Susan M. Cooper - Teaching Dossier

1. Introduction

During my first experience as a university instructor it quickly became clear that I would be deeply committed to pushing myself to excel at teaching. I have taught a variety of courses ranging from introductory calculus to graduate topics courses in algebra. Moreover, I have experience in teaching both small class sizes (e.g., 10 students) and large class sizes (e.g., 370 students). I feel fortunate to have been given the opportunities to teach many different courses, especially those for which I developed the course materials. In addition to these opportunities, I have an interest in improving K–12 mathematics teacher training and have enjoyed working with both pre- and in-service teachers. In this statement I discuss my teaching philosophy, strategies, training, evidence of effectiveness, and student supervision.

2. Teaching Philosophy

"The art of teaching is the art of assisting discovery." – Mark van Doren

Through my teaching I hope to not only motivate students to learn, but to instill in them the desire and need to perform to the best of their abilities. My teaching is guided by the following principles.

To Motivate Students To Learn: When I think of the mathematics courses from which I retained the most, I recall motivated teachers who were passionate about the course material being taught. Their interest in the material not only encouraged me to want to learn mathematics but showed me that mathematics can be beautiful. I engage my students and bring mathematics to life for them as it was for me.

To Talk With Students: I have learned much mathematics through conversations during classes and in private meetings with other students and teachers. These communications gave me an opportunity to clarify my understanding of the material. It is very important that I talk *with* my students rather than *at* them. I encourage my students to ask me questions by demonstrating that I will sincerely listen and provide guidance.

To Challenge Students To Think For Themselves In Logical & Creative Ways: I realize that not all my students will appreciate mathematics as I do. However, I believe that a university should prepare students to become leaders in society. With this in mind, I keep the courses I teach interesting by showing that the material is relevant to other fields of study. I emphasize that an individual never knows when their thoughts will influence the face of a subject. For example, I often tell the story of how Gaussian elimination, a topic seen in an introductory linear algebra course, arose in the study of an asteroid! I instill in my students the pleasure of thinking for themselves in logical and creative ways.

To Improve My Teaching: I admire the teachers who have taught me difficult courses in an effective manner. I believe that the best way to say thanks is to strive to also be an effective teacher. I need preparation, practice, and feedback from self-reflection, students, and colleagues. I always work to improve my teaching because I desire that my students get from me the personal best that I can give them (after all, I expect my students to perform to the best of their abilities so they should not expect any less from me).

3. TEACHING STRATEGIES

I believe that one's teaching style is constantly developing. This natural change is the result of personal growth, experience, and education about teaching and learning. I have been fortunate to teach motivated and capable students who have encouraged me and given me the confidence to experiment with different teaching strategies while maintaining high standards. The following is a list of a few successful strategies with which I have experimented.

Presentations: I try to find a balance between the traditional lecture and interactive small group activities. I will often have students present their homework solutions or small group findings to the entire class. In graduate courses the presentations are often based on working through research papers. In doing presentations the students practice crucial skills in communicating mathematics.

Habits of Mind Problems: In addition to regular homework, I ask students to work in groups on challenging problems. Emphasis is placed on the importance of careful reasoning, problem solving and communicating mathematics. The students develop great flexibility of thinking and the belief that precise expositions are both important and achievable. The students learn that when faced with a problem they need to collect information, assess it, consider multiple pathways to the answer, and explain that answer clearly. The students also get more comfortable with struggling while learning.

The Learning and Teaching Project: When working with in- or pre-service teachers I ask them to explore learning and teaching from two perspectives. They are to pick a topic from class and teach it to a child. Afterwards they reflect on the experience while focusing on if there is a relationship between how well one understands and enjoys the mathematics, and how successful one can be as a teacher of that mathematics. These exercises help students learn to teach children in ways that are mathematically rich while also being responsive to children's ideas.

