

Senior Seminar Swap Session

Fall 2008 Meeting of the Ohio MAA

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SCHOOL: Bates College

CONTACT: Kathy Weld

AUDIENCE: All seniors must take either thesis or senior seminar. Sometimes opened to juniors to increase numbers. About 6 a year.

TEACHING: One faculty.

HOURS: Same as a full course.

TOPICS: Faculty lectures first 2 to 4 weeks on topic of their choice. Students read journal articles related to the topic.

OUTCOME: Presentations in groups of 2 or 3.

LEARNING GOALS:

NOTES:

We have a required capstone. Bates has a huge % of students completing a thesis, and in math that's one of our two capstone options. Alternately, students take a senior seminar. Our goal is to have this be something like a grad school seminar: students read journal articles and present to each other. They present in small groups, usually two students, sometimes three. We start, however, with the professor (one per seminar) lecturing for a few (2-4) weeks to get things going, give proper background, etc. The prof teaching the seminar chooses the topic, so no one person has to know everything under the sun. We try to choose topics that will tap into a large proportion of the undergrad curriculum, and on which we can find journal articles the students will have some chance of tackling. We include, of course, things like Mathematics Magazine - they don't have to be Bulletin of Mathematical Biology articles, or the like. Our way of describing thesis/seminar differences to students is that the thesis is for people who know of a specific project they want to pursue, who want to set their own (demanding) schedule, and who want the intense working along, and working one-on-one with a prof, experience. The seminar, instead, is good for students who don't have a specific thesis topic that has grabbed them, and/or who want to focus on group work and presentation skills.

Since we also have a thesis option, we typically offer just one seminar each year. So students really don't have a choice about their topic! An ideal number of students in the seminar is 6. (Or, let's say, in the range of 5-8.) Smaller has what are probably obvious difficulties and awkwardness; much larger, though, and each individual student doesn't get to do as much and has a less personalized experience. We're usually able to arrange our theses and seminar so that the numbers work out to be fairly close to what we want. To increase the seminar numbers if needed, we sometimes open up the seminar (called Senior Seminar) to juniors with appropriate course background. The yearly change in topics is another reason to do this- some juniors are really interested in a topic but won't get that topic for their own year's Senior Seminar. If we have a huge number of seminar-interested students, we try to open up a second seminar. This has happened just once in the past 6 years at Bates. Students liked the extra choice of topics. We spent a couple of years after that with frustrated seniors, though: "Why don't we get to choose our topic? There **always** USED TO BE two seminars and we only get one!" Ah, the memory span of a college student!

Our seminar counts as a full course. I could easily envision doing it in a way that met less often and required fewer presentations per student, and having it count as half a course.

SCHOOL: Beloit College

CONTACT: Ben Newton

AUDIENCE: All majors. Usually 3-4 a semester.

TEACHING: One faculty member is in charge of running the Colloquium for .5 course credits. Other faculty mentor the presentations for no credit.

HOURS: Two required classes: Math 394 (.5 units) and Math 395 (.25 units).

TOPICS: Attendance at weekly colloquium is required for both classes.

OUTCOME: Math 394 requires a paper, and Math 395 requires a talk presented in the colloquium.

LEARNING GOALS:

NOTES:

Here are the key specs about Bates' Math Colloquium, to add to any compilation of responses you might be making:

-Math 384 (.5 units) and 385 (.25 units) are required for the math major. (Standard course is 1 unit).

-384 involves a substantial paper on a fairly narrow topic.

-385 involves a 50-minute talk on the same topic.

-Attendance at a weekly colloquium is also required for both. Colloquium speakers include faculty and outside speakers at the beginning of the term, Math 385 students in the final few weeks.

-384 and 385 are usually taken in consecutive semesters, but occasionally can be taken concurrently.

-One faculty member organizes the colloquium (teaching credit for 1/2 course per semester).

-Advising for individual projects is fanned out to the dept. with no direct teaching credit, although we typically have fewer students in the courses than you would have (rarely more than 3-4 students writing a paper in any given semester).

Good luck with the capstone planning process!

SCHOOL: Bridgewater College

CONTACT: Melissa Hoover

AUDIENCE:

TEACHING: varies

HOURS:

TOPICS: varies

OUTCOME:

LEARNING GOALS:

NOTES:

We have a capstone course in our department at Bridgewater College. We've done it a couple of different ways.

Some years we have students do independent study types of things (reading a carefully selected journal article or just learning about a topic they know nothing about) and present to the others. Each of our 4 department members attends the seminar so each student is assigned an advisor who helps when needed. When we did this I had only 2 students to be responsible for so I didn't have to learn about too terribly many things in order to be helpful.

Other years we have had the students go through some text on their own. They take turns presenting the material to the others and working problems from the text.

Both methods have pros and cons... but that's what we do. If you have any further questions, I'd be happy to answer them.

