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**NSF-ATE Grant
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Capturing the Next Step in 3D: From 3D Modeling to 3D Parametrics



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Principle Investigator**

Capturing the Next Step in 3D: From 3D Modeling to 3D Parametrics

#0202256

1st Year Project Summary 2002-2003

Moraine Valley Community College has updated its existing exemplary Mechanical and Design Drafting/CAD A.A.S. degree and three corresponding certificates by incorporating 3D Parametric Modeling skills into the curriculum.

Parametric modeling combines the power of three-dimensional modeling as an intuitive engineering design tool with the ability to manipulate and control the corresponding engineering drawings in an adaptive environment. This simplifies the design process, reduces the engineer's design cycle time, achieves better design visualization, more closely associates 2D and 3D drawings, and makes the design process easier to manage. Rapid prototyping is being incorporated into curriculum in order to provide faculty and students the opportunity produce a prototype, or model, of their designs.

The goals for the program are as follows:

Goal 1: Revise/update current Mechanical Design and Drafting A.A.S. degree and three Certificates to include 3D Parametric Modeling.

Goal 2: Build on existing partnerships with high schools and other community colleges to develop, pilot test and evaluate 3D Parametric Modeling courses.

Goal 3: Utilize E-Learning tools to incorporate Web-assisted instructional course resources.

Goal 4: Disseminate the Mechanical Design and Drafting A.A.S. degree and three Certificates to other educational institutions.

Goal 5: Develop and implement recruitment strategies to promote the revised programs to high school students – focusing on students currently underrepresented in Mechanical Design and Drafting/CAD courses.

Participants

The lead personnel for this project are: P.I. - J.C. Malitzke, Moraine Valley Community College, Co-P.I.'s - Chuck Bales, Rick Lapidus and Maria Vlamakis, Moraine Valley Community College and Mark O'Halleran, Park Industries.

The current **Advisory Committee** members include:

| Mechanical Design and Drafting/CAD Advisory Committee Members | | |
|--|--|---|
| William Ostrowski Electromotive Div. of General Motors | Herb Zimmerman Conveyors Plus, Inc. | Ron Badon Reliant Bolt |
| Michael Enright Wm. Wrigley, Jr. Company | | Brian Rusthoven Argonne National Laboratory |
| Jeff Sliepka Matocha Associates | Mark O'Halloran Park Industries | Lori Cesario-Farraj Argonne National Laboratory |
| Dave Sechrest Mid America Taping & Reeling | William Landgraf AK Specialty Vehicles | Dan Prokop Argonne National Laboratory |
| Ineke Sieverding Inekad Drafting and Design, Inc. | Kelly Ruffolo Hansen Technologies | Cathi Eby Thornel Associates, Inc. |

A **Content Development Team** has been established with three other community colleges and four high schools as well as industry professionals to fully develop, pilot test, evaluate and revise curriculum for three existing and two new courses in the Mechanical Design and Drafting/CAD A.A.S. degree. Each member of this partnership, the CDT, has participated in regularly-scheduled meetings and a summer 2002 curriculum development workshop for developing curriculum, pilot testing, evaluation, and revision activities. The PI and three Co-PIs from Moraine Valley will serve on the Content Development Team and ensure that the project goals and corresponding objectives are implemented.

The members of the CDT for 2002-2003 are:

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Activities and Findings 2003-2003

The first year of the grant produced many results. The Timeline document has been updated to reflect the current (May 1, 2002-May 1, 2003) results. (*See Attachment A*)

The Moraine Valley Community College Team continued working on the revisions to the Mechanical Design Drafting and CAD A.A.S degree, 3D CAD Certificate, Mechanical Design CAD Certificate and the Mechanical Design Drafting Certificate during spring 2002. The Illinois Community College Board approved these revisions in the late spring 2002, and classes were added to the fall 2002 schedule. Also, the team revised or created new syllabi and outlines for five courses: MDT160, MDT 278, MDT285, MDT 288 and MDT289. During the 2002-2003 school year, at least one section of MDT 160, MDT 278, MDT 285 and MDT 288 ran. MDT 289 is not run during the school year. Offering and running these classes during the first year of the grant allowed the Moraine Valley team to focus on the vision and direction of each course. Results indicate that the current syllabi and outlines need to be revised during the next two years. Curriculum content becomes the main focus for the remainder of the grant timeline.

