

Jessica Knoch  
Sabbatical Report  
September 25, 2019

### **Introduction**

In the fall of 2018, I entered the doctoral program at the College of Education at Oregon State University, with the specialization of mathematics education at the undergraduate level. The purpose of my return to school is to give me the tools I need to be a researcher in math education - I want to be able to study teaching innovations and their effects on student learning in undergraduate math courses. Some questions that I am especially interested in are: how do students learn math online? In what ways does reducing the cost of required course materials help or hurt student learning? How can we increase student engagement in math and other STEM courses?

I was awarded a one-term sabbatical from Lane, divided between three terms so that I had a reduced workload while I was taking classes at OSU. I attended OSU full-time, taking 12 credits per term. After successfully completing my first year of coursework, and about to start a second year as a part-time student, I am writing this report about what I've learned and what I'll be doing in the future.

### **Course of Study**

Classes I took during my first year in the doctoral program and their course descriptions are listed below. My focus was on laying the groundwork for reading and conducting empirical research in the field of post-secondary mathematics education. In addition to the courses listed, I also completed three terms of a seminar course designed for first- and second-year doctoral students in the College of Education STEM program, as well as weekly seminars and meetings with my advisory group to discuss progress and coursework, peer groups to discuss writing and course projects, and a special topics group on the subject of mixed methods.

*SED 580: Research and Evaluation*

Analysis of qualitative and quantitative empirical research in science education, mathematics education and education in general. Development of data collection instruments for use by researchers and teachers of science education, mathematics education and education in general, including portfolio and other forms of alternative assessment.

*MTH 689: Topics in Mathematics Education*

Topic for Fall 2018: The history of calculus and the history of teaching calculus. Discussion of the history of calculus and the history of teaching calculus, including some of the mathematics education research relevant to this area. Examination of the history of the mathematical development of calculus, and the evolution of calculus curriculum and instruction.

*SED 623: Curriculum Theory*

Establishes theoretical grounding of curriculum. Includes theoretical background, practical knowledge, and skills related to science and mathematics curriculum, including the history, curriculum theory and practice.

*SED 621: Survey of Research on Learning*

Critical analysis of perspectives on student thinking and learning in science/math education.

*SED 622: Qualitative Research Techniques*

A study of qualitative research designs and analytical procedures with specific applications in science and mathematics education.

*SOC 556: Science and Technology in Social Context*

Study of social aspects of science and technology (values, practices, organization, impacts) by analysis of issues revealing their relationship to other social and cultural processes.

*SED 612: Quantitative Research Design and Critical Analysis*

A study of quantitative research designs and analytical procedures with specific applications in science or mathematics education.

*ED 653: Discourse, Identity and Education*

Builds a foundation in discourse theory and its applications to identity and education. Includes empirical studies that draw from particular lenses of discourse theory, exemplifying how these scholars organize the design, implementation, and discussion of research around discourse theory. Develops knowledge of discourse theory to propose a study that could be conducted drawing from discourse analytic perspectives.

*PPOL 551: Higher Education Policy*

An introduction to policy issues in the area of higher education and exploration of possible tensions within the policy goals of quality, equity, access and outcomes. Students will gain knowledge of the key pieces of legislation and constitutional law governing higher education policy at both federal and state levels, as well as an overview of the relevant research in this area. Begins with a short historical introduction to the U.S. higher education system and concludes with a discussion of its competing demands and functions.

### **Outcomes**

This year of graduate study has given me a new perspective on the world of mathematics education research. I've been exposed to many of the big theories in the research world about student learning, with a focus on the fields of science and mathematics. I've also learned about how ethical and responsible research is conducted. Finally, I've learned about the skill of academic writing, and I have written papers and put together mini-projects that stretched my skills and put my research knowledge into practice. Throughout the year, my classes and advisory group afforded me opportunities to choose projects of interest to me and write reports or present at meetings.

