Purdue's Engineer of 2020

2010-2011 Seed Grant Program – Request for Proposals

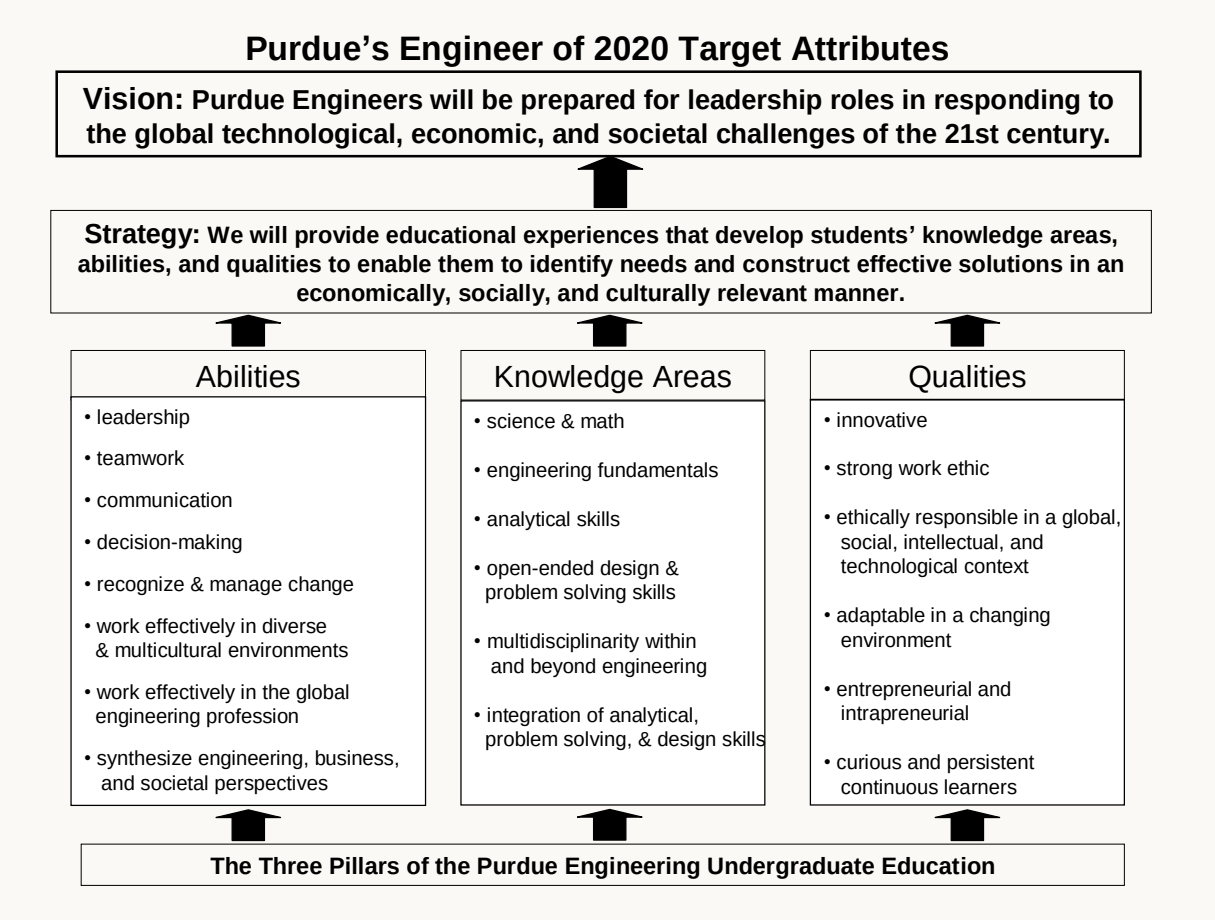
Submission Deadline: January 24, 2011.

Motivation

Purdue has a long and widely recognized tradition of educating high quality engineers, and intends to sustain that tradition. Recent national and international trends, validated by surveys of our own graduates, indicate that what is required of an excellent engineer now has evolved from past expectations (primarily solid technical skills). The attributes that characterized industry and alumni demands of engineering education in the 1970s-1980s (when Purdue was an unquestioned leader in undergraduate engineering education) have changed substantially in the past two decades. In essence, industry is seeking "renaissance engineers" who not only are technically competent, but who also have wide interests and are experts in several areas.

