PROJECT DESCRIPTION

MSEIP: The FAMU Multimedia Learning Resource Management System (FAMLEARNS) for STEM Instructional Enhancement

A. PROJECT GOALS AND OUTCOMES

The goals of this project are to improve student learning and performance in critical and difficult formative STEM courses, and to stimulate the adoption of educational technology by STEM faculty. The expected student outcomes include lower failure rates in the formative courses, higher retention in the chosen academic disciplines, and more rapid progression through the chosen STEM major. Expected faculty outcomes include the increased adoption rates for educational technology and educational innovation. These outcomes are consistent with the university's strategic initiative to increase the use of educational technology that is capable of supporting diversity in instructional delivery.

The FAMU Multimedia Learning Resource Management System (FAMLEARNS) project proposes to use existing computer technology to produce ***captured learning resources*** (CLRs), multimedia based (video and audio) instructional modules. A CLR can be used to supplement a traditional lecture, reinforce key or difficult concepts, show in-class demonstrations or proofs, or even to provide a movie-based instructional manual for a laboratory instrument or computer application. Students can access CLRs as QuickTime movie clips over the Internet, as a supplement to in-class presentations. The proposed technology has been used successfully at major universities such as Duke University[1]. The CIS Department will extend this work in three ways: (1) provide *authoring on the fly*, where any learning situation can be recorded without elaborate set up, such as answering a student's question; (2) develop additional software to make

[1] The Duke iTunes Capture infrastructure described at http://www.oit.duke.edu/dms/dukecapture/index.html

the system easy to use, such as content indexing and searching, and automated upload into the university Blackboard system; and (3) provide a formal Help Desk for all users of the system. Over the three years of the project, the CIS investigators will develop the infrastructure required to institutionalize the use of this technology, starting in the CIS Department, and migrating to selected STEM departments. The multidisciplinary team of investigators (all within STEM disciplines) will collaborate to identify, implement and evaluate enabling technology, and to support users and measure the impacts of this project to the STEM disciplines and to the university.

B. THE FAMLEARNS PROJECT DESCRIPTION

This section describes the project components in detail, to provide a basis for reviewing the remainder of the proposal.

B.1 FAMLEARNS Features

FAMLEARNS uses readily available technology. The basic configuration for the instructor consists of a computer and recording software. The recording software is capable of capturing anything displayed on the instructor's computer screen. Additional computer peripheral input devices can be attached to capture handwriting, audio (i.e., voice), video, and scientific instrumentation such as what is seen through a microscope. In a typical scenario, PowerPoint presentation slides and other computer software usage are recorded along with the instructors voice and teaching aids using the microphone and external video recorders. Writing devices include an ultrasonic ink-pen or digital stylus that permits the real-time capture of the instructor's

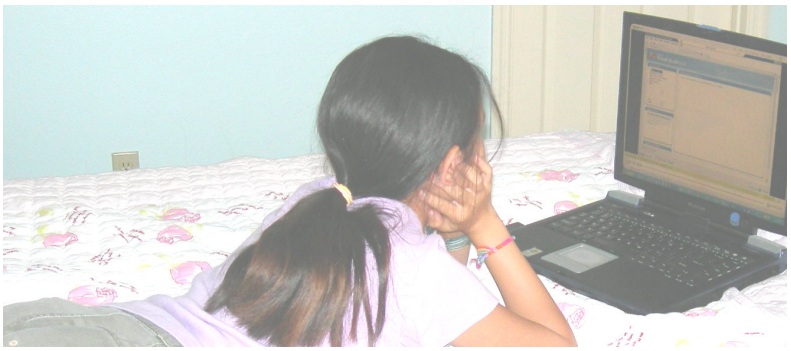
handwriting. The computer is a tablet PC that while having all the features of a laptop computer also facilitates free hand annotating of PowerPoint slides or other software. Video is captured using computer mounted webcams and external video camcorders. Special-purpose scientific instrumentation, such as a USB2 microscope camera, can provide video input to the computer. Besides the cost of the computer, the additional cost per recording station is a low as the cost of a microphone, around $20, and no higher than $500 for a full complement of high-quality input devices.