The Content Development Team (CDT) was established to address curriculum issues. Meetings were held during the school year. Summer 2002 workshop days were also scheduled. (Additional summer workshops have been schedule for the summer of 2003, 2004 and possibly 2005 if needed). (*See Attachment B*)

This summer 2002 workshop was conducted in order to develop course content for the new courses created as part of the proposed NSF project. Numerous tutorials, chapter information, test questions, etc were developed. Continuation of this development will be conducted for the summers of 2003 and 2004. (The summer of 2005 may be needed for final reviews.)

The courses are:

MDT 185: *Introduction to Parametric Modeling*

MDT 278: *Design Visualization*

MDT 283: *Applied 3D Parametric Modeling*

MDT 284: *3D Parametric Assemblies*

MDT 289: *Special Projects in 3D Parametric Modeling*

The principal investigators and co-principal investigators have developed the following specifications for each course:

- Course information and identification:
 - course title
 - course number
 - credit hours
 - contact hours (total hours, lecture hours, and lab hours)
 - description
 - course textbook and additional reference material
 - prerequisites and corequisites
- Course end-competencies
- Course topics
- Course schedule based on 17-week semester
- Outline of instructional content including number and type of assignments, number and type of tests and quizzes, and organization of course.
- Course assignments assigned from the course textbook.
- Instructor lead, web based and blended learning solutions for delivery methods, etc.

The CDT will be responsible for

- Developing course content materials for each individual course topic.
- Creating, evaluating, and testing tutorials for individual course topics. The tutorials will be scripted for traditional lecture-type and web-based, online delivery.
- Creating, evaluating, and testing tests and quizzes. This includes generating a sufficient number of questions/problems for creating a test bank. The tests and quizzes will be used for both the web-based and traditional classroom.
- Evaluating the overall course for completeness and clarity.
- Learning, understanding, and applying Blackboard online course development.

The summer 2002/2003/2004 workshops with the CDT will follow the agenda described below:

- Learn how to use 3D parametric modeling software. The learning will be based on the major topics of the individual courses to be developed.

- Break into small groups (three to four members each) to create tutorials and course content materials for software concepts or topics. Each group will be assigned individual projects. After completion, the groups will exchange their assigned work with other groups for evaluation and testing. Finally, the course content and tutorials will be returned and, if necessary, revisions will be made and the tutorials finalized.
- Break into small groups (three to four members each) to develop quiz and test questions for a given set of topics. After completion, the groups will exchange questions so that they can be evaluated and revised, if necessary.
- Setting up an online class using Blackboard.

Summer Teacher Training Workshops

Working with Autodesk, Inc. it was decided to hold an additional technical workshop for teachers under the auspices of Autodesk for the purpose of Teacher Training. (Workshops are scheduled for the summer of 2003 and 2004 using developed curriculum that was developed by the Content Development Team.) (For the summer of 2005, workshops on the curriculum will also be conducted for the final assessment of the program.) Five technical workshops were held during the summer of 2002. Brochures, emails and a presentation to the Illinois Drafting Educators Association were given to promote the summer workshops. Course outlines were created for the workshops. (*See Attachment C*).

CPDU credits were given to all high school or college instructors who signed in each day of the workshop.

Various textbook publishers gave out free textbooks to all participants in some of the workshop sessions.

Autodesk, Inc. gave a free package of the corresponding software to each instructor for attending a workshop. Autodesk donated a total of 78 copies of AutoCAD, Autodesk VIZ and Autodesk Inventor Series software.

