

Collin County Community College District

APPLICATION FOR SABBATICAL LEAVE

Instructions

Please complete this application by responding to all items. Attach requested documentation (in the order requested) and secure the appropriate signatures prior to submitting the application to the chair of the Sabbatical Leave Committee. Please submit the original and 10 copies.

Name William Ardis

CWID 110557999

Title Professor of Mathematics

Division Academic Affairs – PRC (MSPE)

Have you ever been granted a sabbatical? No If yes: Dates of Prior Sabbatical(s):

Please provide a brief description of your previous sabbatical project:

Sabbatical Leave Period Being Requested

Dates: Beginning Date August 2018 Ending Date December 2018

Length: ☒ One semester ☐ Two semesters ☐ Other

Applicant's Agreement

ABSTRACT

Please give a summary description of the project and its significance in improving teaching and learning at Collin College. Please use language that can be readily understood by persons in areas of expertise other than your own. **PLEASE DO NOT EXCEED SPACE PROVIDED BELOW.**

The purpose of this sabbatical would be to gain expertise in the teaching method known as Inquiry Based Learning (IBL). With the information gained from this sabbatical, I will implement IBL into the courses I teach, beginning with the calculus sequence.

The Academy of Inquiry Based Learning (AIBL) describes IBL as "a broad framework for teaching mathematics that is applicable in a wide range of situations." The AIBL lists two components of IBL:

1. Student engagement in rich mathematical tasks
2. Regular opportunities for student-to-student and student-to-instructor collaboration.

The particular form of IBL I would like to focus on is the Modified Moore Method (MMM).

After attending a workshop and session at the summer mathematics meetings, I will review any relevant literature on IBL and examine existing materials developed by other faculty which integrate IBL into their calculus courses. Using all this information, I will redesign my courses to integrate IBL.

As I develop and implement IBL into my calculus courses during fall 2018 – spring 2019, I would be mentored by Dr. Ted Mahavier. Dr. Mahavier is an expert in the Moore Method and the Modified Moore method, and he is one of the authors of *The Moore Method: A Pathway to Learner Centered Instruction*.

Implementing a new teaching style will provide me with a chance to get out of my comfort zone and allow me to improve my teaching. Through the use of IBL, my goal is to improve student understanding and application of the concepts of calculus. Upon completion of my sabbatical and one semester of implementing IBL into the calculus classes I will teach, I would be willing to offer workshops or seminars on IBL as part of the faculty development conference or at the Mathematics Faculty Workshop.

Inquiry Based Learning as a Method for Teaching Calculus

A person does not learn to swim by watching a "How to Swim" video on YouTube, he or she will jump in the pool and learn by trying. When it comes to learning a subject such as mathematics, most people probably learned by watching their instructor work problems. And if we go on to teach mathematics, we use this same method. For more than 30 years I have used the lecture method, because that is how I was taught. Over the last couple of years I have been looking for a better way to teach. Instead of just passing on a body of knowledge, I want students to actively participate in the development of their mathematical knowledge. In this way, students will develop ownership of the material, which will lead to a deeper understanding of the concepts. Students that have a deeper understanding of the mathematics are more likely to succeed, not only in the current course, but in future mathematics courses as well. One method that seeks to give students ownership of the material is Inquiry Based Learning.

The purpose of this sabbatical would be to gain expertise in the teaching method known as Inquiry Based Learning (IBL). With the information gained from this sabbatical, I will implement IBL into the courses I teach, beginning with the calculus sequence. According to mathematics professor E. Lee May, he describes IBL as

... a method of instruction that places the student, the subject, and their interaction at the center of the learning experience. At the same time, it transforms the role of the teacher from that of dispensing knowledge to one of facilitating learning. It repositions him or her, physically, from the front and center of the classroom to someplace in the middle or back of it, as it subtly yet significantly increases his or her involvement in the thought-processes of the students.

The Academy of Inquiry Based Learning (AIBL) describes IBL as "a broad framework for teaching mathematics that is applicable in a wide range of situations." The AIBL lists two components of IBL:

1. Student engagement in rich mathematical tasks
2. Regular opportunities for student-to-student and student-to-instructor collaboration.