FAMLEARNS supports authoring on the fly. As opposed to formal video recording, which requires expensive recording studios and trained recording staff, FAMLEARNS supports *informal capture* of any learning situation. In the most basic form, this capture can be done sing a computer and projector. Both of these items can usually be found in the classroom. Usage instructions will be provided in the form of a captured learning resource (CLR) including both written instructions and video demonstrations of someone using various aspects of the system. In person training will be provided for advanced authoring techniques: splitting a presentation into topic-specific segments of 4-7 minutes, indexing CLR clips based on subject matter, and creating an assessment exercise as a pre-test or post-test [1]

for a given CLR clip.

The screen capture movie making software is generally very easy to use. Prior to starting the presentation, the presenter clicks the record button. The software captures all computer output, inputs from the audio/visual input devices, and the presenter's audio. The recording does not necessarily include the presenter or the audience, just the instructor's computer screen or other visual aids. Once the presentation (or topic) is finished, the presenter clicks the stop button.

FAMLEARNS provides ubiquitous student access. Captured learning resources (CLRs) will be accessible through the university's Blackboard system at any time and from any place. Initially, each CLR will be linked to the course website for which it was recorded, and in time accessible to any student with access to the university's Blackboard website. When opened, the CLR operates like a movie clip, and can be paused, rewound, and played as often as the student desires. When advanced authoring features are used, the student will be able to search a global Blackboard area for CLRs matching specified topics or keywords, and take assessment tests to measure comprehension of the subject matter presented. We will also explore unique content delivery options including download to iPods and cell phones.



FAMLEARNS includes a support network and Help Desk. Widespread adoption of instructional technology by faculty can occur only if impediments are recognized and systematically defused. These include: computer access, basic computer literacy, knowledge of Blackboard features (course management), knowledge of basic FAMLEARNS configuration (microphone and PowerPoint), and advanced CLR capture techniques. The FAMLEARNS Help Desk, staffed by graduate students, will provide personal assistance to FAMLEARNS adopters. Experienced FAMLEARNS faculty adopters will serve as *champions* to their respective departments to promote the use of FAMLEARNS, including internal training sessions. Student-focused training to ensure that students make the most of traditional university learning resources

will also be provided as CLRs. These topics include using Blackboard, using email systems, and downloading and using CLRs.

FAMLEARNS provides software infrastructure to facilitate the production and use of CLRs. Table 1 summarizes the software technology that will be developed to support all aspects of faculty and student use of FAMLEARNS. Most of the software will be adapted from free or low-cost off-the-shelf packages. Software for advanced features such as indexing and assessment tests creation does not currently exist, and may have to be developed. Training CLRs will be developed for all FAMLEARNS software technology.

Table 1. FAMLEARNS Software to be Acquired or Developed

Software	**Description of Use**
CLR Capture	Supports the initial set up and capture of the learning event. The software will guide the presenter through available options, including: course identification; hardware configuration; number of clips; start/end cues for each clip; recording format (e.g, QuickTime, MPEG, etc.); and the location where files will be stored.
CLR Edit	Assists the presenter with editing the CLRs. Free software such as the Windows Movie Maker provides basic operations include trimming the beginning or ending of the recording, and deleting content. Advanced editing features include merger of inputs from external sources, splicing, etc.
CLR Indexing	Supports the creation of searchable indexes for CLR content. Options for indexing include subject keywords entered by the presenter via an input screen or by spoken language and the automated creation of a text transcript of the CLR[2], from which the presenter selects the index terms.
CLR Upload	Uploads specified CLRs into specified areas of the course's Blackboard website and additional distribution sites such as download servers for iPods, pocket PCs, or smart phones.
CLR Search	Enables students to search for CLRs matching search terms, and within a CLR, the locations where the search term is used. For example, a search for help on taking derivatives of trigonometric functions may return a list of seven CLRs, five of which the term is the sole topic, and two for which the search term is one of several topics in the CLR. In the latter case, the student will be presented a "table of contents" which permits him or her to quickly jump to the portion of the lecture that is of interest.
Universal Access Feature	Ensures that all materials produced are also accessible to students with disabilities. We will investigate providing transcripts of all videos (for the hearing impaired) and alternate visual interfaces (for the vision impaired).

