

INSTITUTIONAL ENVIRONMENT

1. Technology vision (150 words maximum)

In keeping with its mission to nurture students in accomplishing their educational goals, Saint Mary-of-the-Woods College (SMWC) has always welcomed and incorporated emerging technologies for sustaining academic excellence. Supported by an efficient IT infrastructure and rich technology resources, our instructors are able to explore and implement innovative approaches in teaching. With small classes, our students learn in a highly interactive environment in technology-enabled classrooms, some of which are enhanced with powerful classroom management systems. The wirelessly-interlinked campus facilitates students to tap into the benefits of mobile technology from any location.

The technology visions of our academic departments truly echo that of the College. For example, the Sciences and Mathematics Department has several HP Laptop computers for student use in classes/laboratories. In chemistry courses, interactive virtual instruments developed by the Principal Investigator, structure drawing/modeling/visualization tools, novel computer-based experiments incorporating data-acquisition interfaces/sensors, and inquiry-based instruction provide students with a stimulating learning environment.

PROJECT DETAILS

2. Project name

Enhanced Learning Experience Via Advanced Tablet-PC Environment (*ELEVATE*) - Using HP Tablet PCs in Instruction at Saint Mary-of-the-Woods College

3. Project executive summary (200 words maximum)

ELEVATE envisions a strategic redesign of undergraduate courses by integrating HP TabletPC technology in instruction, in order to elevate female students' learning outcomes to unprecedented levels. In this project, three faculty members will redesign three courses – General Chemistry (two semesters), Calculus (two semesters), and Business Finance.

The Project will focus on two aspects of the classroom environment that are conducive for female students' unique learning needs: (1) providing an interactive and collaborative learning

atmosphere and (2) incorporating critical-thinking and problem-solving skills to enable them to succeed in math-intensive courses.

For Aspect 1, a classroom management system (e.g., *SynchronEyes*, *DyKnow*) will be installed in a technology-enabled classroom; the system will facilitate both teacher-student and student-student interaction, thus creating a highly dynamic and supportive learning environment for students.

For Aspect 2, both instructors and students will fully utilize the digital-inking capability of Tablet PCs. Students will take class notes, prepare digital flash-cards, annotate reading materials, perform mathematical calculations and graphing, draw/model/visualize chemical structures, and analyze lab data. Instructors will annotate lectures, illustrate concepts with virtual simulations/animations, synchronously record lectures that students can 'replay' on demand, and digitally grade quizzes/exams/papers.

ELEVATE will impact hundreds of students by providing an experiential learning environment.

4. Focus on learning (300 words maximum)

Saint Mary-of-the-Woods College, the first Catholic liberal arts college for women in the US, has strived since its inception in 1840 to nurture women in accomplishing their educational goals. About 65 percent of its students come from rural settings, and about 55 percent are first-generation college students.

Research has shown that, to be successful in quantitative fields, women have unique learning needs. Step-by-step solutions and graphical illustrations along with discussion of quantitative concepts are the key components that allow them to persist and succeed in mathematics and science courses (National Research Council, 1989; Baker & Jones, 1993; Strand & Mayfield, 2002, King, 2005). For example, chemical concepts being highly quantitative, complex, and cryptic, some students find chemistry courses (e.g., General Chemistry) daunting under a traditional classroom scenario, and whenever possible, try to avoid/postpone taking those courses (The Principal Investigator has attempted to address this problem through a multifaceted remedial approach – guided inquiry-based learning, interactive modules and virtual instruments, and novel computer-based experiments). Similar math phobia among female students is noticed in other quantitative courses as well – Mathematics (e.g., Calculus) and Business (e.g., Business Finance). This problem has a seriously adverse effect on enrollment, retention, and student performance/success in such programs.

We are confident that by integrating HP Tablet-PC technology in instruction and by pedagogically redesigning our courses, we will be able to promote critical thinking and problem solving skills in our students (campus students are all women) and thus alleviate the

aforementioned barrier significantly. Students will experience a dynamic and collaborative atmosphere in the classroom that is conducive to successful learning, as mentioned under “Project Executive Summary”. The implementation of this project will symbiotically tie in with SMWC’s mission to enable women to become critical thinkers, successful learners, effective communicators, and efficient leaders in an increasingly complex world.

5. Goals, objectives and outcomes (500 words maximum)

ELEVATE has four interrelated goals/objectives.

Goal 1: Utilize HP Tablet PCs and an appropriate classroom management system (CMS) to create a highly collaborative learning/teaching environment for students/instructors.

