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Research Study Plan and Informed Consent

Research Project Overview:	
Study/Project Title:	Addressing Postsecondary Mathematics Remediation: How to Encourage Students to Persist in Spite of Mathematical Deficiencies
Principal Investigator:	Alexandra Johnson Email: aljohnson@my.milligan.edu Phone: (423)-620-8762 Relation to Milligan: Undergraduate Student
Faculty Advisor¹:	Dr. Mark Dula Email: medula@milligan.edu Phone: (xxx) xxx-xxxx
Research Assistant(s)/Co-Investigator(s):	Name(s): N/A Email(s): N/A
Outside Collaborations:	No
Proposed Study Start:	August 2022
Proposed Study End:	November 2022
Funding:	No

¹ For principal investigators who are students

Study/Project Purpose:

The United States job market is experiencing a shortage of mathematically qualified individuals to fill the gaps within the STEM job market. Without these individuals, the U.S. will not be able to support and keep up with the fast-paced technological advancements that have been displayed during the 21st century. The problem with the lack of mathematically inclined individuals displays its one of its root issues at the college level. There are not enough students in college taking mathematics courses at the postsecondary level, and therefore, there are not enough students earning mathematics degrees or being trained in mathematics skills. There can be many reasons for students not engaging in higher-level mathematics, ranging from mathematics anxiety to negative mathematics experiences. One of the reasons that affect students at the collegiate level is the nature of remedial mathematics courses that they are required to take. These courses can be demoralizing for students, and students have a difficult time connecting the mathematics that they are learning with their future careers. Students exit these courses discouraged and disinterested in mathematics. It is difficult to rewrite the mathematics history of students before they choose their major, and it is

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impossible to change the content that students are presented in remedial mathematics classes. What educators can do is determine how to motivate and encourage persistence among students inside of the remedial mathematics courses and instill an appreciation for the mathematics that they are being taught. This research is aimed at identifying factors inside of the classroom that affects the persistence and engagement of students in remedial mathematics classes. The questions that will be addressed in this study are:

What factors inside of the remedial mathematics classroom influence the engagement of students in the mathematics content?

What factors inside of the remedial mathematics classroom influence the persistence of students through remedial classes and onto more challenging mathematics courses?

Research Methods:

This study will collect qualitative data through a stratified sample of students. The data will be collected through interviews.

Research Plan, Procedures, and Methods:

- Data will be collected from the 2019-2020, 2020-2021, and 2021-2022 academic years to determine which students were enrolled in any of the following courses at Milligan University: MATH 090 (Math Strategies for College Success), MATH 107 (Principles for College Success), MATH 111 (College Algebra), or MATH 171 (Precalculus). There will be a collection of student data during this first stage of the research process. This would occur during the months of May 2022 until July 2022.
- From the students that fit the requirements above, the course load that each student has taken during their time spent in postsecondary education (whether at Milligan University or another college/university) will be evaluated to determine if they continued to take two or more of the courses at Milligan that would be considered mathematics heavy. This would take place from May 2022 until July 2022.
- From this point, the students will be divided into three different groupings: students who did not continue to take two or more postsecondary mathematics courses, students who did continue to take two or more postsecondary mathematics courses and did not major in Mathematics, and students who did continue to take two or more postsecondary mathematics courses and who did major in Mathematics. This would take place from May 2022 until July 2022.
- From each of the groupings, three students will be randomly selected (9 students in total) to be interviewed about their mathematics background, their feelings/attitudes towards mathematics, and their experience in the remedial mathematics courses at

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Milligan University. This will occur in August of 2022. Participants will be contacted during this period to participate in interviews.

- These interviews will either occur in person or via Zoom, based on the preference of the interviewee. The interviews will be recorded, and there will be notes taken during the interview by the interviewer. The anticipated duration of each interview will be 30-60 minutes. Refer to the interview guide below for interview questions. The interviews will occur from August 2022 until November 2022. Data from the students will be collected during this stage of the research process. The material that students will be asked will not be sensitive, and students will not be exposed to interventions or materials that would alter their well-being.
- After the interview, the data will be gathered and assessed. The data will be used and distributed in the research, but the interviewee will remain anonymous. There will be a follow-up with students based on the information collected in the interview. The interviewer will condense the information in the interview with the students for reporting in the research paper. The interviewer will correspond with each of the interviewees to ensure that their opinions and experiences were communicated clearly and accurately.

