PRE-EDUCATION PROGRAMS:

A COMPREHENSIVE PROJECT AT

HENRY FORD COMMUNITY COLLEGE

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This presentation will give a broad overview of a four year project at Henry Ford Community College in Dearborn, Michigan. The presenters will :

- give a summary of the development of the Pre-Education Programs
- review the development of the three course mathematics sequence for pre-service elementary teachers
- summarize two collaborative projects with neighboring universities
- discuss the impact the program has had on the college and the community.

Because there is no mandated curriculum in Michigan, university teacher preparation programs are somewhat diverse. In order to best serve the needs of students, the College needed to create programs that would allow students to transfer course work as program requirements to university education programs. There were three principle components to the program development at HFCC: research, program structure, and course development.

In terms of research, the Pre-Education Committee, consisting of faculty, counselors, and administrators from HFCC and the Dean of the School of Education at the University of Michigan-Dearborn, examined education programs at several 4-year institutions in the state. We also circulated a survey of K - 12 school districts regarding the educational needs of education paraprofessionals. Based on our research, we saw that some school districts wanted a 32 credit certificate program, while others preferred a 60 credit Associate Degree.

To meet the needs of both situations, a career ladder approach was taken. A 32 credit Education Paraprofessional program providing fundamental content and interactional courses is the first step. This program can be terminal or it can lay the foundation for the 60 credit Associate Degree in Pre-Elementary Education. Students can then apply the Associate Degree to a Bachelor's Degree in Elementary Education. In addition to the programs that service paraprofessionals and prospective elementary teachers, the College developed Pre-Secondary and Pre-Special Education Programs.

During our research, we discovered that new courses were needed to service the teacher preparation programs. Consequently, *Assisting with Elementary Reading, Children's Literature, Instructional Technology for Elementary Teachers, and Introduction to the Humanities* were developed. Upon examining our curriculum, we discovered that the College had an *Educational Psychology* course. However, the course had only been offered once because universities would not accept the course for transfer. After close work with the University of Michigan-Dearborn, the course was modified and is now transferable to UM-D and other universities.

Mathematics Strand meetings during MSSI conferences confirmed our suspicion that the Mathematics for Elementary Teachers course sequence needed revision. With the major shift in K-8 curriculum, implementation of the NCTM Standards, and changes in pedagogy, this revision needed to be done with great care. Therefore, as with the other elements of the program, the redesign of the Mathematics for Elementary Teachers (MET) courses began with a team of instructors doing extensive research, which included several sets of K - 8 test books, the state guidelines for mathematics curriculum, university course syllabi, the NCTM Standards, and the Michigan Test for Teacher Certification (Basic Skills Test). Additionally, the team had discussions with counterparts at four-year institutions about their goals for their courses and with inservice teachers about how these courses should service the prospective teacher. Based on the research and discussion, the committee decided that a three course sequence of three-credit courses was the most appropriate way to serve our students. This decision was influenced by considerations of how the courses would transfer to four-year institution in the state, but more importantly by how students could best be exposed to necessary content. The committee wanted to ensure that students not only had the opportunity to master the content, but also to be exposed to it in a manner in keeping with the Standards and in a manner that modeled good teaching and learning practices.

The content was divided into three primary areas, and so into the three courses. *Mathematics for Elementary Teachers I* begins with a treatment of problem solving. Utilizing Polya's problem solving process, students consider problems individually and in small groups. Students begin to focus on their thought process and consider how they arrived at a solution as well as the solution itself. Students are asked to explain their processes and solutions to each other in small groups and to the class as a whole. They are also required to express their solutions in writing. Some of the problems considered have clean, closed solutions, while others are more open-ended and different solutions are possible, in part depending on assumptions made by the student(s).

As students begin to be conscious of their thinking and how to explain themselves, the course moves to the foundational topics of set theory and logic. These topics provide the background knowledge for the development of later topics, such as models of whole number addition. Also, they expose the student to the formal structure of mathematics as an axiomatic system. While not going into the depth of an entire formal course in either of the topics, the course gives students a sense of the underlying structure and unity of mathematics.

