

UCAT Course Redesign

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## Applicant Information

\* Applicant

Michael Matthews - michaelmatthews@unomaha.edu -

\* Applicant's Department

Mathematics

\* Applicant's College

Arts and Sciences ▼

\* UCAT Committee Member

Brian McKeivitt - College of Arts and Sciences ▼

\* Have you received a UCAT grant in the past 5 years? (This will not affect your application)

No ▼

## Additional Information for Course Redesign Grant

\* Course Numbers

If not known, enter N/A

MTCH 2010

\* Course Names

Mathematics for Elementary Teachers 2

\* Is this a new course or course redesign?

Course Redesign ▼

If there is more than one individual applying for the grant, list team members: (Graduate students may be members of the team but cannot be the primary recipients of UCAT funding)

## Budget

\* Stipend

Course Redesign grants may be used for stipends or materials. If you are not requesting funds in all categories, please enter 0.

750

\* Development Materials

0

\* Estimated Other

0

**\* Less Other Funding**

If your department is matching this funding, please enter amount. Otherwise, enter 0.

0

**Total Request**

750

**\* Other Funding Source**

N/A

## Rationale for UCAT Funding

**\* Applicants requesting a Stipend**

Applicants should carefully and clearly establish the rationale for funding requested. Describe the proposed activities clearly, addressing both the scope of the activities, the action steps you will take, and expected outcomes. Explain specifically how you expect your course redesign activities will enhance the teaching/learning environment at UNO and when you expect to offer the redesigned course developed as part of this grant.

MTCH 2010 is a service course for the College of Education. Future elementary education teachers must take this course. Prior to 2017, students had to pass a version of the PRAXIS exam before being admitted into the College of Education. For a variety of reasons, which I agree with, the College of Education decided to allow anyone in the program prior to passing the PRAXIS; although they must still pass the PRAXIS before graduating. The number of significantly less mathematically prepared students has increased dramatically in the course as a result. DFW rates have sky rocketed from about 5% to near 20%. As part of an attempt to provide more support for the new population of students taking MTCH 2010, I am interested in revamping the course to include the following components: (a) partial flipped-classroom model and (b) use of a Specification-Grading system.

For (a) I plan on developing 40 videos that can be posted on Canvas and that teach the concept, and walk through carefully chose examples for each of the major concepts that are taught in the course. Currently course instructors provide examples in class only. However, the explanations are often complex and involve multiple steps. At times, there is complex logical reasoning involved. The videos will provide the students the opportunities to review these explanations on their own time. This should help them not only master the content earlier but will be invaluable for test preparation as well. Moreover, the most frequent complaint that students have specifically said in the course evaluations over the last year has been in regards to not having enough examples. For each video, I would need to prepare a short lecture on the concept;  
develop a sample problem;  
write the correct solution using mathematical software that allows you to see math well on a computer like Latex, Geogebra, and Equations on Word;  
use existing rubrics or develop a rubric that will be used to evaluate the sample problem so that the students can see why the solution is correct and will know how they will be graded on the exams;  
Record the video covering each of the above points (I will use the vidGrid Screen Recorder software);  
edit as needed;  
re-record as needed;  
and finally upload to Canvas.  
It is impossible to know how long each video will take, but I would estimate 30-60 minutes per video for a total estimate of 30 hours.

For (b) I plan on revamping the course from a traditional weighted grading system to one called specification grading. Specification Grading involves developing, defining and aligning curriculum using outcomes. Outcomes are specific and measurable learning objectives or the concepts talked about in (a) above. For example, one of the outcomes related to

this class would involve explaining why one can't divide by 0. Students prove mastery by doing homework, group activities, and taking a course assessment on the outcome. Course assessments may be tried again if mastery is not achieved. In the pure form of specification grading, students determine what grade they want and complete the groups of outcomes that correspond to a grade. These groups can be organized on Canvas using modules and are often referred to as bundles in specification grading. See <https://ii.library.jhu.edu/2018/04/11/what-is-specifications-grading-and-why-should-you-consider-using-it/> for more details on specification grading.

This grading system gives the student more control over their own learning while still maintaining high academic standards. The system is similar to mastery learning based systems. I've piloted elements of Specification Grading with promising results with two very small classes (5 and 11 students) but I need to integrate it into the Canvas system so that it can be used with a larger class size.

After discussion with Canvas support, I know that it is possible to use the Mastery Learning Gradebook in Canvas with a Specification-Grading model. But it will take quite a bit of work to do so as you have to align everything you do to the outcome and how to do that changes depending on the assignment type. Moreover, I must develop quite a few tests questions. Specifically, for each of the 40 require objectives, I will need to

- develop Canvas outcome;
- develop a rubric and link to each outcome;
- develop 8 different quiz banks with 2-3 problems per quiz bank and link to the corresponding outcome; (This the most time-consuming step but necessary since in Specification-Grading models students can retake tests over and over again.)
- develop 8 different course assessments (one for every two weeks) and use the quiz banks mentioned above to link the assessments to the outcomes;
- develop homework assignment and link them to the corresponding outcome via the rubric;
- and develop group activity assignments and link them to the corresponding outcome via the rubric.

I would estimate about 2 hours per outcome for a total of 80 hours.

The expected outcome for these changes will be an improvement in the DFW in the course, hopefully back to 5% or less. By my estimates it will take about 110 hours to implement this well. The goal is to have this done by the end of May, 2019.

While, one may normally work on curriculum change over time and spend some of your time doing changes like this. To implement these changes, the amount of time involved is, in my opinion, well above the norm and so I am asking for a stipend to pay for the extra time to implement (a) and (b) in the MTCH 2010 course.

**\* Applicants requesting funds for Development Materials**

For materials purchased related to course redesign, provide an explicit list of materials, the cost per item, the rationale for purchasing particular materials (e.g. Why a particular brand, why a certain amount), as well as a discussion of how such materials will enhance the development activity.

N/A

**\* Specifically identify and discuss all UCAT themes you anticipate will be addressed through this activity.**

UCAT Themes related to this proposal are as follows.

1. Curriculum Development: The entire proposal is about a new design of curriculum,
2. Assessment and Instructional Technology: The proposal is using the Canvas technology to implement two major new changes to the course, one of which involves making videos in a flipped classroom approach and the other is to use Canvas to facilitate a Specification-Grading model.
3. Promoting Critical Thinking Pedagogy: The proposal would result in a classroom where students are engaging in curriculum that itself is all about critical thinking (for example, why is dividing by 0 undefined).. and with the proposed model, students will have many more opportunities to engage in the content. They will be able to take control of their own learning better and instead of having one shot at learning something--as is currently and traditionally being done--students will engage again knowing they have more opportunities to learn the content. Simply put, more students

will learn the content.