As a former math major, writing papers was an area I had to learn to embrace. The world of educational research depends heavily on clear and concise academic writing. The papers and projects I have created over the year include:

- “Trends in Higher Education: Online and Developmental Math Courses” (10-page literature review, SED 580)
- “The Seven Bridges of Königsberg” (poster presentation, MTH 689)
- “Designing Research to Study Online Homework in Online Math Courses” (13 pages, SED 621)
- “Use of Specifications Grading in Undergraduate STEM Courses: A Qualitative Project” (16 pages, SED 622)
- “Is a Kindergartner’s Self-control Related to Their Gains in Scores on a Mathematics Assessment?” (7 pages, SED 612)
- “Online Math Homework Systems: A Sociological View” (22 pages across 4 papers, SOC 556)
- “A Look at Policies Encouraging the Use of Open Educational Resources in Oregon’s Colleges” (17 pages and a 30-minute presentation, PPOL 551)
- “Active Learning as a Potential Remedy for the Student Engagement Problem in STEM: Current Understandings and Areas of Opportunity” (12 pages, SED 607)
- “Opportunities Afforded by a Radical Textbook” and “Understanding What Your Students Understand: Implications of Using Specifications Grading in Undergraduate Mathematics Courses” (two talks given at the Pacific Northwest regional meeting of the Mathematical Association of America, April 13, 2019)

As an addendum, I have attached my Academic Yearly Progress report from the OSU’s College of Education. This form includes documentation of my progress as a doctoral student, as well as comments from my academic advisor.

## **Conclusion**

As a result of this year of full-time study towards a doctoral degree in education, I have built a base of knowledge that will allow me to conduct research of my own in the future. I have become a better consumer of research, with a deeper understanding about historical trends in education research and some of the current projects happening around the world. This breadth and depth of educational research knowledge helps me to be more reflective of my own practice as a teacher, and more thoughtful as a colleague. I hope to share both my findings and my original research more widely as I continue in my studies.



Education PhD Program – Science or Mathematics Education Option

**Academic Yearly Progress Report**

Name: Knoch, Jessica Date: 05/12/2019  
(please print) Last Name, First Name

Student ID: 932-988-886 Admission date: Fall 2018 Cumulative GPA: \_\_\_\_\_  
*Include an unofficial transcript*

Major Professor: Rebekah Elliott Option: STEM Minor: \_\_\_\_\_

Program Milestones	Year & Term of Completion
Filed Program of Study (by 5 <sup>th</sup> term or 18 credits)	
CITI	Fall 2018
Program Written Exam	
Preliminary Oral Exam	
Proposal Accepted	
Final Oral Exam (Dissertation Defense)	

Overall student progress

- Satisfactory       Satisfactory but marginal  
submit action plan       Unsatisfactory  
submit action plan

Jessica Knoch  
*Signature of Student*

6/14/2019  
*Date*

\_\_\_\_\_  
*Signature of Major Professor*

\_\_\_\_\_  
*Date*

**Completed form w/signatures must be submitted to PhD Program Coordinator before June 15 each year.**

*The major professor and student should each retain a copy.*

**Members of Doctoral Committee**

Faculty names

Departments

_____	_____
_____	_____
_____	_____
_____	_____

## Graduate Learning Outcomes

Identify an artifact that demonstrates your progress with the following learning outcomes. Identify where you produced the artifact. Briefly describe how the artifact addresses the learning outcomes.

<b><i>Produce and defend an original significant contribution to knowledge.</i></b>				
<b>Data used:</b> (e.g., class paper, assignment, conference paper)	Class project involving original data collection and analysis	Satisfactory	Satisfactory but Marginal	Unsatisfactory
<b>Student comments:</b> The final project I wrote for SED 622, Qualitative Research Techniques, involved collecting data and analyzing the data using qualitative methods learned in class.				
<b>Faculty comments:</b> Jessica has worked across the year to develop her understanding and capacity to produce education focused scholarly work. Faculty noted that Jessica has shown strength in seeing key ideas in research both in her oral contributions on reading and in written documents that allow her to organize literature reviews by themes, rather than a list of summaries of text.				