Classroom Activities: I try to find unique ways to catch and focus the attention of students both with projects and in-class demonstrations. A few such examples are:

- **Large Lecture Voting:** When teaching large class sizes I will often give students voting cards (a sheet of paper with four coloured boxes) and ask them to vote on multiple choice questions at various times during a class meeting. This technique is similar to using "clickers" in class and answers provided have helped me gauge student understanding.

- **Worksheets and Labs:** When appropriate I will have students work in small groups on worksheets or labs while I circulate the classroom and address issues. This allows students to answer their own questions and gauge their understanding of the lesson in the moment.

- **The Dictionary Project:** The language of mathematics involves the careful use of vocabulary. To indicate the importance of the use of vocabulary I have freshmen–junior students create a dictionary of terms. Students are encouraged to present the dictionary in creative ways. Often there is resistance in the beginning, but after a first exam many students express gratitude for this guidance in studying.

- **Mathematician/Quote/Joke of the Week:** I think that it is important for students to realize that the field of mathematics has a deep history. By presenting mathematicians or quotes of the week I hope to pique the interest of students in this history.

- **Candy Demonstrations:** To emphasize the differences between 1-1 and onto mappings I will toss candy towards the class, waking up the sometimes sleepy students.

- **The Venice Dictionary:** When discussing coordinates and change of bases in linear algebra courses, I often set the topic matter up by describing a city made up of many regions (such as Venice). Each region has its own language and to communicate with people from these different regions we need language dictionaries. I then go on to equate the dictionary with the change of basis matrix.

Feedback: I believe that regular homework and feedback play a crucial role in the learning of mathematics. In all of my courses I strive to provide both, while holding high expectations for the quality of student work. Many students indicate via course evaluations that they grow to appreciate this aspect of my courses.

4. Training in Teaching and Learning

I have participated in a number of training sessions, workshops, and conferences to help improve my teaching. Below is a list of sample training activities I have participated in.

Teaching and Learning Conference, North Dakota State University, August 2014: At this conference I participated in a number of sessions that focused on topics such as dealing with academic honesty, working with student expectations and technology.

Conversations Among Colleagues, Central Michigan University, March 2013: I co-organized and participated in this conference which was aimed to engage mathematicians and mathematics educators in conversations about mathematics teaching and learning. The theme for the conference was *Making Practice Core: Mathematical Practices and the Practice of Teaching*.

Enacting Standards for Mathematical Practices, University of Nebraska–Lincoln, October 2011: This conference involved a number of talks from which I have found helpful when working with pre- and in-service K–12 teachers.

Writing Generally in Every Discipline Workshop, California Polytechnic State University, 2006: This was a week-long workshop which focused on incorporating involved written work into assignments.

SGS 901–Teaching and Learning in Higher Education. Semester course, Queen's University, 2003: I completed this full-semester graduate course (SGS 901) in which participants were required to read and discuss research articles on teaching and learning, prepare a teaching dossier, and give presentations with provided feedback.

Program in University Teaching & Learning, Instructional Development Centre, Queen's University, 2003: This was a certificate program through which I completed three certificates in *Scholarship*, *Practical Experience*, and *Professional Development*.

5. Teaching Effectiveness

Reflection plays a critical role in the development of a teacher. When analyzing reflections I seek guidance from experienced and successful teachers. I am fortunate to have been surrounded by deeply committed mentors. Moreover, I believe that it is very important to collect and interpret student feedback. I do this both informally via mid-term feedback forms and formal evaluations completed at the end of each course.

5.1. **Summary of Formal Course Evaluations.**

On the next page is a summary of my course evaluations. The data is based on student ranking of my teaching effectiveness with the scale 0 (low) to 4 (high). Classes taught with no data as of October 2016 are not included. A complete list of courses I have taught can be found on my Curriculum Vitae.

