

Advice from Developing Mathematical Ideas (DMI) Users

Since DMI was produced, it has been used at various sites around the country. The contexts in which the DMI projects have been set up, the backgrounds of facilitators, the constituencies participating at each site, and the formats in which the materials are used, are all quite varied.

We, users and developers of DMI, have learned quite a bit from these varied efforts. In the linked pages, several users share some of their reflections, strategies, and discoveries.

Using Developing Mathematical Ideas (DMI) in Various Formats: Given the particular needs and demands at different sites, people have experimented with a variety of formats in terms of the length and frequency of meetings. On this page, users offer comments on the formats of their seminars.

Recruiting for a Developing Mathematical Ideas (DMI) seminar: Christopher Fraley explains his strategy for recruiting for a DMI seminar in his school system and shares the documents he recruited to communicate with principals, teachers, and other parties.

Adapting Developing Mathematical Ideas (DMI) for an Undergraduate Course: Many teacher educators draw from the DMI materials for their undergraduate courses, and some base a semester's course on one or two DMI modules in their entirety. Jill Lester describes the design of her DMI course at Mount Holyoke College.

Using Developing Mathematical Ideas (DMI) to Integrate the Teaching of Math and Science:

Using Developing Mathematical Ideas (DMI) in Various Formats

Seminar meeting for three hours weekly: "I really like this format. It's very intense, yet enough time between sessions that participants have time to reflect, try things in classrooms, etc. Even when we had two weeks between sessions (because of vacation), participants still admitted to doing the work the night before!"

Seminar meeting for three hours after school biweekly: "Meeting every other week gave both the participants and the facilitators some time to reflect on the work we were doing. As a facilitator who was at the same time a classroom teacher, it was important for me to have the week between to prepare with my co-facilitators and to reflect on our participants' work. The participants commented that meeting every other week made it seem more manageable in terms of the amount of time they spent in class. They also liked that they had time to try things they had been thinking about."

Seminar meeting for three hours on Saturdays biweekly: "To my surprise, the teachers don't complain about spending their Saturday mornings this way. In contrast to after-school seminars, they arrive rested and refreshed. We'll meet approximately every other week throughout the year to cover both modules."

Seminar meeting for 90 minutes weekly: "We chose this format to accommodate child-care issues for the teachers in our school. Having weekly meetings for an entire year seems to maintain a high level of 'mindfulness' about math, individual commitment, and openness to the work of reform; it also offers an invaluable cohesiveness to the group and to our shared purpose. The drawback is that the case discussions and the math activities that support examination of the cases do not take place in the same session."

Seminar meeting for 90 minutes biweekly: "This format encourages teachers who are involved in numerous after school activities or who have young children at home to be able to do DMI. One disadvantage is that it spreads each session over a month, and I'm now feeling the need to move more quickly. It's also not possible to do both modules in one school year unless you add some sessions at other times."

Each module covered in four full-day workshops: "Teachers who participated in the four full-day meetings explained that, because of child-care issues and other concerns, they would have been unable to attend after-school meetings. They said they liked the feeling of shedding their teaching responsibilities in the morning, to have the experience of being the student all day. And they liked the intensity. Issues to think about include how to cover teachers' classrooms and arranging agendas (such as what to do with the interview, writing episodes, etc.)."

Summer institute, 10 full days "We scheduled sessions so that two afternoons were spent conducting interviews. Teachers were told ahead of time which days they would be interviewing children and were asked to make an appointment with a child. They also had long lunch breaks with enough time to reread the cases we would be discussing in the afternoon. Although we had to sacrifice the assignments to bring in student work and write cases-teachers could not be testing out new ideas in their classrooms as the seminar progressed-the concentration and immersion into the work was a positive."

Summer school course, 210 minutes, 2 times a week: "I taught a summer school course that met twice a week for three and a half hours, four weeks (though it should have been longer). I didn't follow DMI exactly, but we worked through all of Modules 1 and 2. Students read 2 or 3 cases for each class and, as much as possible, I posed problems for the class to try before they were asked to read about what the children did. I also selected particular focus questions for students to read, think, and write about before the case discussions."

Semester course for undergraduates: "Due to the structure of the college schedule, DMI for undergraduates met for 28, 75 minute sessions--twice a week for 14 weeks. Working our way through both modules, there was a reading assignment and a portfolio assignment due each week. In addition, each student was paired with a local teacher, who

is working to reform his or her own practice, to facilitate access to classrooms and students."

Recruiting for a Developing Mathematical Ideas (DMI) Seminar

Developing Mathematical Ideas offers a form of professional development that departs from those generally available in school districts. For that reason, many people who have set up DMI seminars have realized that they need to employ a variety of strategies to communicate what DMI is about and to enlist the support of school administrators. Christopher Fraley, from the Lake Washington School District in WA, describes below the strategies he employed and shares the text of messages he sent to potential participants, principals, staff developers, and other administrators.