FAMLEARNS technology will contribute to the professional development of university staff and faculty. The CLR approach applies not only to academic subject matter, but also to any situation where transfer of knowledge or skill is important. This includes training in the use of specific functions of the university's Enterprise Information Technology ERP system[1], manual procedures[2] for clerical and administrative staff, Blackboard training, and other computer literacy related training for faculty and staff. Access to CLRs from any place and at any time can enhance the effectiveness of training classes, enabling trainees to carry with them "copies" of the computer interactions that were discussed in class.

B.2 Relationship to MSEIP Program Goals and Objectives

The purposes of the MSEIP program are to effect long range improvements in the Science and Engineering Education Programs of predominantly Minority Institutions, and to increase the flow of underrepresented ethnic minorities into science and engineering careers. FAMU is a historically black institution with a rich history of both attracting and graduating large numbers of minority students in the sciences. This proposal specifically targets STEM majors in support of the MSEIP purposes.

This research will support the major objectives of the MSEIP program in several ways. It will increase access of pre-college and undergraduate minority students to careers in sciences[3], mathematics and engineering by, over time, making the entire curriculum freely available online. The research will further increase the capacity of minority institutions in planning, implementing, self-assessment, management and evaluation of their science programs and dissemination of their results by following a carefully planned and well managed evaluation plan.

The specific outcomes of the MSEIP program will be positively affected as well. Because the entire curriculum will be freely available online, there will be a corresponding increase in the number of full-time, degree-seeking minority undergraduate students. These additional resources will help meet the academic challenge of students enrolled in a STEM major at FAMU, thereby increasing the persistence of minority students enrolled in math, science and engineering fields. This, in turn, will result in an increase in the number of minority students graduating in science and engineering fields.

C. BACKGROUND

This project addresses a real problem at our institution and nationwide. In this section we present data showing the extent of the problem. We then present research that shows that the proposed approach promises to help solve this problem.

C.1 The Performing Institution

Florida A&M University (FAMU) is among the premiere Historically Black Colleges and Universities (HBCU) and, with an enrollment of 12,000 students, 95% African American, has the highest concentration of African American students in the Florida State University System. In 1997, the University was named the Time Magazine/Princeton Review College of the Year. FAMU has a long-standing reputation as a national resource, successfully competing with Harvard University for National Achievement Scholars, the highest echelon of talented African American high school graduates. FAMU is among the leading producers of baccalaureate degrees in engineering and computing among HBCU institutions.

Improving educational outcomes for all students is important to FAMU. The most recent strategic plan recognizes educational technology as a key ingredient towards this goal:

> *"From a technological perspective, FAMU plans to increase its educational technology resources and help close the gap with emphasis on minority*

> *populations in Florida. … The Media Center will intensify its role in faculty development via the use of educational technology ….”* Strategic Plan for Florida A&M University: Academic Year 2004-2005 – 2012-2013 (Draft version LR) (http://www.famu.edu/oir/strategic/new10year.htm, July 10, 2006)

The multidisciplinary project team involves the Departments of Computer & Information Sciences (CIS), Mathematics, Biological Sciences, and Mechanical Engineering. The team composition is strategic. Biological Science offers basic service course to the entire university. Mathematics offers basic services courses, along with advanced courses for all STEM disciplines. CIS offers a basic service course to all students, along with specialized courses for the other STEM majors. Student difficulty or failure in mathematics affects progression on non-STEM majors, and certainly delays STEM students from entering or progressing through their respective majors. Improving student outcomes in math courses can affect every student in the university, especially STEM majors: even a small positive impact will be magnified. The team members are classroom teachers who understand the challenging courses and the specific course topics that prove problematical for students.