SCHOOL: Bryn Mawr College

CONTACT: Cecilia Diniz-Behn

AUDIENCE: Senior majors. Less than 10.

TEACHING: One instructor. Basically a topics course.

HOURS: 3 hours (same as standard course)

TOPICS: varies per instructor

OUTCOME: Presentations to class.

LEARNING GOALS: Communication of mathematics

NOTES:

I do know about Bryn Mawr! They have a senior seminar that is basically a special topics course. I think it is 3 credits (which is the standard for a math--or any--course at Bryn Mawr). The topic is mostly at the discretion of the instructor, but the students have some input. When I took it, it was taught in a modified Moore method kind of format. I think that part of the emphasis was to get people communicating math, so we would present theorems at the board, etc. It was a small class (<10), but I guess that varies from year to year depending on how many majors there are.

The grade was mostly based on class participation, but there was one take-home exam (I think the prof. wanted to make sure that people were really understanding what was going on and decided that he needed an exam to find out). There was no final.

I think that this course was mainly an opportunity for majors to have some fun with math. Since it was so narrow, it wasn't really designed to better prepare you for grad school or anything (aside from the general, thinking like a mathematician bit). But it was definitely designed to make you feel like a math person, if that makes sense?

SCHOOL: Capital University

CONTACT: Jon Stadler, Dave Reed

AUDIENCE: Math/CS Majors, Jr. Sr.

TEACHING: One faculty (with workload credit). Other department members serve as project advisors/ supervisors.

HOURS: 1 credit, repeated. Three to four credits needed for graduation.

TOPICS: Resume writing, interview skills.

OUTCOME: Write paper, presentation

LEARNING GOALS: Skills related to “topics” listed above.

NOTES:

Usually taken Jr. and Sr. years.

One credit may be waived if the student takes first year seminar course.

All Seniors take ETS Subject test and participate in exit interviews (includes a few (3.5) ETS review sessions). “Passing” the ETS exam is a graduation requirement for the major”

Typical pattern for students is to take 1st year seminar, then 1 semester, go to conference, another semester, write up a research paper, culminating with a presentation in final semester.

SCHOOL: Cardinal Stritch University

CONTACT: Sr. Barbara Reynolds

AUDIENCE: Mixed course with both math and CS majors.

TEACHING: One instructor.

HOURS: 4 credits.

TOPICS: Math may use Problem Solving Through Recreational Mathematics (DOVER). CS may use 66 Excursions in Computer Science (Dewdney).

OUTCOME: Problem solving and presentations.

LEARNING GOALS:

NOTES:

I teach a 4-credit capstone for the majors in our department. This is a mixed course of both Mathematics and Computer Science majors. It is 4 credits, so this probably does more than you want to do if you are contemplating a 2-credit capstone. I'm attaching what I call a "Preliminary Syllabus" and the Syllabus for this course from last semester, Spring 2008 (January to May).

I give the students an opportunity to shape some of the course requirements, which you can see by comparing the Preliminary syllabus with the final Syllabus. Depending on what the mix of Mathematics and Computer Science majors I have in the class might be, I've used different texts. Last year I had all mathematics majors, and used Problem Solving Through Recreational Mathematics, which is a Dover book (and not expensive). When I've had Computer Science majors in the class, I've used Dewdney's 66 Excursions in Computer Science.

Each student does a project.

SCHOOL: College of Saint Benedict Saint John's University

CONTACT: Jennifer Galovich

AUDIENCE: Seniors

TEACHING: One faculty member.

HOURS: At least two.

TOPICS: varied.

OUTCOME:

LEARNING GOALS: integration of prior learning, presentation and discussion skills, independent learning

NOTES:

We are agonizing a new requirement at our institution that mandates a Capstone course in all majors. Our regular courses are 4 credits. The capstone must be at least 2.

We have the idea of having a sort of seminar where 12 - 15 students (all seniors) read suitable carefully selected papers from journals, then present them to the rest of the group. The choice of the paper would be tailored to the individual student's interest and background (and level - not a good idea to give a super challenging paper to a mediocre student.)

This idea meets the mandated learning goals (integration of prior learning, presentation and discussion skills, independent learning), but has the disadvantage (it appears) that whoever teaches this course will have to be an expert on everything from soup to nuts! Or else you farm the mentoring out across the department (not a popular option, since no teaching credit given).

SCHOOL: Connecticut College

CONTACT: Christopher Hammond

AUDIENCE: Senior majors not electing a thesis.

TEACHING: One faculty of record who received no credit for running course. Other faculty are available for advising talks.

HOURS: 2 credits.

TOPICS: First half of class is a semester consists of talks by faculty to show good speaking habits. Second half is spent working on their talks.

OUTCOME: Talk on a topic that student investigates individually

LEARNING GOALS: Learning standards for a good talk.

NOTES:

Connecticut College offers a course quite similar to what you all have in mind. In particular, we have a two-credit seminar taken by senior majors, in which each student has to give a talk on a topic that he or she investigates individually.