<b><i>Demonstrate mastery of subject material.</i></b>				
<b>Data used:</b> (e.g., grades, exam results, dissertation proposal, portion of dissertation chapter)	Grades in Fall and Winter terms, feedback on written assignments	Satisfactory	Satisfactory but Marginal	Unsatisfactory
<b>Student comments:</b> This year I have maintained high grades in my courses while working part-time at Lane. I believe that plus the feedback I have received on my written work in courses shows my progress in mastering subject material.				
<b>Faculty comments:</b> In addition to the comments above, Jessica has pursued learning about new areas of research. The faculty encourage her to continue to pursue learning more about the field of research in undergraduate mathematics education (RUME) prior to honing in on one area for her thesis. Honing in on a topic can be thought about as a tiered process of identifying interests and connecting them to the field of research <i>and</i> exploring a new ideas outside initial interests to know more about the research terrain in undergraduate math ed. I see in Jessica's goals for the year she has been reading across the field of RUME and I encourage her to identify seminal works in the field so that she can know how her interests link to this body of work. This will serve Jessica well in building her expertise in the subject area, prepare her for her written and oral exams and set her on a path for developing her thesis topic.				

<b><i>Be able to conduct scholarly activities in a responsible and ethical manner.</i></b>				
What have you learned about ethical research from the CITI or IRB? Also, address how you are practicing academic integrity in your writing and how you are participating fully and respectfully in a community of scholars.		Satisfactory	Satisfactory but Marginal	Unsatisfactory
<b>Student comments:</b> This academic year, I completed the CITI training and learned about the IRB through classroom visits as well as a workshop I attended. I am committed to making sure I follow guidelines for ethical research. In my writing, I discussed academic integrity with my instructors because of an overlap in topics between multiple courses. I am participating respectfully in the community of education researchers by carefully citing others' work and taking care to correctly characterize papers and articles whose findings I am discussing in my own writing.				
<b>Faculty comments:</b> Jessica has demonstrated a strong ethical stance in review of literature in discussion. She also has been an important, contributing member of the mathematics education community at OSU helping to shape narrative that				

allows for critique and at the same time is responsible and ethical. This was demonstrated in our weekly math lab meetings when we discussed our research and the research of other scholars.

## Science or Mathematics Education Learning Outcomes

Identify one artifact that demonstrates your progress with the following learning outcomes. This could be a class paper, assignment, conference paper, dissertation proposal, or sections of a chapter from your dissertation. If appropriate, identify the class where you produced the artifact.

Briefly describe how the artifact addresses the learning outcomes.

**Artifact submitted:** Final paper for SED 621, Survey of Research on Learning

### Use meaningful and relevant social science literature to better understand and investigate questions in science and mathematics educational research.

Satisfactory

Satisfactory but Marginal

Unsatisfactory

Student comments:

As part of this project, I researched relevant literature in the area of design-based implementation research and how students learn from mathematics homework, particularly online homework. This background knowledge helped me to investigate my question of interest for the paper.

Faculty comments:

Jessica is building her skill with writing in an academic manner and has done well in her first year conceptualizing two studies within her courses taking up research in undergraduate mathematics education. Her course papers show a growing capacity to use relevant literature in meaningful ways to construct an argument.

### Critically evaluate key social science research to construct arguments which further understanding of research in science and mathematics education.

Satisfactory

Satisfactory but Marginal

Unsatisfactory

Student comments:

As part of this project I critically evaluated the literature I had researched to understand how online homework is used in mathematics classes, how students interact with it, and how they learn from it. I also evaluated my research on research-practice partnerships and design experiments to argue for design-based research.

Faculty comments:

see comments above

### Synthesize a coherent point of view using evidence-based and theoretical arguments relevant to questions in science and mathematics educational research.

Satisfactory

Satisfactory but Marginal

Unsatisfactory

Student comments:

In this class paper, I synthesized an argument for design-based research as an appropriate method to study online homework systems in undergraduate mathematics courses.