The university STEM departments are engaged in a number of projects that address the recruitment of new undergraduate and graduate students in STEM disciplines, their retention, and their preparation to seek graduate degrees in STEM disciplines. These programs include the NSF Undergraduate Program (FAMU-UP), the NSF Florida-Georgia Louis Stokes Alliance for Minority Participation in the Sciences (FGLSAMP), the McNair program, and the NSF Minority Institutions Infrastructure Program (awarded to CIS, 2004-2009). Additionally, the Mathematics Department has developed a tutorial laboratory employing a full-time director and 15 undergraduate tutors to serve all levels of mathematics. Students use the 50 laboratory computers to complete assignments that make use of web-based materials in MyMathLab, and algebra software packages such as Maple and MATLAB.[45]

C.2 The Problem

Students struggle in STEM courses considered in this project, evidenced by low passing rates. Student failures lead to discouragement, escalating financial indebtedness, delays in graduation, or the decision to change major. Failure also increases repeat courses, placing additional demands on strained faculty and physical resources such as laboratories and classrooms. The identified courses will be the target for applying FAMLEARNS over the three-year project[6]; addressing these courses can impact nearly 5,000 students.

C.3 Related Work

This section gives a brief review of the use of technology for lecture capture in higher education. We then compare our proposed approach to the current state of practice.

Georgia Tech has been a leader in educational technology. Their early work on eClass [3, 4] recorded separately all the media presented during a lecture—visuals, audio and video—and merged during presentation. Their findings showed that class attendance does not suffer, and that overall student performance was unchanged; a later study found that students rarely viewed the entire lecture, a finding that suggest that more granular recordings may be more beneficial. Recorded lectures were found to be supplements to, not replacements for, attending live lectures [5].

Minority Serving Institutions are beginning to participate in multimedia enabled revolution. North Carolina Central University[7] [6] joined the Apple Computer iTunes U program that promotes the use of iPods by students and to assist faculty to produce downloadable podcasts of their lectures. NCCU joins major universities like Michigan[8], Stanford and Duke in the iTunes U program. Lectures must be conducted in a specially equipped room that contains the recording equipment and uploading software; lectures are recorded in their entirety. Student response at

Duke [10,11] mirrors that reported elsewhere: (1) student class attendance did not decrease, but student interaction did [3,7]; and (2) faculty began to request the technology. A factor in the rapid adoption was the existence of infrastructure that handled all the details about recording and distributing the multimedia within an hour following the lecture.

Other approaches to recorded lectures include: Just-in-Time Teaching [1], which uses the recordings as required preparation for active learning classroom[1]; use of hypertext links to construct a learning site that required interactive student exploration to gather information was shown to be superior to sites that merely presented static facts [8]; and attempts at automatic indexing from speech [2].

Our work is different[9] in the following regards: (1) recording is not limited to entire lectures; (2) no special room or elaborate set up is required; (3) informal, "on-the-fly" authoring [9] is supported; (4) reference aids such as indexes or hypertext link will be used to engage the learner while using the recorded resources [8].

D. PLAN OF OPERATION

Section B contains the technical description of the project. This section describes how the project will be conducted and managed.

D.1 Plan Design

The project plan is incremental, and follows a three-phase ripple pattern: (1) *Development* – the basic version of the system is developed and used in the CIS Department; (2) *Deployment* – the basic and intermediate versions of the system are developed and used in the target STEM departments, with support from CIS; and (3) *Diffusion* – basic, intermediate and advanced versions of the system are available and used by multiple adopters in each target department, supported by departmental Help Desks. Table 2 summarizes the deliverables for each phase.