This engagement in mathematics can be achieved through student presentations of their solutions to problems developed in class. Having students derive and then present their solutions gives them ownership of the material.

The particular form of IBL I would like to focus on is the Modified Moore Method (MMM). In a pure Moore Method course, students are given a set of definitions, and a list of theorems to prove. They are not allowed to work with anyone else or consult any outside sources. If a student thinks they have a valid proof, they present it to the class. Other students may ask questions of the presenter regarding any part of the proof. The goal of the Moore Method is for students learn how to do mathematics, to be active in creating the knowledge. This method is frequently used in proof based courses for juniors or seniors or graduate students. The Modified Moore Method (MMM) is not as rigid as the Moore Method. In an MMM class, collaboration among students can play a key role. Students may be divided into groups and they work together to solve the given tasks. A representative from the group (chosen by the instructor) then presents the solution to the class.

In order to facilitate the learning in class, an instructor needs a well-designed set of mathematical tasks that will engage the students. These tasks should allow students to ask questions about the concepts, to pose conjectures, to prove mathematical statements, and to apply the mathematics. As I redesign my courses to integrate IBL, I will review existing literature on IBL and examine materials developed by other faculty to integrate IBL into their calculus courses. This will help me to structure my course in a manner I think is appropriate for students to learn the material. It is important to have a good set of problems that make the students take an active role in their learning in class. There are some materials available online for use in an IBL version of calculus through websites like the Journal of Inquiry-Based Learning in Mathematics (www.jiblm.org).

As I develop and implement IBL into my calculus courses during fall 2018 – spring 2019, I would be mentored by Dr. Ted Mahavier. Dr. Mahavier is an expert in the Moore Method and the Modified Moore method, and he is one of the authors of *The Moore Method: A Pathway to Learner Centered Instruction*. Dr. Mahavier would provide guidance as I redesign my course, develop materials for use in the class, and implement IBL into any calculus course.

Implementing a new teaching style will provide me with a chance to get out of my comfort zone and allow me to improve my teaching. Through the use of IBL, my goal is to improve student understanding and application of the concepts of calculus. Using IBL in class will also reinforce the core objectives in our mathematics courses. A student will use critical thinking skills any time they have to pose a conjecture or prove a result. A student will have to use communication skills anytime they have to write up a result or present it to the class.

This sabbatical meets several of the colleges' core values. It promotes academic excellence and learning, since I would be learning a new teaching method so I can improve as an instructor, and by using this method in my classes, my goal is to improve my students' ability to learn mathematics. It would also promote these values through workshops or seminars on IBL that I would be willing to offer as part of faculty development or at the Mathematics Faculty Workshop.

I would like to thank the committee for taking the time to consider my application.

Proposed Timeline:

July 2018:

Attend IBL workshop

August 2018:

Attend IBL sessions at MathFest (the summer meeting of the Mathematical Association of America)

September – December 2018:

Continue to learn about IBL by reading articles and books about IBL and the Modified Moore Method. Then, using the ideas gained from the summer workshop, sessions from MathFest, and review of the literature, I will redesign the manner in which I present material in the calculus sequence. There are very few textbooks available for calculus using IBL. Other sources of material include the website for the Journal of Inquiry-Based Learning in Mathematics (www.iiblm.org), and another possibility is to investigate open source textbooks. As part of this redesign, I will survey the available materials developed by other faculty using IBL. As I work on redesigning my calculus sequence, I will have the guidance of a mentor, Dr. Ted Mahavier, an expert in the Modified Moore Method. The redesign could mean developing new or alternate materials classes that incorporate IBL.

January 2019:

Attend IBL sessions at the Joint Mathematics Meeting

January – May 2019:

Teach at least one calculus course using the techniques and materials developed during the sabbatical. I would continue to work with Dr. Mahavier as my mentor.

Fall 2019 – Summer 2020:

Continue to implement IBL strategies and techniques in all calculus courses I teach.

Fall 2020 - ?:

Extend the use of IBL into any sections of Differential Equations, Linear Algebra, or Discrete Mathematics that I teach.

Bibliography:

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