Faculty comments:



Jessica is building her capacity to conceptualize a study and synthesize an argument that frames a study. She clearly is demonstrating an understanding of the elements of the genre of writing that is central to developing social science based educational research. I encourage her to use her reading of research to analyze authors' use of argument structure for designing and conducting research. This will support building further capacity in this area. I also encourage Jessica to write about her own research ideas and use this writing time to build skill with synthesizing theoretical and evidenced based arguments. Faculty see Jessica well positioned at the end of her first year to continue making progress on the skills needed to be successful in the PhD program.

**Demonstrate leadership skills in science or mathematics educational research or teaching.**

Data used: (i.e. GA, SED615, professional conference, work-related)	Conference presentations, teaching at Lane Community College	Satisfactory	Satisfactory but Marginal	Unsatisfactory
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Student comments:  
 In addition to coursework at OSU, I have been teaching at Lane Community College, including serving as course lead for our liberal arts math survey sequence (Math 105, 106, 107). I also participated in ongoing research conducted by Education Northwest on Lesson Study. I presented two talks at the Pacific Northwest Regional meeting of the Mathematical Association of America:  
 Knoch, J. (2019). Opportunities afforded by a radical textbook. Pacific Northwest Mathematical Association of America Annual Section Meeting, Portland OR, April 13, 2019.  
 Knoch, J. (2019). Understanding what your students understand: Implications of using specifications grading in undergraduate mathematics courses. Pacific Northwest Mathematical Association of America Annual Section Meeting, Portland OR, April 13, 2019.

Faculty comments:  
 Highly active for first year student! Nice work presenting and the leadership work.

**Academic style and coherence in writing, while following the format of APA or other official style.**

Data used: (i.e. class paper, writing class, workshop, tutorial)	Class paper (final project for SED 622)	Satisfactory	Satisfactory but Marginal	Unsatisfactory
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Student comments:  
 All of my written papers this year have given me the opportunity to practice writing coherently, in academic style, while following APA formatting.

Faculty comments:  
 see above.

**1) What were your goals for this year?**

For the first year of my enrollment in the doctoral program, my goals were to (a) learn to navigate the program, including becoming familiar with the typical program of study, getting to know various faculty, and successfully completing required and elective courses; (b) explore the nature of established problems in the world of undergraduate mathematics research, becoming familiar with some of the major theories about education and open questions in the literature so that I can see where I may be able to contribute.

**2) What progress have you made toward your degree and the goals you established during the year? What progress have you made in your Program of Study? (Do not include progress recorded in previous year's report.)**

This year, I completed around half of the required coursework for my program and several additional courses as electives that give me exposure to many of the content and methods I will need. I completed a request form for the transfer of credits from my master's degree. As for my goals listed in the previous response, I have made some progress on both of them. This year, I learned to navigate the system to some extent, such as course registration, graduation requirements, CITI/IRB requirements, and AYP. I was able to meet and get to know several faculty, as part of the process of considering who to ask to be on my dissertation committee. I have been reading extensively in the field of undergraduate mathematics research as well as other education-related fields, and have identified several research interests that could become projects or a dissertation in the future.

**3) What are your goals for next year?**

Next year, my goals include (a) continue taking required courses and file my Program of Study, (b) determining an appropriate topic to use for my dissertation, (c) select and recruit faculty members for my dissertation committee, and (d) begin at least one research project that can become the basis of a journal article submission, conference talk, or conference poster.

**4) Please itemize the remaining requirements for your coursework, examinations, proposal and dissertation. Please propose a timetable for completing them. Indicate which items you expect to complete during the next year.**

Program of Study meeting - by Winter 2020 (Year 2)

Coursework - by Spring 2020 (Year 2)

Examinations - by Fall 2020 (Year 3)

Dissertation Proposal - by Spring 2021 (Year 3)

Dissertation Defense - by Spring 2022 (Year 4)