Table 2. Phases and Milestones of the FAMLEARNS Project

Phase	Major Milestones for Phase
Phase I - Development	• Acquire FAMLEARNS technology to be evaluated and implemented. • Develop initial software infrastructure, automated upload to Blackboard • Conduct small scale usability studies within CIS. • Create and train the Help Desk. • Note: Other departments may shadow CIS efforts, but are not officially "on the clock" until year 2.
Phase II - Deployment	• Host FAMLEARNS session in 2008 Faculty Development Conference to promote use in non-STEM disciplines. • Support infrastructure in place for external adoption, including Help Desk and CIS faculty mentors. • Deploy FAMLEARNS in STEM departments: Math, Biology, Mech.Eng. • Develop infrastructure for content indexing, host on project server. • Conduct project evaluation; propose improvements based on data. • Identify new discipline-specific FAMLEARNS requirements.
Phase III - Diffusion	• Implement subject-specific FAMLEARNS requirements from phase II. • Host FAMLEARNS session in 2009 Faculty Development Conference to promote use by university staff. • Promote use of FAMLEARNS by multiple faculty on additional courses in each STEM department: Math, Biology, Mech.Eng., Chemistry. • Train FAMLEARNS Help Desk for each adopting department. • Develop infrastructure for universal access. • Conduct project evaluation for final report; recommend improvements. • Develop migration plan from project server to university computing.

D.2 Project Management

The Manager (PI) will require regular reporting on the deployment of FAMLEARNS configurations containing different mixes of technology, and on the ongoing evaluation process to monitor the adequacy of the technology, the support network, and the use of FAMLEARNS assets by students.

The FAMLEARNS Steering Committee[2] will be established to guide the evolution of FAMLEARNS as an institutional resource. The project Manager will chair the committee. Membership will also include a representative from the FAMU Enterprise Information Technology, the Assistant Vice President for Instructional Technology (Dr. Dhyana Ziegler), the Dean of the College of Arts & Science, along with chairpersons from the STEM disciplines Chemistry, Biology, CIS, Mathematics, Physics, Engineering, and Environmental Sciences, and the Electronics Engineering Technology program, and the College of Education. The project team will give an annual report to the Steering Committee detailing the project status, accomplishments, assessment results, and proposed directions for the next year. The Steering Committee will recommend to FAMU administrators options for migrating FAMLEARNS into institution-wide adoption and integration with institutional educational technology (e.g., Blackboard).

E. EVALUATION PLAN

The evaluation plan[10] is adapted from the MIT Open Courseware Project 2004 Program Evaluation Findings Report [12].

In order to visualize and organize the *FAMLEARNS* evaluation plan, we constructed the following model that ties each element of the evaluation to MSEIP Program goals and *FAMLEARNS* outcomes. Figure 1 depicts the overall model.

In order to understand how well *FAMLEARNS* is fulfilling its mission, as well as to establish a thorough and continuous feedback process that guarantees its improvement over time, we propose a substantial evaluation program. The evaluation focuses on understanding specifics in three areas of user behavior and outcomes each of the three years of the project:

[2] Schedule FAMLEARNS Steering Committtee meeting between mid October and mid November. Should have initial demos ready, along with principles of operation and impact assessment plan.