An evaluation form was developed by Dr. Bruce Ganseder, Ph.D. the projects external evaluator from the University of Virginia to evaluate each workshop. (*See Attachment D* for the evaluation tools.)

The results comparison of the five 2002 Summer Workshops at Moraine Valley Community College was conducted by Dr. Ganseder. (*See Attachment E*)

Impact from Summer 2002 workshops

A survey was sent to all participating instructors that attended the summer 2002 workshops. The survey was designed to acquire information as to the impact of the training the instructors received in four of the workshops. (AutoCAD Update, Autodesk Inventor, Autodesk VIZ and 3D Modeling and Rendering). The survey requested information on the number of sections taught, number of students attending classes and male to female percentages, at the various high schools and colleges based on similar classes at their schools. (*See Attachment F*) This information will be gathered over a three year period with a final total report listing the total impact over the grants timeline.

- A total of 78 teachers from both high schools and colleges attended the four classes in the summer of 2002.
- From that total, 30 teachers were from a college and 48 were from a high school.
- Of the 78 that attended the four classes, 39 returned the survey.

- Of the 39 who returned the survey, 14 were college instructors and 25 were high school instructors.
- Of the college instructors, 14 taught AutoCAD, 9 taught 3D Modeling and Rendering, 6 taught inventor and 1 taught VIZ.
- Of the high school instructors, 21 taught AutoCAD, 16 taught 3D Modeling and Rendering, 15 taught inventor and 15 taught VIZ.
- At the colleges, , 81% male to 19% female students took AutoCAD, 79% male to 21% female students took 3D Modeling and Rendering, 80% male to 20% female students took Inventor and none VIZ.
- At the high schools, , 85% male to 15% female students took AutoCAD, 86% male to 14% female students took 3D Modeling and Rendering, 83% male to 17% female students took Inventor and 91% male to 9% female took VIZ.
- For the colleges, the number of sections during the 2002-2003 school year for AutoCAD was 37, for 3D Modeling and Rendering was 16, Autodesk Inventor was 11 and for Autodesk VIZ was 1.
- The total number of students taught at the colleges was: 508 AutoCAD students, 202 3D Modeling and Rendering students, 121 Autodesk Inventor students and 20 VIZ students.
- For the high schools, the number of section offered during the 2002-2003 school year for 3D Modeling and Rendering was 27, Autodesk Inventor was 30 and for Autodesk VIZ was 15.
- The total number of students taught at the high schools was: 1737 AutoCAD students, 501 3D Modeling and Rendering students, 523 Autodesk Inventor students and 302 VIZ students.

Career Outreach-Mechanical Drafting Design and CAD

The Principal Investigator and Co-Principle Investigators promoted the grant and the enhanced degree and certificates college wide at Moraine Valley. The following are the dissemination, recruitment and awareness sessions conducted this past year.

Dissemination/Recruitment/Awareness Activates 2002-2003

During the 2002-2003 year, efforts in recruitment, The Women in Technology Program, and other dissemination/awareness activities for the grant and the program were conducted.

High School Outreach Program

- | | |
|-------------|--|
| September 5 | Presented at MACS Regional Directors Meeting 20 people approximately were in attendance. |
| October 16 | Recruited prospective students at Reavis High School Approximately 35 students and their counselors attended. |
| October 17 | Presented at the high school articulation meeting |

- Approximately 30 high school instructors and some administrators were in attendance.
- November 12 Recruited prospective female students at Shepard High School
11 female students and their counselors attended
- February 19 Initiated recruitment activities with Marist High School
Targeted the “first time ever” female student population.
- March 7 Promoted the MDT programs at the IDEA competition
Presented to 12 instructors and approximately 121 students from 9 different high schools.
- March 12 Initiated recruitment activities with Queen of Peace High School
Distributed informational material to approximately 50 female students.
- March 27 Attended the Richards High School career/college fair
Distributed informational material to approximately 45 students and their counselors.
- April 8 Attended the MVCC Parents’ Night
Distributed information material to prospective students and their parents.

