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.

ASSESSMENT OF LEARNING STYLES-BASED ACTIVITIES AND PROCEDURES
ON A NEW MANUFACTURING ENGINEERING COURSE

Applicant(s):

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College: Engineering
ASSESSMENT OF LEARNING STYLES-BASED ACTIVITIES AND PROCEDURES
ON A NEW MANUFACTURING ENGINEERING COURSE

DESCRIPTION

The traditional teaching schemes in engineering courses, as well as in other fields of technical instruction, do not effectively address the broad spectrum of mechanisms for capturing and processing information that is normally gathered in the same classroom. This blend of learning styles makes even more difficult the task of establishing the appropriate communicational channels with every one of the students. Understanding the way individuals learn is critically important for educational improvement. One of the challenges for academic institutions today is to assess the learning style characteristics of their students, provide the according instructional frameworks. This scenario challenges the traditional teaching methodologies and demands new tools, techniques, and creativity from professors.

A new undergraduate course is being designed for implementation in the third year of the Industrial and Systems Engineering (ISE) program. This will be a mandatory course and will be taken by all students in the program starting in Fall 2002. The course is being designed from the ground up over a period of a year and its design incorporates a collection of the better-known techniques in the field of education. These currently include, at the design phase, the Felder and Silverman index of learning styles, the Myers-Briggs type indicator, the Kolb’s learning style model, the Hermann Brain dominance instrument, Gardner’s multiple intelligences model, and the Bloom’s taxonomy. The underlying idea has been to develop a composite cognitive model that includes a blend of the ones previously mentioned, for its consequently use in designing the course syllabus (e.g. content, granularity, etc), activities (e.g. hands-on labs, videos, plant visits, etc.) and classroom procedures (e.g. cooperative learning, teamwork dynamics, etc.). In this way, it can be ensured that a true teaching around the cycle is achieved, thus impacting most, if not all, of the learning styles present in the classroom.

The objective of this study is to develop and assess a methodology for course design that is based on learning styles. A model that relies mainly on the Felder and Silverman index of learning styles and the Gardner’s multiple intelligences approach is anticipated. Smaller contributions from the Myers-Briggs type indicator and the Bloom’s taxonomy are also expected. Once the model is fully developed and the teaching cycles from historical data have been established, a comprehensive mapping of course syllabus, activities and classroom procedures will be performed to ensure significant and timely impact on the crucial learning styles and in the predetermined frequency. Preliminary data on learning styles has been collected by the PI for the past three years and from undergraduate audiences at RIT, North Carolina State University and Catholic University (Venezuela). The pilot platform for this study will be the Manufacturing Engineering course (0300-420) to be offered in Fall 2002 for the first time.

In addition, a close and continuous assessment is proposed during its first offering. Analysis and mapping of this feedback information against the activities, procedures and course content is proposed and will be used to modify and adjust them accordingly. Once validated, this iterative methodology will be repeated in future offerings and possibly expanded to other courses in the department.
TARGETED LEARNERS

The Manufacturing Engineering course (0303-420) will be a third-year mandatory course in the ISE department. Historically, the average class size of similar courses is approximately 30 students.

IMPACT ON TEACHING AND LEARNING

Since it will be possible to guarantee that the dominant learning style of each student is addressed by some of the activities and by the way the material is presented, one of the expected consequences is a high level of motivation that provokes active involvement in laboratory/class activities as well as further learning beyond the classroom. Additionally, since there is a rotation in the style in which the information is presented, the student will also be forced to intake information under conditions that are not the preferred ones. This helps in developing the mental dexterity required for successful performance in most situations (e.g. in a real working environments) where there is little or no control on how information is delivered.

An additional contribution from this work is in the direct mapping of the course syllabus, procedures and activities into the ABET accreditation criteria. In this regard, this development has been encouraged and is fully supported by the Department Head of Industrial and Systems Engineering (ISE). Additionally, and because of preliminary work in this project, the ISE Department is already using Bloom’s taxonomy for developing all the learning outcomes from all courses taught in the department. If successful, it is anticipated that the proposed approach will become standard methodology for course design across the ISE department.

MEASURES OF PROJECT IMPACT

The proposed assessment includes customized questionnaires and index forms at the beginning, middle and at the end of the course in addition to the regular feedback mechanisms. The assessment tools considered are the Felder and Silverman learning style index and the Myers-Briggs Type indicator for assessing the learning styles and the Bloom’s taxonomy for the cognitive skills and course instructional objectives. An exit questionnaire will provide data for additional correlation of the activities to the learning styles. Since this is conceived to be an iterative methodology, a redesigned phase is also anticipated to balance activities for the targeted learners. Presentations to faculty meetings at the ISE department are expected. Dissemination on ASEE conferences and possibly the Journal of Engineering Education is also anticipated.

RATIONALE

The proposed study is using the opportunity provided for designing, from the ground up, a course that will become mandatory for all students. No historically predetermined topics or bias in the instructional approach exist in this case. Also, it is innovative in the way it incorporates a multi-model approach that is mainly based on the student perspective, this is, how they process
and assimilate information. This strongly departs from the traditional approach in which course design is dictated by the history of the course and the instructor’s expertise. Again, if successful, dissemination of the findings and methods throughout the ISE department is anticipated.

Credentials: Andres Carrano is an assistant professor in the Industrial and Systems Engineering Department where he has been since 2000. He has a Ph.D. in Industrial Engineering from North Carolina State University with emphasis on manufacturing. Andres is the faculty associated to the Brinkman Manufacturing Lab (http://www.rit.edu/~brinkman/) where he has been developing a learning factory. He has a working paper titled “Cooperative learning factories and their impact on learning styles” which will be submitted to the Journal of Engineering Education”.

**TIMETABLE**

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Activity</th>
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<tbody>
<tr>
<td>June-July, 2002</td>
<td>Development of model and assessment tools</td>
</tr>
<tr>
<td>Fall Quarter, 2002</td>
<td>Implementation of approach in the Manufacturing Engineering course</td>
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<tr>
<td>December, 2002</td>
<td>Compile and summarize surveys and questionnaires. Analysis of data and refining of the activities/procedures</td>
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<tr>
<td>Academic year 2003-4</td>
<td>Second offering of the Manufacturing Engineering course with refined approach</td>
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Grant Application Budget 2003

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).

<table>
<thead>
<tr>
<th>SALARIES:</th>
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<tbody>
<tr>
<td><strong>Faculty Compensation:</strong></td>
<td><strong>Start and End Date</strong></td>
<td><strong>Total Amount</strong></td>
<td><strong>Budget Officer Verification</strong></td>
</tr>
<tr>
<td>1/4 summer = 6%</td>
<td>1 6/21/02 - 7/15/02</td>
<td>$3,900</td>
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<tr>
<td><strong>7.9% Benefits Rate Used For Summer Salary</strong></td>
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<td>$308</td>
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<td><strong>Student Assistants:</strong></td>
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<tr>
<td><strong>Other:</strong></td>
<td>(Professional services, consultant, staff support)</td>
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**SALARIES TOTAL** $4,208

| MATERIALS: | | | |

Funds are requested for purchase of surveys and questionnaires on learning styles and support videos for activities

**MATERIALS TOTAL** $2,250

| SERVICES: | | | |

Other: IITS Computer charges (Describe)

**SERVICES TOTAL** $13

**TOTAL BUDGET REQUEST** $6,471