

Kelle Clark  
CSCI6840 Spring Term Project Proposal  
Due Date Feb. 11, 2020 by 3:30pm

It is crucial to the success of a student that they are provided with the best guidance in course selection. Wingate University has dedicated a lot of effort in creating a Math Placement Test under the direction of Dr. Lauer and other members of the Wingate Math Department. The math faculty use the results of a student's Math Placement Test, along with other data, to recommend a list of math courses suitable for the student's skill level. After conferring with Dr. Don Merrill, Dean of the Cannon College of Arts and Sciences, Dr. Brizindine, Chair of the Mathematics Department and Dr. Lauer, I can report that we all agree it is essential to the effectiveness of this advising process to continually monitor the accuracy and reliability of these tools against resulting student outcomes.

My intention is to build a responsive web-based application with usable interface driven by a search engine that allows faculty at Wingate to evaluate the current model for recommending math courses to incoming students. The product would also allow faculty to reveal patterns in the ever-growing database of this information. The data used would include student scores on the Math Placement Test, the schedule of classes taken during the semester a student takes their first math course at Wingate, and the outcome of the student's first math course registered for (W, A - F). My proposed life cycle for this software would have the majority of the data preprocessing and design phases completed by April 20, 2020, the implementation and testing phases to be completed by December of 2020 and product testing by faculty completed by April of 2021. I am highly motivated to delivering a quality product as a faculty member and parent of two potential new incoming students to Wingate in the not-too-far-distant future (the first to enter in 2022).

I have included my Research Proposal to the RRB at Wingate University immediately below. They have approved my access to the database upon completion of an online module. The approval letter is attached at the end of this document.

## **Wingate University Research Review Board Research Proposal Involving Human Subjects**

**This form must be completed and accompany any submission to the Research Review Board.**

**Undergraduate researchers must have this document (and all other documents) reviewed by their project advisor before submitting to the RRB.**

All of the factors below should be addressed using lay language. The RRB is comprised of individuals from diverse scientific and nonscientific backgrounds. You should avoid all jargon and assume that RRB members have no prior knowledge on the research topic, theoretical or methodological approaches, or measurement techniques or instruments.

The best way to avoid unnecessary delays is to provide the RRB with as much information about your study as possible. **You will need to attach a copy of all demographic forms, survey instruments, and other data**

**collection systems to your proposal.** If you are unable to attach the above please contact the Research Review Board Chairperson for advice.

Also, it is important to remember that informed consent is a process not a document. Informed consent begins with recruitment and ends only after a study is completed.

**1. Describe the purpose of this study.**

Mathematics Faculty recommend math courses to an entering student based on several factors: the student's previous math courses taken, their standardized test scores such as SAT and ACT, the declared major, and the student's score on the Wingate Math Placement Test (WMPT). The goal of this study is to explore the data from students entering Wingate who received math course recommendations and the data available through the Wingate Registrar's Office regarding these students' outcomes in the math course taken at Wingate University during the semester after the student submitted their responses to the WMPT.

**2. List the research questions you will employ.**

The research will address questions regarding the relationships that may exist between the variables: WMPT score, standardized math score from SAT or ACT, overall standardized score from SAT or ACT, last known prior math course taken before entering Wingate University, math course taken the first semester at Wingate University after submitting their responses to the WMPT, and the student outcome of the math course taken the first semester at Wingate University (recorded as W, A, B, C, D or F) after submitting their responses to the WMPT.

**3. Provide a brief review of the literature in the area of this study containing pertinent theories and research outcomes.**

The Principal Investigator (PI), Kelle Clark, is conducting this research in fulfillment of the requirements of a CSCI 6840 Data Mining individual course project through the distance learning program at East Carolina University under the supervision of Professor Qin Ding, [DINGQ@ecu.edu](mailto:DINGQ@ecu.edu). The project's objective is for the PI to experience all of the phases of research in the field of Data Mining, including data pre-processing, data analysis and organization, and pattern detection in large databases.

Upon an initial online search for research in related areas, the PI found "Analysis of Aleks Mathematics Placement Test Data" that was submitted in partial fulfillment for the requirements of a Master of Science in Mathematical Sciences at Michigan Technology University by Teresa Woods in 2017.

<https://digitalcommons.mtu.edu/cgi/viewcontent.cgi?article=1437&context=etdr>

**4. Describe your methodologies and research procedures.**

All data used in the research will be secondary data available from the Wingate Mathematics Department and the Wingate Registrar's Office.

