

Two Integration of Faith and Mathematics Projects for Freshmen Mathematics Majors

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May 29, 2012

Abstract

Two projects will be presented that integrate faith and Mathematics in a freshman Introduction to Proofs class at George Fox University. The first project asks students to look at the life of a Christian Mathematician. The focus of this project is to show students that many great mathematicians also had immense faith. The second project asks students to take a close look at their own life. How do they plan to live a life of Christian faith in their chosen profession? Both projects are designed to encourage students to look at their careers in Mathematics as a vocation.

1 Background

George Fox University is a small, Christian, liberal arts university in Newberg, Oregon. George Fox and its faculty place a high value on the integration of faith and learning in our scholarship as well as the integration of faith in our teaching. The mission of George Fox University is *George Fox University, a Christ-centered community, prepares students spiritually, academically, and professionally to think with clarity, act with integrity, and serve with passion.*[1] Mathematics, by nature, focuses on the education of the mind. Although a clever, beautiful proof can at times tug on my heartstrings, Mathematical proofs rarely appeal to my students hearts. I have been motivated to create faith integration projects for Mathematics students by my belief that students need non-secular role models in both the spiritual realm and the professional realm. I want students to know that there is more to a Mathematician than a logical mind. Throughout history, faith has been the focus of the lives of many Mathematicians. My goal in this paper is to present to you two projects that could be implemented in any Mathematics course in order to open students eyes to the men and women of faith that played a role in the development of Mathematics. These projects help students see that even in a field of abstract logical thinking, faith can and should be the focus of their lives.

2 Integration of Faith into the Mathematics Classroom

I have to admit that I find the concept of integrating faith and Mathematics extremely challenging. I want to bring issues of faith up in my classes, but I have felt in the past that I have to put anything that I would have to say about faith into a distinct subset of my lecture. After I have presented a mini-devotional of sorts, I dive into real Mathematics. This is a much weaker faith integration experience than what I desire for my students. A different and more appealing option would be to somehow weave the study of our faith and the study of Mathematics together for our students. Heie says it this way,

I believe that I must seek coherence in my worldview beliefs. This requires that I seek to discover (or is it create?) connections or interrelationships between my biblical and theological understanding and academic disciplinary knowledge, for I believe that knowledge is all of one piece. [5]

So, where do I find these connections? Where are these interrelationships in Mathematics and faith? I believe that one (certainly not the only) answer lies in the people who have joined these two seemingly different ways of looking at the world together: Mathematicians.

3 The Projects

The student projects that I developed are laid out below. The first project is a ten to fifteen minute PowerPoint presentation students given to the class in groups, and the second part is a five-page paper that each student writes individually. I will present the projects here in a form close to what appeared in my Introduction to Proofs syllabus.

3.1 Project 1: Mathematicians of the Past

The history of Mathematics is full of names of Mathematicians that made positive contributions to both Mathematics and to their faith. This presentation project is intended as an opportunity for you to take a look at one of these Mathematicians in detail and gain a better understanding of what it means to be a Christian Mathematician. My hope is that as you read about these men and women you will form your own opinions about how your worldview will affect and complement your future career in Mathematics.

Assignment:

In a group of three or less give a ten to fifteen minute PowerPoint presentation on the life of a Mathematician that contributed not only to the field of Mathematics, but also lived a life of faith. Subjects to cover in your presentation:

1. Give a brief history of the Mathematicians life. (Country of origin, where they studied, where they taught, their economic position in life, their accomplishments)
2. What are the major contributions that this Mathematician made to the field of Mathematics?
3. What are the major contributions that this Mathematician made in theology and/or how did this Mathematician live out their faith in God?
4. How did this Mathematician make connections between their professional life (as a Mathematician) and their religious life?
5. As a student of Mathematics, would you or would you not consider this Mathematician a good role model for you as you begin looking at a career for yourself in Mathematics? Why or why not? Examples of Mathematicians to write about:

Johannes Kepler, Isaac Newton, Gottfried Wilhelm von Leibniz, Blaise Pascal, Michael Faraday, Bernhard Riemann, Boole, Leonhard Euler, Bernhard Bolzano, Weierstrass, Cauchy, Georg Cantor. (You may write about any Mathematician you choose as long as you can find material about their lives.)

3.1.1 Grading

When grading the PowerPoint presentation, I use the following rubric. I grade each of the five criteria on a 10 point scale.

Visual Presentation: (How good does the PowerPoint look? Is it done professionally?)

Oral Presentation: (How well did you talk about the presentation? Was your speaking clear?)

Information: (Did you talk about all of the information required?)

Professionalism: (Did you look professional while giving your presentation?)

Overall: (Was the presentation as a whole educational? Did everyone contribute equally?)

3.2 Project 2: Mathematicians of the Future

It is not often that Mathematics and faith are talked about in the same lecture, much less the same sentence. In this paper, I will ask you to integrate both your skills in mathematics and your worldview into a statement about what is important to you in life. Your goals as a student of mathe-

matics and your deep convictions as a person do not have to be mutually exclusive. I want you to take time to think about what your goals in life are and how mathematics will play a role in accomplishing these goals.

Assignment:

Write a five-page paper describing the following in your own life:

1. What are your goals as a math major/minor/student? In other words, why are you a Math student? (If your answer to this question is, I just like Math, I encourage you to take a closer look at what is it about Math that excites you, and how Math can play a part in your contribution to the world.)
2. How will you use Mathematics in your career?
3. How will you integrate your worldview into your career?
4. Do your worldview and your career have anything in common? Explain.
5. How do you plan to keep a balance between your career and the values in your life that are most important to you?