Mentoring Activities Targeting the Under-represented Student Population

- September 17 Established the Big Sister Peer-Mentoring Program
Nine (9) students and three (3) industry professionals/mentors joined. Five (5) big sister-little sister groups were formed.
- October 11 Held the first Peer Mentoring Group dinner-meeting
Eight (8) student members, two (2) industry professionals and three (3) MVCC faculty/staff members attended the meeting.
- December 17 Held the second Peer Mentoring Group dinner-meeting
Five (5) student members, four (4) industry professionals and three (3) MVCC faculty/staff members attended the meeting.
- January 21-31 Recruited members for the Big Sister Peer-Mentoring Program
Twelve (12) students and six (6) industry professionals/mentors joined.
Eight (8) big sister-little sister groups were formed.

MORAIN VALLEY COMMUNITY COLLEGE
NATIONAL SCIENCE FOUNDATION GRANT

Women in Mechanical Design Technology

Join the Big Sister Peer- Mentoring Program

Contact: Maria Vlamakis, Assistant Professor
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Partial Support for this work was provided by the National Science Foundation's Advanced Technological Education Program under Award No. 0202256

- February 26 Met with MVCC advisors and counselors
Updated them on the status of the Big Sister Peer-Mentoring program.
- March 7 Held the Spring-2003 Peer-Mentoring dinner meeting
Seven student members, four corporate mentors and two MVCC
faculty/staff attended the meeting.
- April 22 Finalized "Ask a Student/Mentor" web page
The page was finalized and published on the web.
<http://www.morainevalley.edu/CAD/nsfmentors.htm>
Six (6) students and five (5) five mentors joined.
- Overall Impact of Mentoring Activities: 16 students and 5 corporate mentors joined

Dissemination Activities

- September 2002 2,500 new program brochures were created outlining the degree and certificates using the NSF logo were created. These brochures were distributed to all attendees at all activities.
- November 2002 Presented to the Illinois Drafting Educators Association Conference. The presentation included, the grant, scope of work for the grant and the summer teacher training workshops.

Web Site Established

The CAD Program web page was created with the NSF logo displayed at: <http://www.morainevalley.edu>.

Assessment Survey for outreach/recruitment sessions.

A survey has handed out for many of the outreach/recruitment sessions. High school students were asked to answer the questions to give us feedback. (*See Attachment G*). Results will be tabulated for the next three years.

New Brochure for Program and Press Releases

A new brochure was created for the program and press releases were also issued.

(*See Attachment H*)

Budget Status

A restricted purposes account was established to allow for close monitoring of the grant budget. During Year One, the project coordinator, Sandy Rizzo worked with the resource development and accounting offices to administer the budget. The first year budget was under spent for a variety of reasons. All of the travel money allocated for the external evaluator, Dr. Gansneder's was not used. Mr. Malitzke met with Dr. Gansneder at the University of Virginia in October when after Mr. Malitzke attended the ATE PI Meeting in Washington D.C. Dr. Gansneder will be meeting with Mr. Malitzke during the year two of the project at Moraine Valley. Also, the server for on-line activities and project dissemination will be purchased during year two of the project. Consultant costs were also under spent. Use of consultants will accelerate as the need for more assistance in curriculum development increases. The budget breakdown for Year One of the Project is Attached – I.)

Summary of the first year

The NSF grant project team has spent many hours and faced many challenges during the first year. The main focus for the first year was to initiate the project, have the new and revised courses approved, have the revised degree and certificates approved, select a content development team, initiate curriculum development, initiate dissemination/recruitment/awareness activities, initiate evaluation activities, meet project timelines, complete deliverables and provide feedback. In many areas of the grant we exceeded the first year's expectations.