Goal 2: Enable female students to overcome their phobia toward quantitative subjects (e.g., mathematics, chemistry, business) with the aid of the digital inking/graphing capabilities of HP Tablet PCs.

Goal 3: Enhance student learning outcome and satisfaction with the aid of HP Tablet PCs and appropriate software.

Goal 4: Enhance faculty teaching effectiveness and satisfaction using HP Tablet PCs and appropriate software.

The project team, in collaboration with the SMWC Assessment Committee, will develop criteria to evaluate each goal objectively, including the Fennema-Sherman Attitude Inventory. Assessments will be performed using PHP Surveyor, and the results will be used to further refine the courses.

Assessment of Goal 1:

Question to students: How effective were the HP Tablet PCs and CMS in facilitating a collaborative learning environment?

Data collection protocol: Student surveys, focus groups

Frequency: Beginning, middle, end of each semester of years 1 and 2 (The initial survey (semester 1, year 1) will be to determine students’ familiarity with Tablet PCs, to help developing training protocols)

Comments: Ask students about the impact of these technologies on their collaborative learning experience.

Question to faculty: How well did the HP Tablet PCs and CMS provide an effective collaborative environment?

Data collection protocol: Instructor interviews

Frequency: Middle and end of each semester of years 1 and 2.

Comments: Ask instructors how this technology impacted their teaching, and to compare their experience in the redesigned courses with courses before the redesign.

Assessment of Goal 2:

Question: How effective were the digital inking capabilities of HP Tablet PCs and software (e.g., *MicrosoftMath*, *MathJournal*) in helping students overcome their math phobia? What specific inking capability(ies) did the students find the most useful?

Data collection protocol: Student surveys

Frequency: Three times each semester of years 1 and 2

Comments: Ask students how this technology helped them in visualizing abstract quantitative concepts and comprehending the underlying principles.

Assessment of Goal 3:

Question: Were the students satisfied with their learning experience through this project?

Data collection protocol: Student surveys

Frequency: Middle and end of each semester of years 1 and 2

Comments: Ask students to objectively compare their satisfaction with the redesigned courses, versus traditional courses that did not use HP Tablet PCs. What are the pros and cons of Tablet PC technology in education? Did the technology hone their critical thinking and problem solving skills?

Assessment of Goal 4:

Question: Were the faculty satisfied with the technology and did HP Tablet PCs (along with course-specific software) help them realize high teaching standards?

Data collection protocol: Faculty interviews, focus groups.

Frequency: Each semester of years 1 and 2

Comments: Ask instructors about their satisfaction with student performance in their redesigned courses. Did the HP Tablet PC-enabled software applications help students visualize/understand complex concepts more efficiently? Did the technology meet the pedagogical and teaching objectives of faculty? Did the inking technology enhance their teaching effectiveness?

6. Technology integration (400 words maximum)

Collaborative Learning Environment:

HP Tablet PCs, in conjunction with a Classroom Management System (CMS, e.g., *SynchronEyes*, *DyKnow*) will create a collaborative learning atmosphere in classes. Our redesigned courses will incorporate active-learning exercises and modules that will keep students engaged and thus promote critical thinking and problem solving skills in them. The CMS will facilitate teacher-student and student-student interaction. Instructors will be able to monitor students' progress in classroom activities in real time, provide quick feedback, and facilitate the learning process. They will be able to identify concepts/topics where students struggle and accordingly customize their instruction to students' specific needs. Also, the CMS has the ability to display students' Tablet PC screens on the main classroom-screen, and thus convert the latter into a shared workspace, promoting an excellent collaborative learning environment.

Our instructors strive to provide a supportive learning atmosphere to students. For example, the PI is currently using the Process Oriented Guided Inquiry Learning (*POGIL*) method in his classes, and students are finding the method very effective. He has created interactive modules/animations/virtual instruments (*LabVIEW/National Instruments*) which serve as effective teaching/learning aids. He has developed several experiments that incorporate data-acquisition interfaces/sensors (*Vernier Technology*) in the laboratory. We are confident that HP Tablet PCs will enhance the efficacy of such efforts of our instructors to even higher levels.

Digital Inking:

We are positive that the digital inking capability of HP Tablet PCs will also have a profound impact on both students and instructors. *Windows Journal*, for example, will improve students' note-taking skills, and thus their learning outcome. Some applications will help students to visualize, model, and interpret difficult concepts (e.g., *Microsoft Math* or *MathJournal*, for graphing; *Chempad* or *Chemsketch*, for chemical structure drawing/visualization). We believe that this will help our students overcome their phobia toward quantitative subjects, and consequently improve their enrollment, retention, and success in such courses.