The Primary Investigator (PI) for this research will pre-process the data from the two sources, the Mathematics Department and the Wingate Registrar's Office, so that the data is contained in one relational database. This pre-processing will allow information from one subject obtained from both sources to be connected. The PI will discretize categorical data. This means that the name of the course taken will originally be given as a value such as Algebra 1, Math 3, Calculus, and in order to apply some procedures the PI will convert this value into to a numerical value. Pre-processing will also involve scaling the data from the standardized tests SAT and ACT so that these scores are comparable. Once the data has been successfully pre-processed into a usable form, a descriptive analysis on the individual

attributes of the data will be conducted and correlations between variables will be explored within the database using standard data mining techniques. The researcher will use the Statistical Software SPSS and the structured query languages SQL to perform these tasks.

The PI will regularly communicate all findings to the Wingate Math faculty as they can direct the PI as to what information will be relevant to the department and with Professor Ding for guidance in the research methodology and procedures. The project is to be completed by April 20<sup>th</sup> 2020.

**5. Describe the population from which your research sample will be drawn.**

The first WMPT was given to the incoming students to Wingate University in the Fall of 2017. The PI will select data for entering students to Wingate in the Fall of 2018

**6. Explain the inclusion and exclusion criteria that will be used (e.g., age, race, gender, language, academic abilities, free or reduced lunch status, academic program, pre-existing conditions, etc.).**

The PI will exclude from the research database any entering student to Wingate in the Fall of 2018 that did not take the WMPT or that did not register to take a math course at Wingate in the Fall of 2018.

**7. Indicate how many potential participants will be approached.**

The PI expects the maximum number of subjects included in the study to be 500 students.

**8. Please break down your maximum numbers by category.**

No contact with the subjects will be necessary as the information has already been collected. Additionally, the students whose records will be involved in the study would have been entering Wingate Students in the Fall of 2018. The current average age of the student included in this study is approximately 19 years old. At the time of the original data collection, the PI estimates that approximately 40% of the subjects would have been under 18 years old. Sighting the distribution of gender for all students at Wingate University as reported by USNews.com, <https://www.usnews.com/best-colleges/wingate-university-2985/student-life>, the sample will consist of approximately 60% female and 40% male.

**9. Describe how participants will be identified, approached, recruited and consented.**

The participants to be included in the study will be identified by querying the existing databases to extract the records of students that meet the inclusion criteria and to only return the non-personal information under study in this research.

**10. Specifically identify all individuals who will be used to describe the study to potential participants. Also, specifically identify all individuals who will obtain consent from potential participants.**

The collection of data will not involve contact or communication with the subjects involved in the study.

**11. If this study involves deception, describe and justify its use.**

The study involves no form of deception.

**12. Describe any form of compensation that participants will receive (e.g., money, extra credit, toys, food, etc.).**

The subjects of this research will receive no compensation for their involvement. The PI will be submitting the results of the research in fulfillment of a graded course project requirement of CSCI 6840 at ECU to Professor Qin Ding. The grade is based only on the level of appropriate and correct application of the research process and use of Data Mining techniques to address the stated objective of the project.

**13. Explain if this research might entail psychological, legal, physical, or social harm or discomfort to the subjects.**

There is no risk that this research might entail psychological, legal, physical or social harm or discomfort to the subjects.

**14. Describe how the potential benefits of this activity to the participants and humankind outweigh any possible risks.**

The assessment of the reliability and effectiveness of the tools used, such as the WMPT, by the faculty of the Wingate Mathematics Department to advise students is essential in the promotion of student success at Wingate University.

**15. Describe how the confidentiality of participant data will be maintained.**

The data will be made anonymous as explained in item #16 below.

**16. If data will be anonymous, explain how this anonymity will be achieved.**

It will be requested by the PI to the Wingate Office of the Registrar and to the Wingate Mathematics Department that all data made available to the PI is void of any and all personal data that would connect the student to their record. This includes the student's name, the student's advisor's name, the student's email address, and the student's identification number. Only the WMPT score, the overall standardized test score, the standardized math test score, the name of the first math course take at Wingate after the student took the WMPT, and the grade earned in the first math course taken at Wingate after taking the WMPT will be included.