While there is a faculty coordinator for the seminar, that individual does not get credit for teaching a course. Similarly, every faculty member is expected to be available to advise students who are preparing talks, without any sort of course release or other benefit. Nobody has ever really complained about this arrangement. Frankly, I can't imagine how we could have a sufficient breadth of topics without making use of the expertise of the entire department.

We spend a lot of time in the seminar emphasizing the standards for giving a good mathematical talk. For that reason, and to give students enough time to prepare their own talks, we devote the first half of the semester to lectures by "professional mathematicians" -- either members of our own department or faculty members from other schools. (This also gives us the opportunity to bring a wider group of mathematicians to campus than we would otherwise have.)

Let me just mention one lesson that it took us a while to figure out: make sure students in the course are actually given a letter grade, rather than an S or U (or whatever analogous pass/fail grade you have). We started off having the course not be graded, with the result that a lot of students didn't take it as seriously as they should have.

We're currently trying to deal with another problem, and I'm not sure how this will work out. We've come to the realization that, while it is useful for students to attend talks by professional mathematicians, they really need to see talks given by their peers before they try to give a talk themselves. We've considered requiring students to enroll in the seminar for two semesters (once as an auditor, once as a participant), but that poses a real scheduling difficulty for some of our majors (e.g. those who play a sport or study away). We may just wind up requiring them to attend a certain number of talks -- on their own schedule, over the course of their undergraduate career -- prior to the semester in which they actually enroll.

In any event, I hope these comments are helpful.

SCHOOL: Hood College

CONTACT: Betty Mayfield

AUDIENCE:

TEACHING:

HOURS:

TOPICS: History of Mathematics

OUTCOME:

LEARNING GOALS: Presentation and discussion skills.

NOTES:

Our capstone course is a history of mathematics seminar which does, in fact, integrate prior learning, focus on presentation and discussion skills, and foster independent learning.

SCHOOL: Houghton

CONTACT: Kristin Camenga

AUDIENCE:

TEACHING: One professor chooses a topic.

HOURS:

TOPICS: Varies depending on instructor.

OUTCOME: Presentation, written work.

LEARNING GOALS: Problem solving and communicating mathematics.

NOTES:

At Houghton, they have had a capstone in place for multiple years. We have just recently changed how we organize the class, switching between the different models mentioned. In all cases, our focus has been on problem solving and communicating mathematics, both orally and in writing.

Before the switch, all faculty were involved and we farmed out credit - and this worked since some of our intro courses are team taught which results in some loading that is not full courses. One person got the majority of the credit, with others getting a little. Students solved problems individually or in pairs and developed a presentation on a topic of their choice - both of which were presented and written up. Only as I arrived did they start to require a higher level of literature use for the project.

Last year we started assigning the course to one faculty member (fixing the load credit issue since the time spent by each faculty member was more than the load credit) and working with something more thematic, close to what Kristen mentioned. Last year the faculty member had students learn about neural networks. He continued to have them solve problems as one component of the course, but all the presentations were related to this topic.

I will be teaching the course this next spring and will be focusing on number theory with applications to cryptography. I am planning a more formal teaching process to get them started with number theory than my colleague (we don't have a number theory course) and then I plan to assign different related topics, mostly related to cryptology, for them to research and write up. I will also continue the problem solving, although I may try to pick problems a little closer to the number theory theme. While I hope to introduce content that they can't get in any of our standard courses, I hope to do it in a way that communication is the key. I am hoping to do even the more formal teaching in a more seminar/modified Moore method style and have them talk about and compare different ways to write up proofs and present them to each other. We will read some number theory material, both for general and specialized audiences. They will write up and present their own problem for a specialized math audience and write up and present their cryptology project for a general audience (I'm even planning to get non-math students to show up for them to do their final presentations or to see if they can present in local high schools as part of Math Awareness Month -April - even though it wouldn't match the theme of the year.) Of course, all this is a dream so far rather than implemented, so some may get simplified as we go.

SCHOOL: Macalester College

CONTACT: David Bressoud (bressoud@macalester.edu)

AUDIENCE: all seniors

TEACHING: 1 credit course in spring of senior year. Taught as overload.

HOURS: meets 1.5 hours every 3rd week.

TOPICS: student research papers.

OUTCOME:

LEARNING GOALS: writing and oral presentation.

NOTES:

In addition to the written report, students give 20 minutes presentation on Capstone Day, a Wednesday in mid-April when all math and comp sci classes are cancelled and student in those classes are required to attend at least 2 presentations and write up short summaries (usually counts as a homework assignment in the class).

We have a serious problem with unequal distribution of the capstone advising.

SCHOOL: Malone University

CONTACT: John Williams (jwilliams@malone.edu)

AUDIENCE: Senior math majors

TEACHING: One lead professor that rotates. All professors involved with consulting and grading.

HOURS: 1 hour course.