Instructors will also benefit from the digital inking technology. They will have permanent digital records of their classroom instruction (unlike chalkboards, where the writing is permanently lost when erased); they will also be able to superimpose audio records of their lectures using appropriate software (e.g., *Camtasia*, *Audacity*, *Lectora*). These digital lectures can be replayed "on demand"; students will find this feature extremely beneficial. Instructors will exploit this unique feature in distance-education courses as well, thus ELEVATE will benefit those students too. Instructors will also use digital inking for making annotations while grading quizzes/tests/papers.

7. Project timeline (200 words maximum)

First summer (2008)

Install a suitable Classroom Management System (e.g., *SynchronEyes*, *DyKnow*) on the HP Tablet PCs. With the support of our IT personnel, develop the classroom hardware/software infrastructure.

Install course-specific software (e.g., *ChemPad*, *Chemsketch*, *LabVIEW Run-Time*, *LoggerPro*, *Microsoft Math*, *MathJournal*)

In collaboration with the Assessment Committee, develop criteria to assess student learning and faculty satisfaction.

Create a Website for ELEVATE.

Redesign the target courses; create teaching modules (avail support from Dr. Daesang Kim, our Instructional Design Specialist, for *Desire2Learn* questions).

First Academic Year (2008-2009)

Conduct a pre-project student assessment using PHP Surveyor.

Organize a Dedication Event for project visibility.

Implement the redesigned courses.

Identify and debug technological (software/hardware) issues; resolve logistical hurdles and operational problems that may arise.

Conduct student and faculty assessments.

Participate in Worldwide HP Mobile Technology conference.

Second Summer (2009)

Analyze assessment data collected in 2008-2009; use results to revise assessment criteria and to refine courses.

Collaborate with past-recipients of the HP Technology Grant (e.g., Rose-Hulman Institute of Technology) for comparing experiences, joint publications and presentations.

Conduct workshops to interested faculty on Tablet PC and Digital Inking Technologies.

Second Academic Year (2009-2010)

Implement the modified courses.

Conduct student and faculty assessments.

PROJECT CONTEXT

8. Course impacted (100 words maximum)

General Chemistry (CH115/CH116, Ramachandran): Two-semester sequence for science majors (for freshmen); deals with fundamental principles governing the behavior of substances; is highly math- and content- intensive.

Calculus (MA121/MA122, King): Two semester sequence for mathematics majors and most science majors; deals with single-variable calculus; symbolic manipulation reinforced through collaboration.

Business Finance (BU381, Mitchell): One semester course for all business majors offered every fall; deals with fundamental principles for profitable decision-making using advanced mathematics/ graphing as part of the process.

While three faculty members are directly involved in ELEVATE, others are also interested in exploring Tablet-PC technology (Lytle/CIS; Whittle/Economics; Davis/Education; Clark/Physics; Grabowski/Biochemistry)

9. Course redesign (200 words maximum)

The target courses chosen for redesign share a common attribute – they belong to highly quantitative disciplines (chemistry, mathematics, business). Course redesign will incorporate HP Tablet PC and digital inking technologies in terms of the following elements:

Collaboration-facilitating and audio-capturing software: Currently students take notes and solve equations on paper as instructors solve them on chalkboards. Students seem to understand material while in class, but often can't recall the concepts later. After the redesign, instructors will be able to synchronously create digital copies (including audio) of their lectures that can be "replayed" on demand, a great benefit to students. As an added advantage, instructors can provide those lectures to distance-education students as well.

Digital Inking: Interactive learning modules, learning activities, and digital note-taking will keep students engaged, and promote critical-thinking skills. Digital notes will be more effective (and also eco-friendly!) than paper notes currently used by students.

Collaboration facilitating and Math software: The Classroom Management System will facilitate student-teacher and student-student interaction and thus provide a collaborative learning atmosphere. Specific math software will support problem-solving skills through visualization (to tackle complex problems), modeling, and graphing. These will help female students in overcoming their math phobia.

10. Course discipline:

Mathematics Sciences Other (Business)

11. Faculty (25 words maximum)

Three faculty members will be directly involved in ELEVATE. They have all demonstrated strong commitment and competence in exploring/incorporating emerging pedagogies and technologies in teaching.

12. Students (25 words maximum)

General Chemistry I/ II (36 students)

Calculus I/II (25 students)

Business Finance (30 students)

This corresponds to about 30 % of our campus students.