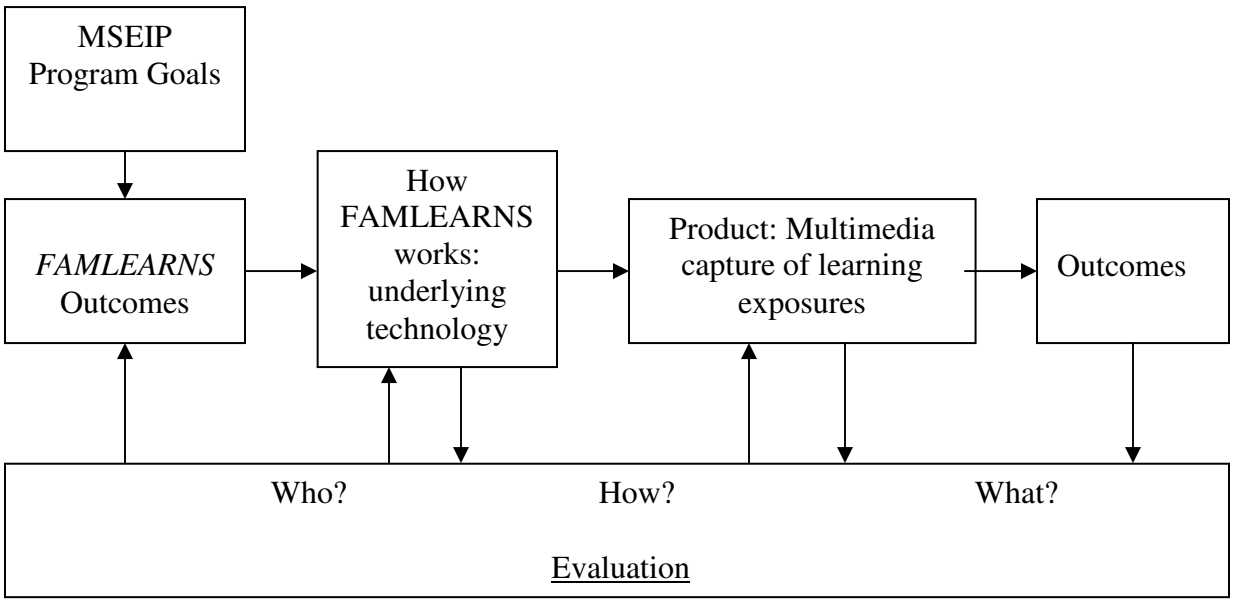


Figure 1: FAMLEARNS Evaluation model

Who is accessing *FAMLEARNS*? Possible user groups include: faculty who produce CLRs for their courses; students who use course CLRs; self-learners (non-registered students) who sample educational content recorded as FAMLEARNS CLRs in order to decide on a major or which class to take; faculty who use the system for self-learning; or university staff who use training CLRs.

How do educators and learners use *FAMLEARNS,* and is *FAMLEARNS* designed appropriately to facilitate that use? To what extent and in what ways are CLRs being designed or adapted for teaching purposes?

What effects are being realized from the use of *FAMLEARNS* (productivity, learning, motivation, etc.)?

An integrated "portfolio" approach will be used for data collection. Multiple methods will be combined to achieve breadth and depth in the evaluation. Quantitative and qualitative data

will be collected and analyzed to make decisions about which FAMLEARNS elements meet project goals and which ones need to be modified and improved. The evaluation team is responsible for monitoring implementation of the evaluation plan at each adopting site.

Table 3 summarizes the different data sources and their use in the evaluation process.

E.1 Quantitative data

Web Access. A web analytics tool will capture data on accesses to web sites. Captured data include URLs of viewed pages, total time spent viewing a course page, first time visitor rate, returning visitors rate, frequency of visits, time of visits, and visitor profile (students, faculty, self learner). Additional system tools will be used to gather bandwidth utilization data.

Professional Development Activity. Online tutorials (through Blackboard and proprietary systems), faculty retreat workshops, as well as departmental workshops will be held to advance technology use by faculty campus-wide. Participation and adoption rates (within one semester of training) are the relevant quantitative data that will be gathered.

Class Attendance Observations. Class attendance data will be gathered on random days and hours of the week in order to analyze the effect of FAMLEARNS on class attendance.

Pre/Post Online Self-Assessments. Students who access CLRs that contain pre- and post-tests will have the option of taking these self-assessment tests before and after viewing a module. Test scores measure student knowledge gain due to use of the CLR.