TOPICS: Group presentation on a journal article.

OUTCOME: A paper and oral report on a topic not previously covered. Student take ETS field test in mathematics.

LEARNING GOALS: Independent study of a math topic / ability to write a math paper / ability to give an oral presentation.

NOTES:

SCHOOL: Manhattan College

CONTACT: Kathy Weld

AUDIENCE: Pure math or math -ed juniors or seniors.

TEACHING: One faculty member.

HOURS:

TOPICS: Problem Solving

OUTCOME:

LEARNING GOALS: Improve problem solving skills. Presentation, writing solutions.

NOTES:

I'd be glad to tell you more about the course. Its a 400 level "Seminar" taken by all our students following either a straight math track or a math ed track preparing to teach at the secondary level.

They take it in junior or senior year, and need to have taken either Algebra I or Analysis I before hand. That means all will have taken Calc I-III, a Foundations Course, Linear Algebra, Algebra or Analysis and 2-4 more Math classes before taking Problem Seminar.

I should say also, at the outset, that the course is modeled after one I had myself in the '70's at SUNY Potsdam as an undergraduate. I found the course of tremendous value, and doubt I'd have survived grad school with out it. (Long story, I came to math late, had a very weak background..) I haven't changed much in my version of the course.

The primary business of the course is to engage students in solving problems, writing and presenting solutions. I almost never lecture.

I divide the problems into two sets: the first type are called "general mathematical knowledge" problems, or GMK, for short. The second type are the weekly problems, or ? POTW? pronounced ?pot-dub? by the students. GMK problems are often short answer computational problems of the type one might see on the mathematics specialty GRE exam. They range over the entire undergraduate curriculum, but emphasize the calculus sequence and linear algebra. They function as a device to require that students review, and often re-learn, the topics in the core math curriculum. In a 3 hour class, we spend roughly 2/3 of our time doing GMK problems- students present them and we discuss them.

On the 3rd day we discuss the old problem of the week (usually a student presents a solution) and we lay the ground for the next Problem of the week. Often they work on it in class a bit. Next spring I will probably try to make the split more of a 50-50 time split.

The problem of the week is more open ended, and the aim is to require the students to engage in creative problem-solving. In selecting a problem for problem of the week I try to find something that is accessible to all, and which will yield to elementary techniques if they are wielded with skill and creativity. This sounds simple, but requires time, craft, and a genuine knowledge of the capabilities of one's particular students in order to invite them to engage, and at the same time stretch their ability so that they may gain in

mathematical maturity. A simple device is to incorporate as part of the weekly problem and easy warm-up exercise, a slightly harder midrange exercise, and for the final part a serious problem. Many students end up working in groups on these, though I ask for individual write-ups. The best students seem to take pride in working alone. A good example of a discovery-based POTW is the great Halmos question, "Which natural numbers can be written as a sum of 2 or more consecutive integers?" I ask them to collect data, form a conjecture, and then prove the conjecture.

The GMK problems are assigned to individuals. While students frequently consult me about these problems, but they seem not to rely as much on their peers. The GMK problems are presented by the students on the board once or twice a week. That gives me a chance to discuss exposition with them, and the pre-service teachers like this part the most.

Most of the students who take the course seriously do well, (I count the GMK and the POTW's 50-50), and feel that they develop problem solving skills, consolidate knowledge and even enjoy (!) the process of discovering math. Such students evaluate the class enthusiastically, and feel it is really valuable. Our student teachers appreciate the chance to get feedback on exposition, and our best students really like working on the POTW problems.

Students think its a lot of work, and in our department, they take over our common area and have huge, enthusiastic work sessions. Its great for the culture of the department.

I think if I hadn't been through a course like this I'd worry that the problems weren't "hard enough" or the right level for a senior seminar, but the level is infinitely adjustable, depending on the strengths of your students, and the experience of discovery and problem solving outside the safety and context of a course is something they don't get anywhere else, except for the particular ones who do an REU or such. Also, the course is usually a joy to teach.

I could go on- but maybe you should tell me if you have more questions?

SCHOOL: Marietta College

CONTACT: John Tynan, Matt Menzel, Mark Miller

AUDIENCE: All math majors (5-6 a year)

TEACHING: One faculty of record, entire department does presentations.

HOURS: 1 credit – spring of Junior year (Math 401), 1 credit – either semester of senior year (Math 402).

TOPICS: Presentation by faculty, presentations by student, culminating in final projects.

OUTCOME: Major presentation during senior year.

LEARNING GOALS: Communicating mathematics in oral and written form.

NOTES:

The first credit involves the students seeing presentations from faculty, then doing two presentations of their own. The first is a presentation of some article. The second must include presentation of a proof.

The second credit involves the student choosing a topic and doing “research” into it. If it is a new topic, they can do an expository paper and presentation. If they are expanding on a previously known subject, we assume that they will end at a slightly higher level. Students that complete Math 402 obtain 3 General Education Writing Proficiency credits.