**17. Explain how any data collected might relate to illegal activities carried out by the subjects.**

N/A

**18. Your attached informed consent document must include each of the following elements as required by the Code of Federal Regulations: Title 45, Part 46.116:**

- A statement that the study involves research;
- An explanation of the duration of the subject's participation;
- A description of the procedures to be used;
- A description of any reasonably foreseeable risks or discomforts to the subject;

- A description of any benefits to the subject or others which can be reasonably expected from the research; *(Note: compensation or academic credits are not benefits)*
- A statement describing the extent, if any, to which confidentiality of records identifying the subject will be maintained;
- An explanation of whom to contact for answers to pertinent questions about the research and research subjects' rights, and whom to contact in the event of a research related injury to the subject; *(Note: should include Wingate RRB, principal investigator and if applicable, the faculty sponsor)*
- A statement that participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled and the subject may discontinue participation at any time without penalty or loss of benefits to which the subject is otherwise entitled. *(Note: this statement should be written in language at an appropriate level for the subjects in your study)*

The PI did not include an attached informed consent form given that consent will be implied and only secondary acknowledged by the subject to be used by Wingate University faculty with consent from the appropriate boards and administrators.

**The following may or may not apply to your study. If they apply, your attached informed consent form must include:**

- An explanation of whom to contact in the event of a research related injury;  
N/A
- A disclosure of appropriate alternative procedures or courses of treatment, if any, that might be advantageous to the subject;  
N/A
- For research involving more than minimal risk, an explanation as to whether any compensation or any medical treatments are available if injury occurs and, if so, what they consist of, or where further information may be obtained;  
N/A
- A statement that the particular treatment or procedure may involve risks to the subject which are currently unforeseeable;  
N/A
- Anticipated circumstances under which the subject's participation may be terminated by the investigator without regard to the subject's consent;  
N/A
- Any additional costs to the subject that may result from participation in the research; *(Note: This is not limited to monetary costs)*  
N/A
- The consequences of a subject's decision to withdraw from the research and any procedures for orderly termination of participation by the subject;  
N/A

- A statement that significant new findings developed during the course of the research which may relate to the subject's willingness to continue participation will be provided to the subject; and N/A
- The approximate number of subjects in the study  
There will be approximately 400 subjects involved in the study.

**19. If you are requesting a waiver of the documentation of informed consent please explain how you would meet the requirements of 45 CFR 46.117(c):**

(1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or

(2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

**Informed Consent Notes:**

FDA Research cannot receive a waiver of informed consent.

Even if formal consent requirements are waived, the RRB may still require documentation of consent in an alternative format.

**Implied Consent:**

Implied consent is the tacit indication that a person has knowingly agreed to participate in research by performing a research activity or task. By completing the research task (e.g., completion of a questionnaire, interview, survey, etc.), the participant has provided consent to participate in the research. The use of statements such as "Participating in this survey represents your agreement to participate in the study" or "completion of this questionnaire, interview, etc. signifies your agreement to participate in the study" are examples of implied consent statements. **Use of implied consent is considered a waiver of informed consent and must be requested from the RRB. The circumstances where implied consent is used must meet the parameters listed above from 45 CFR 46.117(c).**

The participants in the study have given implied consent in that, at the time of submitting their responses to the WMPT and submitting application to Wingate University, the subjects were made aware that the University would use the information provided to offer advising services. This research is a step in the validation of the tools used to aid in that advising process. In particular, the WMPT contains the following statement: **"Results from this test will be used to determine what level math class you should take at Wingate University. You will not be allowed to see your score on this test."**

The data collected from the Registrar is available to the PI as a member of the Wingate Faculty and is acknowledged by the subjects as necessary for faculty to advise students in their course selection and academic success at Wingate. As stated above, all data will be cleaned so that names of the students and student id numbers are not included. Thus, subject's personal information is disassociated with the project report and findings.

**20. Research Involving Children:**

The research does not directly involve human subjects. All data used will be secondary data that has already been obtained for advising purposes. There are no direct or indirect consequences to any subjects that will be represented in this research. All personal information that could link a subject to a record will be removed before the results are presented. Obtaining any further consent from the original

subject would only serve to link a person with their information.