Academic Performance. Participating faculty will gather metrics on passing and retention rates in courses where FAMLEARNS is being used.

Controlled Experiments. We will teach the same course in two different sections – one the classical way and one with FAMLEARNS, in order to obtain comparative data.

E.2 Qualitative data

Online Intercept Surveys. A survey tool will randomly invite FAMLEARNS users via pop-up window to complete an online survey. The surveys will provide a limited number of questions based on student classification and major to measure user expectations and satisfaction levels.

Table 3. Evaluation Data Source / Usage Summary

	Access (who)	**Use (how)**	**Outcome (what)**
Web-analytics	Traffic volumes, site entry points, site performance	Log-in information, frequency of visits, time of visits	Technology adoption
Tutorials and workshops for faculty		User goals, purposes, expectations, usefulness	Educational technology participation rate, adoption rate
Attendance			Behavior/attitude change
Pre-post online self-assessments			Knowledge gain
Academic performance			Passing rate, retention rate
Control group			Comparative analysis
Online intercept surveys	User profiles	User goals, purpose, expectations, satisfaction	User satisfaction Behavior/attitude change
Student survey	User profiles, department profiles, periods of higher/lower use, usability, performance	User goals, purposes, expectations, usefulness	User satisfaction Behavior/attitude change
Interviews	Complementary to surveys		
Feedbacks	Supplement about data access	Data about use, usability	Satisfaction, perceived benefits, anecdotal data about specific outcomes

Student Survey. In order to understand the usefulness of FAMLEARNS to students, randomly selected undergraduate students will be asked via email invitation to participate in a web survey. A special emphasis will be on incoming students to assess the influence of FAMLEARNS to their decision to attend FAMU.

Interviews. Interviews will be conducted with a small subset of target user groups to gather textured qualitative data about the use and impact of FAMLEARNS. Interviewees will be selected randomly from faculty and students who use FAMLEARNS.

Help-Desk Site Feedback. User email feedback will be processed and analyzed. Randomly selected users will be contacted to gather additional insight into system access, use, and impact. This feedback will provide anecdotal insight into FAMLEARNS and Help-Desk user experience.

Meeting Discussions. Classroom visits will be organized to gather feedback about the data capturing process and other aspects of the system.

E.3 Appropriateness of evaluation methods

The evaluation methods are derived from the evaluation methodology used on the MIT Open Courseware Project, which has comparable project objectives – widespread use by learners and teachers. Our plan links project outcomes to MSEIP purposes and outcomes. Where appropriate, we employ control and experimental groups to measure objectively the effects of FAMLEARNS. Qualitative data are important to understand behaviors and attitudes that affect student and faculty decisions to use FAMLEARNS.

The project has identified impediments to the adoption of FAMLEARNS. They include (1) lack of incentives for instructors to learn and use new technology; (2) lack of time to learn new methods and procedures; (3) low reliability of equipment being used to deliver course material over the Internet; and inadequate bandwidth for use of multimedia applications for effective

learning. The evaluation methodology gathers data which will indicate the incidence of these impediments. The project management structure provides project team visibility into this problem area, should it occur.

F. POTENTIAL INSTITUTIONAL IMPACT OF THE PROJECT

The evaluation plan defined in this proposal will determine the extent to which science education outcomes have been impacted by FAMLEARNS. We believe that, over time, market forces will stimulate a supply of CLRs on most science topics, and student usage will identify the high quality CLRs that will be long-lived. We also believe that teachers will be motivated to produce high quality learning resources that have a substantial life time. Finally, departments can produce high quality, standardized CLRs for specific subject areas.

G. EXPECTED OUTCOMES

This project addresses a significant problem in higher education. The proposed methods have been shown to be effective at majority institutions; we expect an even more impressive result in our institution. We have also proposed significant software technology development to support institution-specific technology norms–the effort and computer sophistication required by faculty must be reduced to a bare minimum.