	Fall semester	Spring semester
Junior Year		Math 401 -- 1 hr/week Mathematics Seminar. Students read the literature and/or do some research. One faculty member handles this as part of load.
Senior Year	Math 402 -- 1 hr/week Students complete their projects, write the results as a major paper, and present the results to the department.	Math 402 Students can take Math 402 either semester of their Senior year.

SCHOOL: Mercer

CONTACT: Carolyn Yackel

AUDIENCE:

TEACHING: One instructor of record. Students choose mentors for presentations.

HOURS: 1 credit

TOPICS: Projects can be on research, but most students present on a paper or cool idea.

OUTCOME: Some present at research conference. Both oral and written presentations.

LEARNING GOALS: Learn latex / write CVs and resumes / discuss job or grad school search.

NOTES:

We have such a thing. It's one credit hour. They learn latex, write cvs/resumes, think about applying for jobs/grad school, and have to give a presentation to which all the faculty are invited. They also write a paper on this presentation. If the students are doing undergrad research, the presentation is on that. But most of our students don't do that, so they often read a paper from CMJ or find some cool idea. They also have a "math friend"=faculty in the dept. who helps them with this project. It does drum up some good business for our biennial undergraduate research conference. We can get the students who do something interesting to talk at that. Plus, the students choose their own math friends, so usually you get to work with your favorite students.

SCHOOL: Miami University – Middletown.

This is a two year campus, and has no “senior seminars”. However many of the goals that 4 year colleges strive for in their capstones, are achieved within classes at MU – Middletown.

CONTACT: Rajappa Asthagiri (asthagr@muohio.edu)

AUDIENCE: Calculus 1, 2, 3 students.

TEACHING: Rajappa

HOURS: Regular calculus courses for 5, 4, 4, credits respectively.

TOPICS: Group activities at least four times each chapter of the course. Three writing projects on word problems.

OUTCOME: Group activities are 16% and writing projects are 16% of the final grade.

LEARNING GOALS: Foster thinking together; helps as feed back for actual tests on the chapters.

NOTES:

I use WebAssign for each section of a chapter.

SCHOOL: Morehead State

CONTACT: Mike Dobranski

AUDIENCE: All Math / CS Majors, 8-15 each semester.

TEACHING: One instructor of record but students work with other faculty on projects.

HOURS: 3 hour.

TOPICS: New research or appropriate review of research.

OUTCOME: An hour long presentation and 12+ page paper.

LEARNING GOALS: Also take MFT in subject.

NOTES:

Our 3-hour capstone course includes students in all programs in our department - mathematics, secondary mathematics teaching, and computer science major and area of concentration. We have 8-15 students each semester. The main project is new research or appropriate review of research culminating in an hour-long presentation and a 12+ page paper. The students also give shorter presentations on a biographical or historical topic, a recent journal article, and their preliminary research. We also have our students take the MFT in their subjects - mathematics or computer science. One faculty member is the instructor of record and coordinates the grading of each student, but nearly all the students work with an advisor other than the course instructor. The advisors do not receive course credit for this work. We take turns "teaching" the course, which is generally viewed as slight reduction in course load. Our regular course load is 12 hours per semester, so I don't imagine that your faculty would have it much if at all worse than we do. We have determined that the value added for the students justifies the additional work.

SCHOOL: Ohio Northern University

CONTACT: Harold Putt (h-putt@onu.edu)

AUDIENCE: All senior math majors

TEACHING: one-on-one mentoring

HOURS: varies. Usually two one-credit hour courses.

TOPICS: varies

OUTCOME: A 10+ page paper and a 15 minute oral presentation. Student also present at the Ohio Sectional meetings and at the Joint National Meetings.

LEARNING GOALS: Varies depending on the "track" – math / math-ed/ stats.

NOTES:

Our capstone experience runs for two quarters with the following typical structure.

	Fall quarter	Winter quarter	Spring quarter
Junior Year			Math 300 -- 1 hr/week Juniors choose a topic and a faculty advisor. One faculty member handles this as part of load.
Senior Year	Math 492 -- 1 hr/week Senior Research. Students take this and work individually on their projects with faculty support. Faculty participation is considered as service to the department.	Math 493 -- 1 hr/week. Senior Exposition. Students complete their projects and write up a paper, usually 10-20 pages long. Faculty participation is considered as service to the department.	

All majors are required to participate in the capstone experience. At the end of the quarter where there are students taking Math 493 there is a "capstone colloquium" where students give 15 minute presentations, similar to a contributed paper session, and afterwards there is a "capstone banquet" for students and their families.

Often the distribution of students among faculty mentors is uneven.

SCHOOL: Randolph-Macon College

CONTACT: Bruce Torrence

AUDIENCE: Seniors in their Fall term approx 5 a year.

TEACHING: One faculty of record, but paper topics are spread out among faculty.