3.2.1 Grading

This project is graded for both the quality of the writing and the effort and thought put in by the student. Since each student is writing about their own life and experiences, it is difficult to quantify what makes an excellent paper. However, it is not difficult to tell when students have not put time or thought into their work. I tell students that I am primarily going to be grading their papers on the careful thought they give to each question and on grammatical correctness to a lesser extent.

4 Project Goals

I designed these projects to make my students consider two important things. First of all, the PowerPoint project is intended to show them that the history of Mathematics is rich in men and women who had a strong Christian faith. Second, I wanted students to take some time to think about their own lives and how they plan to incorporate faith into their future career.

4.1 Mathematicians of the Past

The first goal of the Powerpoint project is to introduce my students to some of the great minds of Mathematics and the lives that they lived. Many Math classes do not focus much on the history of Mathematics. This project gives students a glimpse of the rich history of Math.

The second goal is to show students how faith was a driving force in many of the great mathematician's lives. In the PowerPoint project, I ask the students to tell us whether they would consider the mathematician that they studied to be a good role model. This was an important piece of the project in that the students were asked to look carefully at the men and women that they studied in light of both their Mathematics and their faith. The reason for doing this is that I wanted students to look deeper into the mathematicians biography than just their great mathematical accomplishments. The Bible says in Mark 8:36-37,

What good is it for a man to gain the whole world, yet forfeit his soul? Or what can a man give in exchange for his soul?[2]

In the words of Gauss,

There are problems to whose solution I would attach an infinitely greater importance than to those of mathematics, for example touching ethics, or our relation to God, or concerning our destiny and our future; but their solution lies wholly beyond us and completely outside the province of science.[4]

This project challenges my students to think about Mathematics informing things other than our Mathematical accomplishments. My goal for my students is for them to see that their gift of logical thinking can be used to discover new and exciting Mathematics, but they are also called to use their logical minds to think about issues of faith, good and evil, and salvation. Mathematics should not be the sole focus of my students thoughts. They need to be thinking about their current and future lives in Jesus Christ. Cauchy once said,

Men will pass away but their deeds will abide.[3]

Students need to look at the scope of their lives and their accomplishments in light of what will remain. Mathematics is a wonderful tool to sharpen our minds and to let us catch a small glimpse of the order that is in Gods creation, but there are bigger questions to be answered that Mathematics does not address. These great mathematicians of the past give us a model of such thinking. This project gives my students an opportunity to look into the integrated life of faith and thinking of these great men and women.

4.2 Mathematicians of the Future

The second part of the project gives students an opportunity to discuss and organize their thoughts on issues of faith in their own lives. How is their faith going to play a role in their future career? Does their chosen future career have any intersection with the values in their lives that are most important to them? These are difficult questions to answer for students and often questions that they have not thought about before. Many Mathematics majors become Math majors simply because they love

Math. They have not given much thought to how they are going to apply Mathematics to their Christian lives. This project helps students to start thinking about the connections between their vocation and Gods calling. Some of our students vocations include being teachers, research Mathematicians, and working in business, but they have all been called to use their logical mind for Gods kingdom.

5 Follow Up Day

The day that students hand in their five-page paper, I have a follow up day in class. On this day I have students break up into groups of three or four and talk about what they have learned in these two projects. Following are the questions that I ask them to answer:

Was there anything hard about writing this paper? If so, what?

What did you learn about yourself while writing this paper?

How will your faith shape and inform your career?

I then bring the class together again to discuss what they have talked about in groups. Lastly, I give the students my own personal testimony. I tell the students what integrating faith into my life looks like and why I chose to be a Mathematician and teach at a small Christian university. I tell students about my relationship with Jesus Christ and how my relationship with Him affects the way I teach and work. Students walk away from this day feeling like they got to know me better as a person and some of them feel like they know themselves better after talking through some of these integration issues.

6 Assessment

To assess both projects, I give a three question evaluation on the day the papers are handed in. The three questions I ask are:

Were the two projects in this class valuable to you personally? If so, how?

Do you have any comments (positive or negative) on the PowerPoint project?

Do you have any comments (positive or negative) on the personal paper project?

I have been pleased with the feedback that I have received through these evaluations. The student comments have confirmed that my goals are being met. Here is a sampling of student comments:

Since I recently changed my major and career choice, it was nice to take time to really think about my life after George Fox and how my faith will interact with my career. It was helpful to actually verbalize it and write down my plans.

The two class projects forced me to research the people in the history of math, and make me think about what I wanted to do in math. Learning about what other mathematicians had done and how they had used their faith helped me to think about what I wanted to do with my life.

I enjoyed the first one (the PowerPoint) because it gave me a chance to see how founders and giants in math, people with IQ's in the stratosphere, still see God and argue for the truth. I love reflection papers because in college there isn't enough time to just sit and think about your life.

7 Conclusions

The two projects discussed have been a positive experience both for me as a professor and for my students. The presentation is an excellent opportunity for students to get a glimpse into the history of Mathematics and to get to hear about the faith of some of our Mathematical fathers. The paper project has given me a glimpse of the call on my students lives. It has also forced them to think about what is truly important to them and how their faith is going to influence their careers. Students have come away from both projects discussing Mathematics and faith in the same conversation, which is a victory in and of itself. I hope that you have found these projects interesting and will be able to implement them in some form into your Mathematics classroom.

References

- [1] *George Fox University Catalog*
- [2] *The Holy Bible, New International Version*, Zondervan, Grand Rapids Michigan, 2002.
- [3] H. Eves, *Mathematical Circles Revisited*, Boston: Prindle, Weber and Schmidt, 1971.
- [4] J. R. Newman (ed.), *The World of Mathematics*, New York: Simon and Schuster, 1956. p. 314.

[5] Arlin C. Migliazzo, *Teaching as an Act of Faith*, Fordham University Press, New York, 2002. p. 99.

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