Once the foundations have been laid, the course moves into a treatment of numeration systems. Students investigate numeration systems in general, looking at place-value and bases. An example of an activity that students do in the course, relates to this topic. Students design and develop their own numeration system with guidance from an adapted version of "Alphabitia" from the Bassarear textbook. The activity suggests a base five system, but students are encouraged to be creative as they work in small groups. Each group must submit a written description of their system, including an evaluation of its strengths and weaknesses. In addition, each group must present its system to the rest of the class and answer any questions posed. As students deal with numeration systems other than the base ten place-value system with which they are familiar, they gain an appreciation for the difficulty and questions children experience.

Attention then turns to focusing on the whole number, the integer and the rational number systems. Models of the operations in each system are discussed and studied. Where applicable, students use manipulatives to see for themselves how and why the models work, and to gain an introduction to the use of manipulatives in the classroom. Set theory is used to introduce the set models of whole number operations, and then the whole number models are used to build some of the integer models. Students again see that in the structure of mathematics, new ideas build on previous ideas. In addition to the models of the operations, students investigate properties of the number systems and elementary number theory. Manipulatives add to the understanding of, for example, the commutative property of integer addition.

The course concludes with an understanding of fractions and the rational numbers and the operations of addition and subtraction in this system.

Mathematics for Elementary Teachers II begins with a review of the rational numbers and concludes the treatment of them by studying the operations of multiplication and division. The real number system, with decimals and irrational numbers is then considered to conclude the study of number systems. Knowledge about numbers and arithmetic is then generalized to a study of algebra. This treatment, which provides students with a review of high school level algebra, includes a focus on linear functions and equations. To increase their familiarity with linear functions, and as a preview of data analysis, students spend time fitting lines to data. Some data is collected by students, and they learn how to decide if data is approximately linear. Various methods of line fitting are investigated beginning with the "eye-ball" method of finding a line of best fit, to an elementary level discussion of linear regression. This provides a nontrivial way to review algebra as well as learn some applications of mathematics.

The course then turns to geometry. For many students, this is their first formal exposure to the subject. In the introductory material, there are many definitions. In place of lecture, small groups of students research the definition of a given set of terms and topics. Each group then presents their information to the rest of the class. This again encourages students to be clear in their understanding and clear in their explanation. "Geometers Sketchpad" and "LOGO" are also utilized to help students study geometry in a dynamic and constructive way. Following the basics of plane and solid geometry, the course concludes with a study of geometric constructions using straightedge and compass, and the similarity of triangles.

Mathematics for Elementary Teachers III completes the study of geometry and introduces probability and statistics. Ideas of measurement, including linear measure, area and volume are studied, as well as different systems of measurement. Students use geoboards, volume models and other hands-on activities to study these topics and derive measurement formulas. To study probability, students perform various experiments and compute probabilities from them. Then these experimental probabilities are compared to the anticipated theoretical probabilities. Discussions of these comparisons not only add to students' understanding of probability, but also continue to engage students in communication and proper use of mathematical language. The hands-on approach continues as the course turns to a study of data analysis. Instead of only using data taken out of a text or arbitrarily generated, students actively collect their own real-world data. This data is then examined using graphs, stem-and-leaf plots, and histograms, for example.

Measures of central tendency and measures of dispersion are studied by having students apply the concepts to the data they collected. Also, students are introduced to the limitations and potential abuses of statistics. Transformational geometry and tessellations of the plane are also discussed and investigated. Recently, a major part of this study has come through looking at multicultural mathematics. For example, students have studied art at the Detroit African-American History Museum and investigated the application of transformational geometry to the art. This is one example of a project that has developed from collaboration between HFCC and Eastern Michigan University.

Dr. Joanne Caniglia of Eastern Michigan University was awarded an Eisenhower Grant in 1997. This grant funded a project focused on Multicultural Mathematics. Mathematics Methods students from EMU, MET students from HFCC, fourth and fifth graders from three Detroit Public Schools, and instructors from the respective institutions participated in the grant activities.