Interview Guide:

1. What is your major?
2. Why did you choose the major that you are currently involved in?
3. How do you see mathematics fitting into your future career, if at all?
4. Describe your experiences in mathematics during middle and high school:
 - Was it a time that you enjoyed mathematics?
 - Was it a time when you lost interest in mathematics?
 - Was there a turning point in liking/disliking mathematics during this period? If so, explain.
 - Did you have any teachers that influenced your mathematics journey in any way? Can be positive or negative.
5. How would you describe your experience with any of the following mathematics courses at Milligan University: MATH 090, MATH 107, MATH 111, MATH 171?
 - Did you find them to be helpful?
 - Did you enjoy the class? If so, what did you enjoy about it?
 - Do you think that the information pertained to your future career?
6. Why did/didn't you continue to take more mathematics courses?
 - Why did you not continue to take any more mathematics courses or why did you not continue to a mathematics-heavy career?
7. How do teachers help encourage you in mathematics classes?
8. How can teachers make mathematics classes more interesting?

Study Participant Recruitment:

Approximately 9 students/graduates will be interviewed for this study:

- The age of participants in the study will range from 18 to 26
- Participants will be selected by gathering a stratified sample. All students who have completed one of the MATH courses listed above will be divided into three different groups: (1) students who completed the MATH course and did not continue to take any more mathematics courses, (2) students who completed the MATH course, took 2 or more mathematics courses and did not major in Mathematics, and (3) students who

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completed the MATH course, took 2 or more mathematics courses, and did major in Mathematics. Three students will be selected at random from each of these groups.

- There will be no special populations included in this study
- Their participation will consist of one interaction
- There will be no compensation for participation in the study

Benefits:

There will not be any benefits to the group of participants, but the general population of students who are preparing to take remedial mathematics courses will benefit from this research. One of the main goals of this research project is to get more students to enjoy the mathematics that they are placed in and help students develop an appreciation for mathematics regardless of the career path that they choose. Instead of students journeying through classes that they believe are not useful for their desired career path, students will now be more prone to enjoy what they are learning because of the encouragement and persistence tools discovered in this project and applied by educators.

The benefits of this study are not guaranteed. If there are no factors that positively influence encouragement and persistence among students, then there will be no benefits achieved from this research project.

There will not be incentives that will encourage participation in the study.

Risks:

There are no serious risks as students will be anonymous to the reader and subject material is not sensitive.

Informed Consent

Participation in this study is voluntary.

Research participants will be emailed regarding the study and the interview process. The email will include the research questions and will describe the nature and setting of the interview that the participant will potentially be involved in. Students will be informed of how the information of the interview answers will be used and distributed in a research paper/presentation. They will have the opportunity to accept or decline the invitation to be interviewed based on their availability/comfortability with the nature of the research.

An *Informed Consent* form for this study:

- Is described in **Appendix A**
- Is not required (*NOTE: This selection is infrequent for research conducted at Milligan.*)

Privacy and Confidentiality of Data:

- Participants' identifying information (PII) will be collected and connected to the research, but the researcher will be the only one with this information. The data that is distributed and written about will keep participant information anonymous.
- The PII that will be collected will be the name, student identification number, course selection, and major. This information will be used to separate the groups of students into different strata for the stratified sample. The information will also be used for the

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interview if the students are selected and volunteer to be a part of the study. When the data collected from interviews is used in the final report of the study, the PII will not be included.

Research data shall be maintained at all times in a secure manner by the Principal Investigator on a password protected Milligan network drive, or Milligan account within research/archival software (such as Qualtrics, Sharepoint). The research data will be maintained by the Milligan Investigator (or designee) for 3 years, at which time the digital (and any related physical data) will be securely destroyed per the *Human Research Protections Program* policies. The culminating research report shall be archived in a central location on Sharepoint maintained by the IRB and the Office of Institutional Research and Effectiveness (IRE). The Principal Investigator will retain a personal copy of the culminating research report/document.

The research data and/or specimens from this study:

- Will not be used for any other studies
- May be stored for use in secondary research (broad consent to store will be obtained)
- May be used in secondary research (broad consent to use will be obtained)

Results and Reports:

The findings from this research will be used and disseminated as follows:

- The results of the research study will be used to draw inferences as to why students respond the way that research study results will be used to draw inferences as to why students respond the way they do to remedial mathematics courses and draw upon the strategies that they have found to be helpful in mathematics courses. The information will be recorded and evaluated in the research paper/project.
- The research may be presented at a conference outside of Milligan. This presentation will include the nature of the research, the purpose of the research, and the results of the research.
- Participants can have access to their interviews at their request. The recording of the interview will be sent to the participant, as well as the notes were taken by the interviewer. Participants will not have access to others' interview results or information.

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Appendix A – Informed Consent Form

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Research Participant Informed Consent Form

Invitation to Participate

You are invited to participate in a Milligan University sponsored research study. This form is part of a process called “informed consent” to allow you to understand this study before deciding whether or not participate.

This research study is recruiting students to participate in this study. The expected duration for participation is two to four weeks .

This study is being conducted by Alexandra Johnson (the Principal Investigator). The Principal Investigator is associated with Milligan as an undergraduate student. You may already know the researcher as a Mathematics teaching assistant or student leader at The Well student ministry, but this study is separate from those roles.