The major benefit to science students is having anytime, anyplace access to learning resources from lectures, labs or tutoring sessions. CLRs support guided repetition and practice, which are required to master scientific principles, problem solving techniques, and laboratory procedures.

Students who benefit for the multimedia capture technology of FAMLEARNS for STEM courses are also likely to see benefits in other disciplines as well: having this supplemental resource may resonate with the learning preferences of such a student.

H. SCIENTIFIC AND EDUCATIONAL VALUE OF THE PROPOSED PROJECT

H.1 Relation of the proposed project to the present state of science education

Many universities are exploiting multimedia capture of educational material, motivated in part by the ready availability of iPod technology to students and by major vendor programs like Apple's iTunes U program. The major universities are using the multimedia capture technology in a variety of disciplines, including the sciences. These results suggest that FAMLEARNS can have use throughout the university.

H.2 Development or use of effective techniques and approaches in science education

FAMLEARNS supports exploration and innovation by students (tutors) and creative faculty. Good ideas and inspiration are preserved as CLRs, and students can give feedback on the usefulness of innovative approaches to the subject matter. Moreover, because the production costs are low, there is not a high penalty for trial and error. An important benefit to students is that FAMLEARNS provides *alternative learning paths,* some of which may match the student's learning style or overcome learning barriers such as access to a teacher. The bottom line is this: the student is given a new choice.

H.3 Suitability for use of aspects of the project at other institutions

FAMLEARNS is based upon commodity, off-the-shelf technology, and results in digital learning resources in a universal display format. Not only can FAMLEARNS learning resources be used at other institutions, resources from other institutions can be imported into FAMLEARNS. The potential for a community of learners is indeed exciting!

I. SUMMARY

We have proposed the multimedia capture of learning events, to be used by students as a supplement to classroom lectures. We believe this is an approach whose time has come due to the ubiquity of multimedia devices (e.g., iPod) and the computer peripherals (cameras, pens, high

fidelity microphones), and their affordability. Technology permits high quality capture without requiring studio-quality space.

We believe this approach addresses current issues of success, retention and recruitment of minority students into the STEM disciplines. The impact of this project will be magnified by the numbers of students involved. Changing the passing rate from 50% to 60% for the nearly 5000 students in the targeted STEM courses will mean that 500 more students will be able to move forward towards completion of degree requirements. Further, if the grade of already passing students improved one-half a letter grade, a substantially higher number of students would be on the road to meeting GPA requirements for graduate study.

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[12] *MIT Open Courseware Project 2004 Program Evaluation Findings Report*, January 2005.

END NOTES

[1] Include EIT on the Steering Committee, and invite to participate in the Video Conference 9/10/07.

[2] Just a test

[3] Link up to Upward Bound, FGAMP, TRIO and other programs attracting students into STEM majors.

[4] Consider hosting some CLRs on computers in the Math Lab to get initial feedback. Plan to treat a single topic. Possibly award extra credit to experimental subjects.

[5] Consider the IRB requirements of this project, especially in the pilot studies where students volunteer (versus a whole class, instructor's commitment).

[6] Strategically select the courses. May not be able to do them all, decide upon criteria for selection: departmental commitment; instructor commitment and training; commitment to evaluation and assessment.

[7] Contact NCCU for updates, advice -- http://macdailynews.com/index.php/weblog/comments/9799/ and http://findarticles.com/p/articles/mi_m0WMX/is_9_23/ai_n16546100

[8] Michigan School of Business makes CLRs available to public – see http://www.bus.umich.edu/NewsRoom/ArticleDisplay.asp?news_id=8289

[9] We need to make a CLR to promote the vision of the project!

[10] The Evaluation Plan is SERIOUS BUSINESS. Really need to make someone the leader – makes sense for Jones, Moore and Stephens to define the plan, with help from College of Education.