13. Extra considerations

Check the box, "Serves a significant number of underrepresented / marginalized students"

SMWC admits only female students to its campus programs (in the distance program about 95% of students are women). ELEVATE will primarily target our campus students. Furthermore, about 65% of our campus students are from rural areas of Indiana and nearby states; also about

55% of the students are first generation college students. The project team and the College are excited that the project will positively impact the lives of the underrepresented female population that needs encouragement and support in the math/science arena.

We also like to mention that ELEVATE will benefit our distance education program (Woods External Degree, WED) too, indirectly. Even though the WED students will not use the HP Tablet PCs (of the Grant) per se, instructors will be able to provide them with access to the course modules and digital lectures (which they develop for their campus courses under this project); those digital lectures will serve as “virtual classes” for the WED students, a hitherto non-existent opportunity. We are thrilled that ELEVATE will thus impact our WED students as well.

SHARING BEST PRACTICES

14. Project visibility (200 words maximum)

ELEVATE Team will:

Organize a Project Dedication event in September 2008, to publicize SMWC’s vision and Hewlett-Packard’s commitment to promote technology in higher education; representatives from nearby schools, colleges/universities, industries, media and public will be invited.

Conduct workshops on HP Tablet PC and Inking technologies to other faculty members to motivate them to redesign their courses as well, and thus impact an even larger student population.

Collaborate with nearby institutions that are already recipients of this Grant (e.g., Rose-Hulman Institute of Technology, Butler University, Purdue University) to share our experiences. Such joint ventures will be extremely beneficial to all for mutual enrichment and for assessing the impact of the HP Tablet PC technology on higher education.

Will create a website for ELEVATE to share our experience in this project with the academic community at large.

Will present its experience, findings, and assessments at conferences (e.g., Teaching and Learning with Technology Conference; Workshop on Impact of Pen-based Technologies in Education (WIPTe); Independent Colleges of Indiana meetings; HP Technology for Teaching Worldwide Higher Education conference, Chemical Education sessions in American Chemical Society Meetings).

Will publish articles on this technology in educational and technical journals (e.g., Journal of Chemical Education)

TEAM

15. Principal Investigator:

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Additional Members:

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ADMINISTRATIVE SUPPORT AND APPROVAL

16. Key Administrator

Christine M. Bahr, Ph.D.

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17. Statement of support

As Vice President for Academic Affairs, I am pleased to support the proposed project to use HP Tablet PCs and Digital Inking technologies to help students in math-intensive classes overcome math phobia and “elevate” their learning.

To demonstrate support, Saint Mary-of-the-Woods College will provide the following for faculty engaged in this project:

1. License(s) for a classroom management system such as *SynchronEyes*.
2. *Desire2Learn*, a course management system that includes capacity to identify competencies and assess learning outcomes associated with the targeted courses.
3. Support from the Assessment Committee in the development, use, and evaluation of appropriate instruments to assess student learning outcomes.
4. *PHP Surveyor* to enable collection of student satisfaction and assessment data.
5. Travel support from the Office of Academic Affairs for members of the team to present their work at conferences, such as the *Teaching and Learning with Technology* conference at Purdue University and the *HP Technology for Teaching Worldwide Higher Education* conference.
6. Support for faculty time in course redesign activities.

For many years, Saint Mary-of-the-Woods College faculty have been using technology to enhance classroom-based instruction. Thirty-five years ago, the College was one of the first in the country to launch a comprehensive undergraduate distance education program (called Woods External Degree – WED), supported in large part by online instruction and technology-based communication methods. The proposed project will further the College’s efforts to deliver high quality math and science instruction to female students, a traditionally underrepresented group in these areas.

Christine M. Bahr, Ph.D.
Vice President for Academic Affairs
Professor, Education

18. Approval of terms and conditions

Yes

19. Privacy terms and condition

Yes

INSTITUTION INFORMATION

20. Institution name

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21. Institution mission

“Saint Mary-of-the-Woods College, a Catholic women's college sponsored by the Sisters of Providence, is committed to higher education in the tradition of the liberal arts. The College serves a diverse community of learners in undergraduate and graduate programs, while maintaining its historical commitment to women in its campus program. By participating in this community, students develop their abilities to think critically, to communicate responsibly, to engage in lifelong learning and leadership, and to effect positive change in a global society” (SMWC Mission Statement)

22. Institution tax ID number

35-1065063

23. Tax exempt

Yes

SMWC is an educational institution of higher learning, and has tax-exempt status; it is a 501(C)(3) Charitable Organization.

African American	2%
Asian/Pacific Islander	1%
Caucasian/White	94%
Hispanic	3%
Native American	<1%
Other	0%

Student financial need 90%

24. Shipping instructions

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