Research Objective/Purpose:

The purpose of this research study is to evaluate and determine what factors help encourage students and promote persistence inside of the mathematics classroom.

Procedures:

The procedures used for this research study are described below.

- A list of the students who took one or more of the introductory mathematics courses at Milligan University will be gathered from the Registrar's Office. This list of students will be divided into three subgroups based on their further participation in mathematics courses and their major. This will occur during the months of May 2022 until July 2022.
- Three participants will be selected from each subgroup, nine participants total, to be involved in the study. The students will have the choice to accept or decline the invitation to participate. Participants will be selected and contacted during August 2022.
- Students who decline the invitation to be involved in the research process will have no consequences. Participants who terminate their involvement before or after the interview will not face any consequences.
- The participants will be interviewed once by the principle researcher. The interview will be anywhere from 30 minutes to an hour long, and the questions will be about the student's mathematics background, attitude towards mathematics, and importance of mathematics in the workforce.
- The interview will be recorded, and there will be notes taken during the interview. The information from the interview will be evaluated and important pieces will be selected to be included in the final research presentation.

Voluntary Nature of the Study:

Participation in this study is voluntary. Any decision to not participate in this study will have no penalty or loss of benefits that you would otherwise be entitled if you were not invited to participate. Additionally, you may discontinue participation in this study at any time, without penalty or loss of benefits that you would otherwise be entitled if you were not invited to participate.

Risks and Benefits of Being in the Study:

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Risks: Participation in this research study involves the following minimal risks. There are no risks because the information is not sensitive and Personal Identifying Information will not be released in the study

Benefits: Participation in this research study involves the following potential benefits. These benefits, however, are not guaranteed.

Teachers/professors will gain insight into what encourages students inside the mathematics classroom and what students view as incentives to persist through the material. This will potentially affect the teaching styles that teachers/professors choose to adopt when teaching introductory mathematics at the postsecondary level. This teaching style will potentially encourage students to engage more heavily in the mathematics they are placed in and see in their careers. This might also lead to more students developing a deep appreciation for mathematics and deciding to pursue a career in a mathematics-heavy field.

Compensation:

This research study:

- Does not involve any compensation.
- Does involve compensation as described below:

Describe in detail any payment, gifts, or reimbursement you are providing to participants and how such compensation will be made available as per the Research Proposal.

Privacy:

By participating in this research study:

- Your personal identifying information will be **maintained confidentially** and will not be used in association with any other research project. Your study-related research data will be used and reported as an aggregate only and will not be individually identifiable.
- Your responses to the survey will be **completely anonymous** and no personal identifying information will be associated with your responses. Your survey responses will be used and reported as an aggregate only.
- Your responses to the survey/interview will be **maintained confidentially** as follows: The principal investigator will not include the participants' private information in the research report. All statements that are used in the research will only describe what category of students that the participant is a part of.

Research data for this study will be maintained securely by the Milligan Investigator (or Milligan designee) for a period of 3 years, at which time it will be securely discarded.

Secondary Research

(NOTE: Research conducted by Milligan Investigators typically does not involve future, secondary research initiatives.)

This research study:

- Does not involve** storage or use of the research data (or specimens) for future, secondary research.
- May involve** storage and/or use of the research data (or specimens) for future, secondary research.

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- Your personal identifying information will be maintained as described in the “Privacy” section.
- Data/specimens will be stored and used within 3 years.
- The future, secondary research will be limited to none
- By initialing/dating in the space provided, you give broad consent to for the storage and/or future use of the studies research data and/or specimens: Initials: _____ Date: _____

Research Participant’s Rights and Responsibilities

As a research participant the following rights and responsibilities apply:

- If applicable, significant new findings developed during the course of this research, which may relate to your willingness to continue participation in the study will be provided to you during the course of the study by the Principal Investigator.
- To withdrawal from the research study while it is still in-progress, contact the Principal Investigator to ensure orderly termination of your participation.
- For a summary of the findings or conclusions from this research study, you may contact the Principal Investigator.
- For questions about this research study, your rights and responsibilities, or a research-related injury, you may contact the Principal Investigator and/or Milligan’s Institutional Review Board.

Contacts:

Principal Investigator:
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Phone number

Milligan Institutional Review Board:
IRB@Milligan.edu

Office of IRE:
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Statement of Consent:

I have read and understand the Informed Consent information presented for participation in this research study.

- This study **does not** require written consent. As applicable to the study:
- By clicking the provided **link or “I consent” button**, I am 18 years or older and I agree to participate in this research study.
 - By **replying “I consent” via email** to the Investigator, I am 18 years or older and I agree to participate in this research study.
- This study **requires** written consent. By **signing below**, I (or my minor child) agree to participate in this research study.

Participant’s Name (Printed): _____

Participant’s Signature: _____ **Date:** _____

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Parent/Guardian (Printed): _____

Parent/Guardian Signature: _____ **Date:** _____