For questions or additional information, contact the RRB Chair: [rrb@wingate.edu](mailto:rrb@wingate.edu)

# Wingate University

## RESEARCH REVIEW BOARD APPLICATION

*THIS COVER SHEET MUST BE ACCOMPANIED BY THE WINGATE GENERAL RRB PROPOSAL FORM.*  
 SEND THE COMPLETED APPLICATION, RRB PROPOSAL FORM, AND ALL SUPPORTING DOCUMENTS TO: [RRB@wingate.edu](mailto:RRB@wingate.edu)  
 All undergraduate researchers must have all of their documents reviewed by their advisor before submitting to the RRB

Today's Date: 01/28/2020		Anticipated Project Completion Date: 04/20/2020	
Investigator (Applicant) Name: Kelle L. Clark	Applicant Phone: (704) 699 - 3450	Applicant Email: k.clark@wingate.edu	
Names Of Other Investigators AND Faculty Advisor/Project Chair: Professor Qin Ding, <a href="mailto:DINGQ@ecu.edu">DINGQ@ecu.edu</a> serving as research supervisor/advisor. Professor S. Lauer, <a href="mailto:s.lauer@wingate.edu">s.lauer@wingate.edu</a> Math Faculty research advisor			
Project Title:  "Knowledge Discovery from Wingate University's Mathematics Placement Test Data"			
General Purpose of the Research:  The purpose of the research is to measure the strength of the Math Placement Test in predicting the outcome of a student's first math course at Wingate given the choice of math course taken and the course is taken their first semester at Wingate. Another objective will be to identify correlations between the variables and to highlight any patterns within the large dataset.			
Describe How You Will Obtain Data AND Attach Copies of Surveys, Questions, Drawings, Photographs, Narratives, or Other Items Used In Data Collection:  Secondary data will be used collected from the existing database of Math Placement Test scores and from the Wingate's database of student schedules and grades.			
Describe How Subjects Will Be Recruited AND Attach Consent Form(s):  Students entering Wingate for the Fall 2018 term that took the Wingate Math Placement Test and a math course Fall 2020 records will be the population for this subjects for this study. No consent forms will be used as implicit consent is given by the student allowing their application materials and the score on the Math Placement Test to be used in the advising process. This study is an evaluation of a piece of the advising process.			
Will Any Subjects Be Less Than 18 Years Old? <input type="checkbox"/> yes <input type="checkbox"/> no <i>If Yes, also complete and attach the Investigator Checklist for Research Involving Children</i>  The original data could have been collected from subjects under the age of 18 years. However, since this research will be using the data as secondary data, with no contact and neither director nor indirect consequences to the original subject that the data was collected from, it is proposed that an Investigator Checklist for Research Involving Children is not needed.			
Are the Subjects Students At Wingate University? <input type="checkbox"/> yes Yes, the subjects were students at the time the original data was collected.	Are Any Subjects Incarcerated, Institutionalized, Pregnant, Or Wards Of The State? <input type="checkbox"/> yes <input type="checkbox"/> no This would be unknown to the researcher, and the subject is not physically involved in the research at any stage and this information is not included in the data that will be mined.	Will The Proposed Research Involve Deception Of The Subjects? <input type="checkbox"/> no (If Yes, Describe in Proposal) No deception will be involved at any stage of the research.	
Describe Any Participation Incentives Offered (class credit, gift card, food, etc.):  No incentives will be offered to any participants.			
Describe How Data Will Secured During and After The Project And Measures Undertaken To Ensure Confidentiality Of Data: The data will be securely transferred to a hard drive on a single PC located in the locked adjunct faculty on the Wingate University campus in Burriss Hall. The data will be destroyed and deleted from memory at the completion of the research.			
<b>CERTIFICATION:</b> In making this application, I certify that I have read and understand the <b><i>Wingate University Policy for Research Projects Involving Human and Animal Subjects</i></b> and I intend to comply with the letter and spirit of the university policy. I agree that significant changes in the protocol will be submitted to the RRB for written approval prior to changes being put into practice, that adverse outcomes, unexpected events, or research subject complaints will be reported immediately to the RRB, and that research records for non-exempt projects will be secured and kept for at least 3 years after completion, closure, or cancellation of the research. <b><i>The RRB must be notified in writing when the project is completed, closed, or cancelled.</i></b>			
Applicant's Signature <u>QR</u> Typed Name And University ID Number:  Kelle L. Clark 006011089			
Wingate University Research Review Board:	<input type="checkbox"/> Full Review	<input checked="" type="checkbox"/> Exempt	<input type="checkbox"/> Expedited
This Project Has Been:	<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Deferred	<input type="checkbox"/> Disapproved
RRB Comments:			



Signature of RRB Chair:

*Armie Naylor*

Approved on Jan 29, 2020