	Course	Mean	Class Size	Semester
North Dakota State Univ.	Cryptology (Math 473/673)	3.33	12	Spring 2016
	Algebra I (Math 720)	3.75	4	Fall 2016
	Algebra II (Math 721; co-taught)	3.75	4	Spring 2015
	Calculus I (Math 165)	3.628	152	Fall 2014
	Intro. to Abstract Math. (Math 270)	3.75	17	Fall 2014
Central Michigan Univ.	Modern Algebra I (MTH 523)	3.73	28	Spring 2014
	Theory of Numbers (MTH 521)	3.85	26	Fall 2013
	Calculus I (MTH 132)	3.85	54	Spring 2013
	Theory of Associative Rings (MTH 625)	3.82	11	Fall 2012
	Theory of Groups (MTH 623)	4.00	15	Spring 2012
	College Geometry (MTH 341)	3.63	26	Fall 2011
Univ. of Nebraska–Lincoln	Intro. to Modern Algebra I (Math 417)	3.87	23	Spring 2011
	Mathematics Matters (Math 300)	3.56	27	Fall 2010
	Experimentation, Conj. & Reasoning (Math 804T)	3.92	12	Summer 2010
		3.72	20	Summer 2009
	The Power of Monomial Ideals (Math 918)	3.80	10	Spring 2010
	The Joy of Numbers (Math 189H)	3.94	16	Fall 2009
	Using Math to Understand Our World (Math 807T)	3.54	33	Spring 2009
	Matrix Theory (Math 314)	3.48	24	Fall 2008
		3.08	34	Fall 2008
California Polytechnic State Univ., San Luis Obispo	Methods of Proof in Math. (Math 248)	3.44	21	Winter 2008
	Linear Algebra III (Math 406)	3.44	9	Winter 2008
	Linear Algebra II (Math 306)	3.50	22	Fall 2007
		3.13	9	Fall 2007
	Linear Algebra I (Math 206)	3.47	18	Spring 2007
	Calculus III (Math 143)	3.62	36	Spring 2007
	Calculus II (Math 142)	3.23	34	Winter 2008
		3.07	36	Winter 2008
		3.75	29	Winter 2007
		3.61	29	Winter 2007
		3.43	35	Fall 2006
	Calculus I (Math 141)	3.16	39	Fall 2007
		3.48	32	Fall 2006
		3.36	33	Fall 2006
Syracuse Univ.	1st Course in Linear Algebra (MAT 331)	2.97	34	Spring 2006
	Calculus I (MAT 295)	3.53	21	Spring 2006
		3.95	28	Fall 2005
		3.73	19	Fall 2005
Queen's Univ.	Intro. to Linear Algebra for Engineering Students (APSC 174)	3.8	73	Winter 2005
		3.4	48	Winter 2004
		3.1	50	Winter 2004
		3.1	112	Winter 2003
	Differential & Integral Calculus (Math 121)	3.5	125	Winter 2005
		2.6	370	Fall 2001

5.2. **Selected Student Comments from Course Evaluations.**

•"She wanted to make math fun for the students and not just work through the course material. She attempted to encourage students not only in the area of math but in life. S. Cooper is an excellent teacher."

•"You really have taken our suggestions from the beginning of the year seriously, and the improvement in your communication with us reflects that! Thanks!"

•"She also tried to make the class more interesting with "Quotes and Mathematicians of the Week.""

•"The teacher was interested and motivated and always tried to stimulate class participation."

•"The instructor is very enthusiastic about the class and ready to teach us anytime we were ready to ask questions. She seemed to stand out from the list of profs that I have in showing genuine care to teach the students. She goes through the basic steps to incorporate everyone who don't understand that topic and even goes through the complex steps to challenge the able minded."

•"I thought that Professor Cooper was fantastic at simplifying difficult concepts."

•"[I liked] the examples which included food and other interesting things to keep us interested."

•"Cooper is an excellent instructor! I really enjoyed attending her classes. She is extremely helpful, and makes sure that everyone understands the material. She is always available for outside discussion."

•"This class is very difficult for me, but Dr. Cooper makes it fun and uses class collaboration to help us understand what is going on."