HOURS: 1 credit (most classes are 3)

TOPICS: Attend weekly seminar / read paper.

OUTCOME: Assemble portfolio (collection of written work in previous courses), oral presentation.

LEARNING GOALS: Oral Communication + other not filled in the major.

NOTES:

We have begun a very similar capstone experience at our college. We're now in our second year, so the jury is still out on its success, but the signs are very positive.

We have a 1-credit course (normal courses are 3 credits), mandatory for seniors in their fall term. In the beginning of the term they attend weekly seminars (some of our own faculty, and some outside speakers) and work on assembling their portfolios (a collection of their written work from earlier courses). Each student is given a paper to read and ultimately uses it as the basis for an oral presentation. Students rate each others presentations, and discuss strengths and weaknesses.

One faculty member runs the seminar, but (s)he is not solely responsible for the paper topics; we spread that out. Now we average 5 majors per year, so this is not a heavy burden. In fact, it's kind of fun. The seminar organizer, in our limited experience, appears to bear the brunt of the paper assigning and subsequent advising, but not all of it. We expect that over time it will strike a sustainable balance as we rotate the seminar organizer through the dept. faculty.

Benefits: Our seminar talks are lively and well attended, as sophomores and juniors want to see their senior peers, and get a glimpse of what they will be in for. All faculty rate the student speakers, so we're all involved. In all, it seems to really be a boost to the cohesiveness and community spirit of our dept, and so far does not seem to be that heavy a burden either on the students or on the faculty. It's a win-win.

However you decide to do it, be sure to work it carefully into your assessment plan for the major program. Ours filled a number of gaps by giving us a concrete means of assessing if our students are meeting certain goals, such as oral communication.

SCHOOL: St. Edward's University

CONTACT: Carol Gee

AUDIENCE:

TEACHING: Spread evenly through the department.

HOURS: 4 semester research sequence. 1 credit / semester.

TOPICS: varies.

OUTCOME:

LEARNING GOALS:

NOTES:

We have a required 4-semester research sequence here (one credit hour/semester for the students) with student-mentor pairs similar to what David Miller mentioned, and it begins with reading an "accessible" paper. From my limited experience, those accessible yet interesting papers within the mentor's field of expertise can be challenging to find. We don't officially get teaching credit for mentoring research students, but it is expected that the faculty distribute the workload evenly, and carrying two students for a whole year will typically buy us a one course load reduction. (down from a 4-4 to a 4-3 course fall-spring load).

Have you considered expanding your idea to allow textbook topics not usually covered in the classroom (things like fractals, knot theory, or soap films come to mind) or topics from Popular Science-type books? The latter could include some philosophical ideas like zero and infinity, or historical aspects of math. The book "Chaos, Coincidence and all that Math Jazz" by Burger and Starbird has lots of fun tidbits about everything from voting theory to the golden ratio. Another interesting idea might be to have students talk about some classic unsolved problems in math.

It seems like one of these avenues might yield (more!) topics that are more accessible and hence need less mentor guidance, while still requiring the students to integrate prior math skills, learn independently, and communicate their findings. You could brainstorm with colleagues to generate a list of topic ideas, and then add some self-contained, accessible journal articles to your list, steering pre-grad-school students toward a journal article, if that's an unstated goal.

Hope that helps!

SCHOOL: San Jose State University

CONTACT: Trisha Bergthold

AUDIENCE: Future Secondary School Teachers

TEACHING:

HOURS:

TOPICS: Problem Solving

OUTCOME:

LEARNING GOALS: Improve solving open ended, sometimes ill-defined problems.

NOTES:

We have a capstone course that is designed for the future secondary teachers, but would be easily adaptable to other specialties within mathematics. It's basically a problem solving course. You would be surprised at how poorly many senior math majors are at solving nonroutine problems. Through many courses of being told, "Here are the conditions, here is the result, find a mathematically valid path from point A to point B," students are remarkably unprepared for open-ended, sometimes ill-defined problems, be they real-world problems or not.

My two cents' worth.

SCHOOL: Shawnee State University

CONTACT: Robert Mendris (rmendris@shawnee.edu)

AUDIENCE: Some juniors but mostly seniors. (5-10 majors per year)

TEACHING: Many faculty participate. You mentor your advisees.

HOURS: Two semester sequence. A one credit course followed by a two credit course.

TOPICS: Varies (students choose under advisor guidance). Can be research or expository.

OUTCOME: Written report (which could resemble a thesis) and a talk.

LEARNING GOALS: Learn to do research, write mathematics, speak mathematics.

NOTES:

The title is “senior Research Project”.

There might be something related to math education, but I’m not sure.

Students pick their advisors.

The paper is between 20 and 100 pages.

The talk is 1 hour and is usually given in the spring.

Student teaching is a big problem. Students are overworked.

Advising is unequally distributed. Advisors are a little compensated, but that doesn’t solve the irregular load.

