Provost's Learning Innovations Grant for Faculty
Request for Full Proposal
2002-2003

Please send your completed grant proposal (4 pages, plus attachments), one original and eleven copies, to
Linda Jones, 4000 Eastman
by 4:30 p.m.
Wednesday, February 20, 2002.
No hand written proposals will be accepted.
Notification of awards will be made by Friday, March 22, 2002.

Project Title: Implementation of Product Realization

Applicant(s):

Project Coordinators
Name: Carl Lundgren
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College: CAST

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College: CAST

Participating Faculty
Name: Robert Merrill
Telephone: 475-6174 (dept)

Name: Louis Gennaro
Name: Dan Johnson
Name: Jon Freckleton
Name: John Stratton
Name: Elizabeth Scholle
Name: Marty Gordon
Name: James Scudder
Name: Ti-Lin Liu
Name: Sueng Kim
Name: Ron Amberger
Department: MMET/PS
College: CAST
Implementation of Product Realization

Summary

This project will enable us to completely implement our Product Realization project being piloted during the 2001 academic year, funded in part with a Provost’s Proof of Concept Grant (appendix). Our intention in this request is to support the broad implementation of Product Realization modules within courses across the curriculum in both the Mechanical and Manufacturing Engineering Technology degree programs. Simultaneously retaining the opportunity for participation by students from other CAST programs and from programs in other colleges. Currently students outside our programs represent Packaging Science, EET, Cpet, CIAS’s Industrial Design and from KGCOE’s Mechanical and Electrical programs, as well as a small number of SUNY Morrisville students. The size of the student population participating from the MET and CIMET programs will be roughly 400 each year when the product realization project is completed.

Narrative Description

The project’s premise is the creation of a multidisciplinary “backbone” tying together curricular elements from a wide range of courses. The project brings together courses and students from first year through graduate level to design, develop and manufacture products using RIT resources (and, as necessary, other resources by networking with local industry and other colleges). During the Proof of Concept effort this year students are developing, designing, manufacturing components and building a working scale electronic kitchen scale. In the first generation of this concept some students are participating as part of several courses, as part of SME club activities leading to national competition, as Independent Study course registrants, or as volunteer members of a “club” to make the project possible.

The broader implementation phase of product realization will require creation and coordination of instructional and activity modules to be used in a diverse collection of courses within the Mechanical and Manufacturing programs. In addition maintenance of the project will require ongoing efforts to identify and cultivate future opportunities and users. The list of faculty, from the MMET Department, who are participating in this proposal represents the faculty teaching every course in the related areas. Using Product Realization to hold together the diverse elements of our curriculum has captured the imagination and enthusiasm of the faculty and students.

This implementation award will allow the release time necessary to develop materials related to connect the current Product Realization cycle to 15 required courses and 4 elective course, plus up to 10 additional required or technical elective courses depending on the particular product cycle. The courses involved represent over 50% of the Mechanical program and almost 50% of the Manufacturing program technical courses. The courses range from first year through fifth. In addition some monies are needed for raw materials and some outside development and/or manufacturing processes.

Preliminary assessment of the effectiveness of the concept is anecdotal, but entirely favorable from faculty and students, and we might add prospective students and parents who have heard of the project through Open Houses this fall. As ABET programs, we are charged with continuous assessment of the effectiveness of our programs and having a continuous improvement plan. To those ends we regularly survey alumni, industry, our IAB, and are developing a survey for current students to be administered annually to assess the success of Product Realization in connecting coursework to career. Ultimately, we expect to see an increase in demand for our programs and improved retention.

In this phase of our Product Realization project we will formalize the connection between coursework and career by specifically including new segments in more courses, by reaching virtually the entire student population in the programs, while retaining the multidisciplinary possibilities by allowing additional participation by our students and students from other programs and colleges. Our outreach to other learners includes the possibility of using resources available at institutions from which we receive large transfer populations; for example, SUNY Morrisville students are currently participating by providing prototypes utilizing equipment currently unavailable at RIT for our students.
Obviously we are proud of the pilot program and eager to expand that success through the Implementation phase. Plans are in place to solicit additional funding through NCIIA and to disseminate our results through ASEE, ETA and NCIIA meetings and publications. Based on prior participation in those organizations, Product Realization is a creative and effective educational strategy relative to other institutions. This project will clearly place RTI in an elite group of universities that successfully integrate learning and career discovery while cultivating the essential creativity for future success.