Initially, all participants visited the African-American History Museum in Detroit. This field trip exposed the students to the African-American history and culture. Following this experience, the university and college students completed several mathematics activities collected by Dr. Caniglia and her colleagues. Finally, the prospective teachers participated in three activity days involving Detroit Public School children.

HFCC students benefitted from this project in several ways. The museum visit allowed them to see the transformational geometry we had studied. The work with the elementary school children applied the content of the MET course but more importantly provided the HFCC students the opportunity to interact and guide students in mathematics activities. The insights gained were important. Students noted the broad array of skill levels among the children and questioned why it occurred and how they could offset it. They saw nine year olds who had decided that they could not learn, and asked what could be done. They interacted with university students and saw themselves as capable and eager to enter the teaching field.

A second collaboration involves HFCC, the University of Michigan-Dearborn, and Detroit Public Schools. Funded by MSSI, this alliance focused on the recruitment of promising minority students to the career of teaching mathematics in urban schools.

The project consisted of two components: formation of a learning community and outreach to urban high school students. First, a community of learners from the University of Michigan-Dearborn and HFCC was formed. This group met weekly to discuss mathematics learning activities, and to examine some exemplary experiences in teaching mathematics in multicultural classrooms. After several weeks, the community visited Northern Model High School in Detroit. Northern's Young Educator Society students met with the UM-D/HFCC students to discuss the college experience and teacher preparation programs and to engage in innovative mathematics activities. The final meeting at Northern was a pizza party. The UM-D/HFCC liaison who mentors minority students at the campuses addressed the group and outlined the support available to those pursuing a teacher preparation program. Several elementary school children were present at the meeting and the UM-D/HFCC/Northern students guided the children in a data analysis activity.

For the UM-D/HFCC students, the benefits were many. These students:

- were exposed to current literature and experiences focused on teaching mathematics in an urban setting
- created a learning community that smoothed the transition of the HFCC students to UM-D
- experienced positive meetings with urban high school students.

Based on this work, UM-D has secured an Eisenhower grant to fund an expanded project that includes UM-D, HFCC, Dearborn Public Schools, and Detroit Public Schools. This initiative will have the UM-D/HFCC students attending seminars for several weeks, designing learning activities, and delivering these activities to middle school and high school students in Dearborn and Detroit. The seminars planned for this fall will focus on mathematics curriculum, teaching in an urban setting, and cooperative learning. Winter seminars will include speakers on multiple intelligences and cooperative learning. Learning activities will be developed by teams consisting of UM-D and HFCC students, will be previewed by middle and high school teachers and paraprofessionals , and will be delivered to the bilingual and urban school students.

With the programs in place and strong alliances developed, it was important to focus on the ultimate goal of the teacher preparation programs at Henry Ford, i.e., helping students make that transition. Articulating courses and programs to four-year institutions is important to this student transition to a university program. An articulation agreement is a document that insures transferability of the program to a four-year institution. This document consists of three parts: formal language, the community college program and how it transfers to the university, and the university course work that must be done to complete the Bachelor's Degree. The formal language ensures the transfer of the program. It also provides for an annual review of the agreement. Depending on the institution, it may also specify student services that will smooth the transition from the community college to the university.

Providing a program is an important beginning to the work we have done. Student success is being supported through a variety of initiatives: coordinated scheduling, Future Teachers' Association, and Partners Plus.

Providing support for the program, the Pre-Education Committee meets monthly maintaining the programs internally. An advisory committee consisting of faculty and administrators from neighboring universities and HFCC and representatives from K - 12 districts meet three times a year to make recommendations continuing to improve the quality of the programs.

A noticeable change has occurred among pre-education students at HFCC. The structured program provides students with a sense of security in their course selections. Students are estatic when they find that their HFCC course work transfers to university programs. Along with the efficiency of the program, the sense of community that develops among the students and faculty nurtures both.

As students notice the same faces moving from class to class, they form study groups. They often begin to socialize together, creating social and support groups.