5.3. **Selected Unsolicited Student Email Comments.**

•"I just wanted to say, even regardless of what my final grade will turn out to be, thank you for sticking with me through all my calc troubles and my struggles with test anxiety. I came into this year really arrogant about calc I, as I had taken it in high school. And to be perfectly honest, I was so comfortable and happy with my high school teacher's way of teaching that I initially didn't like your teaching style at all (for example, my teacher's tests consisted of utterly straightforward, easy problems, and yours, well, were a step up). Your way of teaching really grew on me, which is why I decided to stick with your class throughout. And now looking back, I think you've been the most effective at getting the material through my head in an understandable fashion."

•"Thank you very much for your kind words this evening. I probably should have talked to you before. . . . Your recommendations and compliments have certainly made me feel better about this class. I feel that you have just made this extremely bumpy road a little smoother."

•"I admire you for so much more than your Ph.D you've earned and knowledge of the subject I love, the caring person that kept me fighting when it would have been so much easier to let me quit, that is the person that I admire, and will always remember."

6. Student Supervision

Teaching goes much beyond the classroom. I believe it is crucial to supervise student research and instruction, both at the undergraduate and graduate levels. Sharing a vibrant research program with students strengthens a department's environment and programs. I have been a successful mentor for both undergraduate and graduate students. For example, I mentored a group of three students in the 2013 REU (Research Experiences for Undergraduates) program at Central Michigan University; the students worked on the project "Fat Points and Coding Theory" which involved commutative algebra, algebraic geometry, and coding theory. At the graduate level, I am currently supervising a Ph.D. student on his dissertation work and have successfully supervised master's projects. I have also organized activities such as Graduate Learning Seminars and sessions at TA Workshops. At both the undergraduate and graduate levels I have acted as an academic advisor to individual students and recognized student organizations. Details of sample student supervision are listed below.

Ph.D. Student Supervision

- Benjamin Noteboom, Ph.D. Candidate in Mathematics, North Dakota State University, Nov. 2015–present.

Master Student Supervision

- Jeffrey Conner, Plan B Master's Paper *Bounding Geometric Invariants Using Coding Theory*, Central Michigan University, Spring 2013.
- Jeffrey Fujioka, Plan B Master's Paper *Hilbert Functions of Complete Intersections*, Central Michigan University, Spring 2013.
- Jason Pode, Plan B Master's Paper *Connecting Graph Theory and Commutative Algebra via Ideals*, Central Michigan University, Spring 2013.
- Megan Stobel, Master's Paper *Flipping Triangles*, University of Nebraska–Lincoln, Spring 2011.
- Mary B. Kilnoski, Master's Paper *The Mathematics of the Five Card Trick*, Univ. of Nebraska–Lincoln, Summer 2010.

Graduate Committees

- Sara Solhjem, Ph.D. Candidate in Mathematics, North Dakota State Univ., Fall 2015–present (internal member).
- Corey Vorland, Ph.D. Candidate in Mathematics, North Dakota State Univ., Fall 2015–present (internal member).
- Rashmi Moparthi, M.S. in Computer Science, North Dakota State Univ., final examination Nov. 2015 (external member).
- Hannah Altmann, Ph.D. in Mathematics, North Dakota State Univ., final examination June 2015 (internal member).
- Jonathan Totushek, Ph.D. in Mathematics, North Dakota State Univ., final examination June 2015 (internal member).
- Thomas Dunn, Ph.D. in Mathematics, North Dakota State Univ., final examination May 2015 (internal member).

Undergraduate Student Supervision

- Daniel Carmody (Indiana U.), Nicholas Crispi (CUNY), Marie Ermete (Central Michigan U.), National Science Foundation (NSF)-Research Experiences for Undergraduates (REU) Program, Central Michigan University, Summer 2013.

- Jordan Wiebe, Honors Project in Group Theory, University of Nebraska–Lincoln, Spring 2011.

Other Student Supervision

- Linda Anderson, Internship for Linear Algebra (MTH 223), Central Michigan Univ., Fall 2013.

- Jeffrey Fujioka, Graduate Research Assistant, Central Michigan Univ., Fall 2012–Spring 2013.

- Cleland Loszewski, Internship for Linear Algebra (MTH 223), Central Michigan U., Spring 2012.