SCHOOL: Skidmore College

CONTACT: Rachael R. Rode-Dale

AUDIENCE: Usually seniors. Every major must take.

TEACHING: One faculty member.

HOURS: 3 hours

TOPICS: Varies by who is teaching it. Research in that years' topic.

OUTCOME: Presentation at the Hudson River Undergraduate Math Conference

LEARNING GOALS:

NOTES:

All math majors at Skidmore must take MA 376 Senior Seminar (worth 3 hrs). Here is our catalog description: Research, discussion, and presentation of selected topics at an advanced level, to provide a capstone experience for the mathematics major; primarily intended for seniors.

Each year a different faculty member teaches the course and usually tailors it to his/her area of research or interest. The students are required to give a presentation at the Hudson River Undergraduate Math Conference (HRUMC) near the end of the semester.

I have not yet taught the course so I am not sure about the specifics. Two recent topics, though, were 1. Tessellations 2. Topics in Algebraic Geometry.

We require advanced calculus and abstract algebra, both 300 level courses. Since the students who enroll our 376 are usually seniors they have also had a handful of other electives.

SCHOOL: University of Wisconsin - Stout

CONTACT: Laura Schmidt

AUDIENCE:

TEACHING: One instructor that ran weekly meetings, mentored presentations spread out among faculty. No credit for mentoring.

HOURS:

TOPICS: varied

OUTCOME:

LEARNING GOALS:

NOTES:

We have recently changed to internships/co-ops for our requirement now since we are an applied program, but when we had a capstone we did a similar idea and spread out the mentoring across the department. If a student chose a paper in your field, then you were their mentor.

The lead person (basically the one on the course schedule who got paid) ran weekly meetings with the students, checking their progress, and reading general papers that the entire class went through. As for the mentors, if they are untenured it was a nice service piece to add to their evaluations, other than that, there was no credit for it.

SCHOOL: Washburn

CONTACT: Kevin Charlwood

AUDIENCE: Pure and Math -Ed majors (not actuarial students) about 5 a year.

TEACHING: One official instructor for the topics, other faculty handle the project.

HOURS: 3 hours.

TOPICS: Class is split in two pieces. 2 hours are spent learning an advanced topic of the instructor's choice. 1 hour spend on the project.

OUTCOME: Semester project present both orally and in writing.

LEARNING GOALS:

NOTES:

At Washburn, we started our Capstone in Fall 2006, and we're now running it for the third time. Our Math for Secondary Teachers and pure math majors are required to take it; our actuarial students take SOA exams.

We created the course since we needed an assessment tool for majors at the end of their time with us; ours includes a required semester project to be presented both orally and in writing.

Our 3-cr. course is split into 2 pieces - a regular 2-cr. class where students learn about advanced topics (advanced discrete, graph theory, complex analysis, etc.) at the whim of the instructor. The 1-cr. portion is the project, typically directed by someone other than the capstone instructor to distribute the workload more equitably across our faculty. (Merit points and merit raises are the only way project directors get any credit, officially.) The project can be anything within the mathematical sciences; the main difficulty is to get students to arrive at a tractable topic about 3 weeks into the semester, otherwise, there's little hope that they'll finish anything by semester's end. In 2006, we had 3 students in it, last year, 5, and this year 5 again, so we're dealing with small numbers.

If you're interested in any materials for the course, or further logistics of it, please let me know - I'd be happy to help out!

SCHOOL: West Virginia University

CONTACT: David Miller

AUDIENCE: Junior and Senior Majors.

TEACHING: Student chooses mentor to advise their sequence. No credit for faculty.

HOURS: 3 credits that can be spread up to 3 semesters.

TOPICS: Varies depending on mentor. First semester they pick a topic, second semester they do reading, and third they write a paper.

OUTCOME: Capstone paper. Talk is encouraged.

LEARNING GOALS:

NOTES:

We have a capstone course that has students sign up for 3 credits that can be spread out for at most 3 semesters. During the first semester the student must select a faculty member to work with and determine a project. The second semester the student will continue reading articles and books on that particular topic and during the third semester the student will write their capstone paper. The depth and rigor depend on the topic and faculty member. We are also encouraging students to give a talk (the math club is one venue). If students choose to do the capstone at a faster pace then they can by completed things in two (or possible one for more exceptional students).

As of right now there is no compensation (other than you can put it down as service) and no limit on how many students a faculty member advises. I have advised 4 students in the last two years and currently have 2. Faculty can choose to work with a student or suggest others who might. Some faculty do not work with anybody and others have 1 or 2 a semester.

With you situation then each faculty might need to work with a minimum of two with some set maximum to get it to be reasonable and make sure it works. Two or three students a year might be too much for some faculty at your school.

SCHOOL: Wheaton College

CONTACT: Tommy Ratliff

AUDIENCE: 8 students.

TEACHING: One faculty of record.