Targeted Learners

The primary targets are students in the MET and CIMET programs. Collateral targets include students from Packaging Science (PS), Electrical/Mechanical Engineering Technology (EMET), students from the programs in Civil Engineering Technology, Electrical Engineering Technology, and Computer Engineering Technology via service courses, and even College of Engineering students enrolled in our plastics design sequence. This effectively covers the Technology and Engineering cluster of programs.

There are two levels of participation in the product realization project. Explicitly there will be the students in the course, Product Realization. More important will be the implicit participation of a much wider population of students in various courses contributing to the design and development portion of each product cycle. As many as 18 courses could be involved in any given product cycle, involving multiple times the entire student population in the MET and CIMET programs (in excess of 200 students). In addition to full-time day students, the evening students (largely part-time) in the same courses will also participate.

Impact on Teaching

It is always easier to teach students when they can see where the material is leading in a career sense. This project integrates learning and application in a real way. The faculty teaching the many connected courses will be able to use the project as case studies, group projects, laboratory exercises testing materials and designs and illustrative lecture material. Theory becomes reality for students seeing an actual purpose and end goal. The only completely new course in the project is the capstone Product Realization course, however many courses will be stimulated and energized by the connection. The project has been favorably received by our Industrial Advisory Board and assistance has been offered to faculty to assist in the execution of portions of the project at or beyond our lab capabilities.

Measurement of Impact

The success of this project will be measured in several ways. Standard student course evaluations and a specialized evaluation for students in the MET and CIMET programs investigating their understanding of the “connection” between their studies and the career which will lead from those studies. The “connection” survey will be completed annually beginning this spring. Obviously demand for the Product Realization course will be a direct indication of the students impression of success. The overall success will be best indicated by an enhanced identification by students with their career choice. Success from the perspective of the faculty within the two primary programs will be easier to assess, the faculty meets bieweekly with a major focus on continuous improvement issues and the exchange is free and frank, especially if a faculty member feels a course is not “working right.”

In addition to the obvious coordination required within the project between numerous courses the product realization project will remain an open item on the bieweekly meeting to ensure communication within the department. The proposers will also prepare and present at appropriate internal and external forums the results of the project. ASEE, NYSETA, and NCIIA are engineering education organizations seeking
examples of innovative educational strategies. This project's goal of connecting coursework with a design
thread culminating in a capstone course will be attractive.

Rationale

Related programs in CAST are collected into departments and some departments share common courses
(e.g., the engineering technology departments), but there is much less connection between other
departments. This project's primary target, the students in MFT and CIMET degree programs share a
common first two years. In the CIMET program currently a pair of courses provide a capstone project
experience. The MFT program has several multi-course sequences and individual courses having large
capstone-like experiences.

While both programs have required course sequences and large experiential projects in individual courses,
this project will provide a new and unique thread tying diverse courses and subjects together. This reduces
the tendency of students to perceive courses as standing alone as individual knowledge sets.

The implementation of the product realization project directly addresses the goal of our department to
produce graduates who function at a high level upon graduation in the real world of production, design,
development and manufacturing. The Product Realization activity fulfills the "Continuous Improvement"
department and student outcome objectives through the inherent testing within the design and development
process associated with product realization. RIT, CAST, the Department and Programs have goals and
outcomes associated with career education. Product Realization is designed to be a direct reflection on the
future career environment of our graduates. Involving freshmen and sophomores with these career related
activities also better prepares them for coop, meeting additional department and CAST goals and student
outcomes.

This implementation will present a clear image of the career path to which their education is being directed.
It is an observable fact that students are more eager to learn after having cooperative education experience
and this innovative approach to including tradition capstone activities from start to finish within the
curriculum will have a similar effect. Presumably the enhanced engagement of students with their
curriculum will improve student satisfaction and retention.

