are educating our student's whole person, participating in God's work in their lives.