First, I try to keep my supervisors and principals as informed as possible before I start the recruiting process. District administrators and principals can sometimes be a road block to effective recruiting if they are not "on board." However, they can also be tremendous assets in getting the word out if they are "on board."

Second, I try to connect the goals of the program to the goals of the district and/or building. I try to show that this experience will support teachers in "going" forward with the organization's goals. If administrators are convinced of this, they can often be your best recruiters (outside of teachers who have been through the seminar) because they are in contact with teachers and may know who would be really interested.

Third, I try to make it seem like this seminar is a sought after thing... that if principals and/or teachers don't act soon they may miss out. Deadlines, mention of waiting lists, and the sharing of who has already committed often help promote this sense of urgency.

Below, I have included examples of six letters or memos I:

A) an informational message to principals

B) a reminder message with a list of those who have committed

C) a message to staff-development personnel (they have contacts with teachers and have insights that I do not)

D) a letter of invitation to teachers,

E) a message asking for the commitment of participating teachers

F) a recruitment up-date for administrators.

A) Informational Message to Principals

Dear Principal,

Here is an exciting opportunity to build capacity in your building for improving the mathematics performance of students by developing and supporting a potential teacher-leader in mathematics education.

I am offering a seminar/workshop for elementary teachers (K-6) called "Developing Mathematical Ideas." This course will help teachers to:

1. think through the major ideas of K-6 mathematics,

2. examine how children develop these ideas,
3. determine what constitutes a teaching practice that supports children's development into powerful mathematical thinkers, and
4. understand what effective student-centered instruction looks and feels like in the classroom.

Two critical components of any effort to improve student performance in mathematics are: 1) to strengthen teachers' understanding of the mathematics they are being asked to teach, and 2) to modify or improve the effectiveness of teaching practices.

This seminar/workshop supports teachers in both of these areas.

I AM GUARANTEEING EACH ELEMENTARY BUILDING ONE SLOT IN THIS YEAR'S SEMINAR. This seminar may be a useful piece of support for those buildings considering a focus on mathematics. Some buildings may want this seminar for some or all of their teachers as a part of next year's implementation plan.

I am encouraging each building to find one teacher who will commit to this seminar. This teacher will be able to help your building determine if this kind of training would benefit more of your staff.

Since this seminar is consistent with the district's profile goals, the 3 profile-incentive days could be used to help pay for some of a teacher's time. Teachers can also earn 4 college credits.

A detailed description of the seminar is enclosed and is included at the end of this quickmail. A letter of invitation for teachers is also enclosed and included at the end of this quickmail.

*** IMPORTANT! ***

Timeline and Procedural Information:

* Send to me (Christopher Fraley) the name of a teacher for your guaranteed spot by SEPTEMBER 26th.

* If more than one teacher would like to participate, send me all their names. The one you list first will be given the guaranteed spot and the others will be put on a waiting list.

* On September 26th, I will open up the seminar to any interested teacher on a "first come, first serve" basis. Those teachers on the waiting list will be given first priority.

Please let me know if you have any questions. My phone number is xxx-xxx-xxxx.

Sincerely,

Christopher Fraley Staff Development

(At this point, I provided a description of the seminar.)

B) Reminder message with sharing of those who have committed

Hello,

Today (9/26) is the last day that I will be reserving a spot in the "Developing Mathematical Ideas" K-6 seminar for a teacher in your building. So far, we have representatives from 10 different buildings. If I do not hear from you today, I will assume that no teacher will be representing your building. This afternoon, I will be opening up the seminar for those teachers on the waiting list.

The following is the information that I sent to you last week (9/17) about this seminar/workshop.

C) Message to Staff Development personnel

Below are the dates for the Developing Mathematical Ideas Seminar/Workshop.

But first, please read the following carefully.

* As you know, one of our focus filters is "promoting building capacity by developing teacher leaders." Developing Mathematical Ideas will be a great opportunity for teachers who have potential for taking on some leadership in their buildings. I am particularly interested in recruiting teachers who could become future facilitators of this workshop.

** Please encourage teachers who you think, given an opportunity like this, could really increase the capacity of their building. Or give their names to me and I can give them a call.

I hope that each of you will be able to participate. I believe that this experience can be a powerful way for us to move math forward in our district. As you know, there is a strong interest in this area throughout the elementary buildings.

*** Lois has ok'd the offering of this course. So the time frame will be as follows:

First: A letter will be sent out to all principals by tomorrow morning. It will provide an overview of the seminar and explain that I am guaranteeing their building one spot if I receive the commitment of one of their teachers by September 25.

Second: On Sept 26, I will open it up to all teachers on a "first come" basis. It is IMPORTANT that I have the name of potential teachers prior to this time so that I can ensure that they have a place.