HOURS:

TOPICS: Read one paper together / read one paper individually / weekly presentations.

OUTCOME: Present at local undergrad conference.

LEARNING GOALS:

NOTES:

We instituted a capstone course three years ago, and I taught it for the first two iterations. We've structured it very similar to what you describe below, although I had slightly smaller classes with around 8 students.

We spent the first two weeks reading a paper together so that they understood what was involved in **really** reading a math paper. e.g. "It follows that. . ." means that you actually need to verify the conclusion! I used the excellent "Counting on Continued Fractions" from Math Magazine by Art Benjamin, Francis Su, and Jennifer Quinn for this exercise.

After this, each student was responsible for finding a paper in an area of interest to them and using it as a starting point for the rest of their work during the semester. The remainder of the class meetings consisted of them presenting their work, and everyone presented at least once per week. Most of the topics were outside my area of expertise, ranging from generalized fibonacci sequences to a new model for the spread of the bubonic plague to a problem from game theory, etc. I told the students that while I wasn't an expert in the area, I'd be willing to work through their paper with them. Since I wasn't doing course prep in the same way as in other classes, I viewed this as a reasonable tradeoff.

The challenge is to make sure that each student picks a paper appropriate for their level and of interest to them. We spent one class meeting early in the semester with a reference librarian who showed the students how to use some of the electronic resources we have, and then I let the students dig around looking for a paper. By the end of this meeting, almost all of them had found a paper.

The first year I taught this, all of the students presented at the Hudson River Conference. The second year, it fell on our big Spring Weekend, which for some reason, the seniors were reluctant to miss.

I really enjoyed the course, but it was somewhat disconcerting to walk into the class and really have no idea how it would turn out. In the end, it was a very good experience for me to learn how to give up control of the classroom. I'm not sure how the logistics of this would work with a larger group, though.

SCHOOL: Wittenberg University

CONTACT: Brian Shelburne (bshelburne@wittenberg.edu)

AUDIENCE: Senior Mathematics Majors not optioning for an honors thesis, or statistics consulting class.

TEACHING: One faculty member

HOURS: 90 minutes / week. A 2 semester course where most are 4 semester hours.

TOPICS: Essentially a history of math course. We use Dunham's Journey Through Genius.

OUTCOME: Do oral presentations / write a 10-15 page paper on a mathematical topic / attend class & participate in discussion / turn in homework problems based on readings.

LEARNING GOALS:

NOTES:

All seniors must complete a capstone experience. Most take Math 460: Senior Seminar, the two credit course described above. However, better student may do an independent study or Honor's Thesis in place of math 460. Seniors take ETS major Field Test. This is for our assessment – the students' performance is not reflected in their grade.

SCHOOL: Xavier University

CONTACT: Daniel E. Otero (otero@xavier.edu)

AUDIENCE: Second-semester juniors, first and second semester seniors (all math majors)

TEACHING: Single Professor

HOURS: Three one credit courses, spread out over the final 3 semesters of the undergraduate program. They are MATH 391, 392, and 393.

TOPICS: Negotiating the mathematics literature, preparing a talk. “the culture” of mathematics.

OUTCOME: Oral and written report of substantial project.

LEARNING GOALS: Individual independent learning from standard sources is expected for all students; we hope that students become more familiar with literature; practice at giving a talk, writing mathematics; use of technical word processor (TeX, Beamer)

NOTES:

MATH 391: Juniors learn about expectations for their senior project and watch their senior classmates as they complete their projects; juniors choose faculty advisor and topic; juniors work assignments that are meant to familiarize them with reading from the mathematics literature. For example they may read an article in the Monthly and follow up on it. A good literature search is part of the follow-up.

Math 392: Seniors work independently with their faculty advisors on their project topic (no common meeting during the Fall semester).

Math 393: Seniors write final report, prepare and give oral report.

	Fall semester	Spring semester
Junior Year		Math 391 -- 1 hr/week Juniors and Seniors meet in common. One faculty member handles this as part of load.
Senior Year	Math 392 -- 1 hr/week Only Seniors take this and work individually on their projects with faculty support. Faculty participation is considered as service to the department.	Math 393 -- 1 hr/week Juniors and Seniors meet in common. Each Senior gives a written and an oral report of his/her research. As with Math 391, one faculty member handles this as part of load.

ETS Field Test Comments

Baldwin-Wallace College

The use of the ETS field test is in a state of flux. Right now majors must pass at the 50th percentile.

Capital University

Majors take the ETS field test during final examinations. There are several review classes for the test. “Passing” the test is a graduation requirement in the major.

Malone University

Students take the ETS field test in mathematics.

Wittenberg University

All students take the ETS field test as part of the course. There is an “ETS night” where students take the first half of the test for an hour, break to have pizza and some social time, and then take the second half of the test of an hour.

Xavier University

Students are required to take the ETS field test and to achieve a “sufficient score.” Student may have to take the test over again to achieve that score.