Implementation will provide an immediate enhancement to existing courses taught by all members of the
faculty teaching in the MFT and CIMET programs. While this project will be managed by two members of
the faculty, the ideas and goals have been discussed and developed by the entire faculty. The success of the
project will be built on the successes of each faculty member in the department capitalizing on the potential
improvement in the individual courses. Implementation will result in connections within specific courses
between the course content to career and other courses. Faculty in the department benefit from the modules
connecting the course to the current project which all students can see and participate. Our faculty and
other ET Departments’ faculty participating are frankly having fun and enjoy having students discover the
relevancy of curriculum and career. Faculty in our department are eager to implement the project fully and
funding this project will successfully engage the faculty in the project.

Faculty beyond our department utilizing the traditional capstone project methodology of measuring student
outcomes will have the demonstration of an alternative "backbone" methodology for developing and
measuring those design and development related outcomes. Transferring our project’s concept to faculty
outside our department requires the demonstration of the success, the student outcomes, the student
satisfaction, and the potential for retention improvement.

Qualifications

The project coordinators have diverse background and experience. Carl Lundgren has been a faculty
member for 21 years and the advisor and program chair for the lower division of the MFT and CIMET
programs for 5 years. This proposal has grown from his realization that student uneasiness and lack of
academic success is frequently the result of misconceptions of where the curriculum and career path is
leading. Professor Lundgren has also been searching for means to incorporate more emphasis on student innovation and invention in a traditionally analytically focused curriculum without compromising the necessary rigor and required program breadth.

Professor Bill Leonard is a Visiting Professor and has previously been an adjunct faculty member teaching in the MMET/PS department for the past 4 years. Prior to RIT, Mr. Leonard had a successful career at Eastman Kodak, including product design, development and realization. Currently he has a successful consulting business specializing in providing rapid prototyping and product development services. He has numerous patents and trade secrets to his design credit.

The entire Mechanical and Manufacturing Engineering Technology faculty are the other applicants for this project. Their expertise in industry and in RIT teaching is extensive and demonstrable.

Curricular Innovation

This is the first example of a comprehensive unifying theme to tie together a significant portion of the courses in this, or other, mechanical or manufacturing engineering technology curriculum. While many examples of capstone courses are available, this attempt at a “keystone” course tying and locking together large elements of a curriculum while serving two degree programs is unique.

This project will develop within the curriculum the crux of the educational goals of our programs, that our graduates will be leaders in the design, development and manufacturing fields. As a bonus, student satisfaction and retention should be improved and our attractiveness as a program increased.

Other capstone courses seek and receive industry projects for students to complete. Our intention is to have the project to be largely the result of student innovation and invention without the constraints imposed by the requirements of a benefactor. The use of a multiyear project, interconnected courses, a technical elective available at different year levels allows tailoring the Product Realization experience to student needs and capabilities.

### Implementation Timetable

| Quarter 200014 | Module development for courses (20 of 30)  
|               | Determine next product  
|               | Pilot Grant Report (not part of this funding) |
| Quarter 20021 | Complete development of modules (10 of 30)  
|               | Coordinate and manage final design issues generation 1 of product #1 |
| Quarter 20022 | Generation 1 of product #1 tooling and assembly process design  
|               | Prototype of product #2, concept development |
| Quarter 20023 | Generation 1 of product#1 manufacturing and delivery  
|               | Prototype of product #2 design and prototype production |
| Quarter 20024 | Implementation Grant Project Report Delivered |
Implementation Grant Budget Outline

Materials:

- Polyurethane Cast $2,100.00
- Silicone Rubber molding $850.00
- Wood molds $387.00
- Aluminum Stock $825.00
- Miscellaneous materials $250.00
- Prototype manufacture $300.00

Total: $4,712.00
Grants Application Budget 2002

Funds can be used for release time, student workers, and for purchasing supplies and services (such as CD pressing, video production, digitizing, photography). Funds will generally not be available for activities consistent with normal college business, doctoral research, equipment purchase or travel (though the latter will be considered if a clear connection can be demonstrated between the project and a given conference or workshop).

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| **COLLEGE SUPPORT:**  | | |
|----------------------|| |
| Support provided by college in addition to grant request, if applicable. (Explain) | | |
| College is supporting implementation of product realization at 50%. The proposal requests 50% support from the Provost's Learning Innovation Grant | | |