Third: If there are not enough teachers signed up by October 3rd, then I will open the workshop up to secondary teachers.

Please let me know if you have any suggestions for or concerns about this plan or the dates (see below).

The seminar will begin on October 20 and will meet the second and fourth Mondays of each month until February 9.

Please respond as soon as possible if you see any problems or if you have any concerns. I need to get this project rolling.

Thank you for your help and suggestions, Christopher

D) A letter of invitation to teachers

Dear Colleague,

I am excited to invite you to participate in a seminar/ workshop for K-6 teachers called "Developing Mathematical Ideas." This seminar will be an opportunity: 1) to explore the major ideas of K-6 mathematics, 2) to analyze how students' thinking about these ideas develop and change as they progress through the grade levels, and 3) to determine what constitutes a teaching practice that supports children's development into powerful mathematical thinkers.

The seminar is organized around a series of cases written by teachers in which they describe classroom events during the teaching of mathematics. These brief narratives capture both student dialogue and the teacher's analysis and questions. These cases are supported by videotapes of classroom sessions and student interviews as well as related research.

Participants in this seminar will discuss these cases and videotapes to better understand what students' thinking reveals about their understanding of mathematics and how their understandings can be used to inform teaching decisions.

These cases will be grouped under the topics of "Building a System of Tens" and "Making Meaning for Operations." Participants will consider ideas of the base ten number system from learning to count to operating with multi-digit numbers and working with decimals. They will also consider the strategies students use to solve problems in real contexts and the actions and situations that students use to model the four basic operations.

Seminar assignments will include reading cases and research articles as well as writing short papers. Participants will also be responsible for keeping a portfolio.

Each session will be held at the Resource Center from 4:15 to 7:15 PM. We will begin on October 20 and will meet on the second and fourth Monday of each month until February 9.

Participants may choose to earn 4 credits.

Cost : \$xx materials fee; \$xxx for 4 credits

You may register by sending me your name, school, and grade taught via e-mail.

Please let me know if you have any questions or if you would like a more complete description of the seminar.

Sincerely,

Christopher Fraley, Staff Development

(At this point, I enclosed a detailed description of the seminar.)

E) a Message for the commitment of participating teachers

Hello Everyone!

Welcome to the Developing Mathematical Ideas Seminar. You or your principal sent your name to me and I am happy to inform you that you made it into the seminar. I look forward to meeting each one of you on October 20th.

You should receive the seminar casebook and your first assignment (a short one) by October 15. A materials fee of \$xx will be due at our first meeting and you may sign up for credits at that time.

It is very important that you are able to come to each seminar session and that you complete each assignment. Each session builds on the previous one. Your participation in the activities, the assignments, and the discussions will impact the quality of our experience.

Since there are teachers on a waiting list who would like participate, please review the seminar summary below. If you decide that you are unable to participate, please let me know by Thursday afternoon (October 2). If I do not hear from you by then, I will assume that you are fully committed to this seminar.

I believe that you will find this seminar to be a great experience.

Let me know if you have any questions or comments.

Christopher

(At this point, I again provide them a detailed summary of the seminar.)

F) A recruitment up-date for administrators (to keep them informed and "on board").

The participant roster for the Developing Mathematical Ideas seminar has been finalized. There are 36 teachers and one principal participating. These teachers represent 19 different elementary buildings as well as every grade level K through 6.

One of my goals for this year is to determine if this kind of training should become one of the resources that buildings can use to more effectively implement the mathematics portion of the framework.

Below is the information I sent out to principals regarding the seminar. I sent this to you earlier in the year, so you do not need to read it unless you want to refresh your understanding of what this seminar is about.

If anyone made it this far, you deserve an award. I hope you may find something of use in this.

Christopher

Adapting Developing Mathematical Ideas (DMI) for an Undergraduate Course

SummerMath for Teachers (SMT) has offered semester-long Developing Mathematical Ideas (DMI) seminars at Mount Holyoke College since the spring of 1997. In order to support the development of both pre-service and inservice teachers, some years the seminars enroll a mix of undergraduates and practicing teachers. The DMI classes follow the typical undergraduate schedule, meeting once each week for three hours for a semester. Even though DMI was originally designed for practicing teachers using 8 three-hour sessions, the SMT undergraduate course follows the DMI curriculum closely, modifying the timing suggested in the agendas but not the activities themselves.

In the years when the seminars include teachers, undergraduates are paired with one of the practicing teachers to provide access to classrooms for the portfolio assignments that involve analyzing student thinking, recording classroom discourse, or interviewing elementary and middle school students.

Each semester the undergraduates who enroll are of varied backgrounds and interests. Some have plans to become elementary or middle school teachers, some are interested in teaching high school math or science, some have a general interest in the field of education or special education, and some are interested in exploring mathematics for themselves. While most of the graduate students are practicing teachers with K-8 classrooms, coaches and principals have also participated.

Through their DMI experience, the undergraduates develop a sense of mathematics as a logically interconnected body of ideas to be explored; learn to view learning as a process of concept construction and refinement of ideas; learn to listen to, follow, and analyze children's thinking, and develop a stance of inquiry toward learning and teaching. An additional outcome is a changed view of teaching; the undergraduates begin to speak of teaching as a thinking profession, a view they admit is new to them.

Developing Mathematical Ideas courses are now a regular offering of the Department of Psychology and Education and the Department of Mathematics and Statistics at Mount Holyoke College, and serve to satisfy part of the certification requirement in the state of Massachusetts.

Excerpts from end-of-seminar portfolio reviews illustrate how seminar participants' ideas developed over the course of a semester. One undergraduate student wrote about the connections she saw between the Developing Mathematical Ideas seminar and an abstract algebra course:

Experiencing representations of the basic operations and representational proofs of their important properties at the same time as defining abstract algebraic operations, properties, and structures has especially helped me to see and understand algebraic foundations. Having both classes (Making Meaning for Operations/Reasoning Algebraic Operations and abstract algebra in the Math Department) at the same time enabled me to see the

interconnectedness of mathematics throughout its many levels as well as to identify important algebraic ideas that can be taught and discussed even in early elementary school. Helping students from the very beginning to think about generalizations and applicability will not only build the foundations for their future math work, but will also be beneficial to them in a wide variety of situations in terms of the logical thinking skills they develop.

Others portfolio reflections were about evolving as mathematical thinkers and about the process of teaching and learning:

About Becoming a Mathematical Thinker

The most profound way in which my ideas [about mathematics] have changed, perhaps evolved is a better word, is that I began to really understand it.

I am a mathematician. Who knew? ...and given that discovery, I know that everyone can be a mathematician.

I knew immediately after our introductory session that the way I viewed the mathematical skills I had and how I used them would be tested with every class I attended. I also began to discover through both the readings and the discussions held in class, improved ways to approach a problem and an idea. I was beginning to think in ways I never had before, and it was fascinating.

About Teaching and Learning

Throughout this semester, we, the class, have learned to test our limits both together and individually, to debate things that we have read and studied, and to delve into the stories of the children and teachers that we read about and take away the vital lessons that are discussed.

Because of these class conditions, I have received the opportunity to change, and I truly feel like I have grown in many ways not just as a learner but as a teacher as well over these past three months. This class has shown me that there is so much more to basic mathematics than just rules and applications.

I now understand and respect the amount of effort, patience and most importantly passion teachers must have about teaching to be effective. I am grateful to have learned this from our class because it was unexpected, but above all it brought a new awareness and respect for teaching and teachers.

Using Developing Mathematical Ideas (DMI) to Integrate the Teaching of Math and Science

Since 2003, with support from two Howard Hughes Medical Institute grants, SummerMath for Teachers at Mount Holyoke College has been offering two-week summer programs focusing on strengthening the connections between math and science teaching and considering both mathematics and science as inquiry-based.

These programs help teachers develop instructional methods in which doing mathematics and science is presented as a process of describing and predicting patterns, then testing and revising hypotheses, rather than as a matter of applying rules to arrive at specific answers.

Each summer, the program is based on pairing one of the Developing Mathematical Ideas modules and one of the Foss Science Kits. We have successfully integrated the following math/science combinations:

Developing Mathematical Ideas	Foss Science Kits
Working with Data	Variables
Examining Features of Shape	Levers and Pulleys
Measuring Space in One, Two, and Three Dimensions	Measurement

Teachers who participate in the summer institutes also attend three day-long workshops, where they continue to engage in exploring mathematics and science, share their classroom experiences implementing the new lessons, get feedback from colleagues and SMT staff, and assess the impact of inquiry-based explorations on their students' learning.

The following quotes from participating teachers' evaluations indicate the importance of increasing one's content knowledge and experiencing this learning in an environment that both values and challenges one's ideas:

The format and design [of the summer institute] challenged me to look at teaching and learning differently—both my own learning and that of my students. The math activities forced me to understand what students understand. This calls for my own understanding of the content at a deeper level. The discovery and exploratory aspect of the science activities was pivotal in deepening my understanding of the content and honed my problem-solving skills.

This institute gave me the opportunity to actually stop and think about teaching and learning and experience learning in an inquiry-supported environment.

Some comments indicate how the summer institutes have an impact on participants' ideas about teaching and learning:

I will be modifying my questioning [and] allow for more discussion and exploration.

I have really had an opportunity to think about what is important in the classroom and what I want to do to create an environment for more, deeper student learning and understanding.

[My] learning is in the nature of my instruction. You may now observe more discovery learning, good questions, inquiry based learning, and problems with more than one right answer.