Objectives and Program Philosophy

Our primary program objectives are to solicit innovative proposals that will: 1) accelerate the effective and sustainable development of the target attributes of the Purdue's Engineer of 2020 in our graduates (see target attributes listed below), and 2) to foster collaboration across the College in this endeavor including broad dissemination and uptake of effective teaching and learning strategies that will achieve the goals of the Purdue Engineer of 2020.



Proposal Invitation: We are pleased to invite proposals for the 2011-2012 Seed Grant Program to conduct pilot studies in any areas related to the development of one or more of the target attributes. Funding amounts up to a maximum of $40,000 for one year can be requested. We anticipate funding five grants to help launch new initiatives to achieve the goals of the Engineer of 2020. These grants will not be extended past the one year anniversary of the award acceptance date.

It is planned that a new competition at a similar level will be held each year for the next several years.

Proposal Requirements: A 5-page (maximum including figures) project description (11 pt. font or larger) that includes:

- Objective of study
- Background literature to establish the need for and significance of the proposed project
- Evaluation plan including approach, implementation methods, expected results and assessment methods
- Plan for dissemination of findings within College of Engineering

In addition, the proposal must include (not included in the 5-page limit):

- Literature cited
- Budget and Budget justification
- 1-2 page Biosketch for each PI similar to NSF's format requirements
- A complete list of Current and Pending grants for each PI

Criteria for Assessing Proposals:

- Significance of the proposed project in relation to current knowledge
- Grounding of the proposal in current theories and knowledge on teaching and learning
- Potential impact of the work (its ability to embed the new attributes in all CoE graduates)
- Potential to gain significant funding beyond the seed grant

If you have previously received an Engineer of 2020 Seed Grant, please state the impact of that work and the funding subsequently sought.

Reporting Expectations: Awardees will be expected to submit a short mid-year report (typically in the form of a poster at next year's Engineer of 2020 Workshop), a final report (due by Oct. 30, 2012), and present results at a relevant conference and on campus. Applicants are strongly encouraged to use the results from this pilot study to seek more substantive funding to continue their work on a broader scale.

Submission Deadline is January 24, 2011. Electronic submissions can be sent to lhiggins@purdue.edu or hardcopies send to Associate Dean Mike Harris, attn. Engineer of 2020 Committee, ARMS 3007.

Announcement of Winners will be on or before February 28, 2011. The proposals will be reviewed by the Engineer of 2020 Committee and selections will be made on projects with potential for future funding or high risk projects that identify novel and important directions in this field of study. The proposals will be judged on their intellectual merit and their broader impact.

Purdue's Engineer of 2020
2011-2012 Seed Grant Program
Purdue University

Project Title: Assessing Individual Ethical Reasoning and Team Ethical Climate: Understanding their Relationship in Undergraduate Design Teams

Total Budget Requested: $39,965

Target Attribute(s) to be studied/implemented:

PI Information:
Name: William Oakes
Email: oakes@purdue.edu
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Department Head Name: William Oakes (EPICS) or David Radcliffe (ENE)
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Name: William McBride
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Campus Address: Philosophy, BRNG
Campus Phone: 49- 44285

A. Project Description:

Objective: Education in engineering has sought to incorporate the challenges introduced as engineering becomes an increasingly global profession. Interaction with more of the world's peoples and cultures introduces greater social and ethical complexity to the profession (NAE, 2011) and raises the importance of practicing engineers becoming capable ethical-decision makers and contributors to ethical team climates. Although engineers have often effectively incorporated codes of ethics into engineering practice, these codes typically focus only on common professional conventions and on establishment of broad professional standards. While they do much to set the tone for proper professional behavior, codes of ethics do not typically provide the specific guidance needed for today's (and tomorrow's) engineers to make ethically-justifiable decisions consistently in the culturally- and ethically-complex environments in which they are and will be working. For example, such codes would compel engineers to hold paramount the safety of the public (NSPE, 2011), but we still might ask "to which public does that apply?" or "to what degree?" In such cases codes of ethics do not go far enough and engineers must possess skills in ethical reasoning to more fully address the complex ethical demands of their professional environment.

As engineering educators, we are responsible for helping students develop these skills so they might transfer them into practice in the profession. Furthermore, engineering is often a team-based profession and professional engineers must be equipped to contribute positively to a well-functioning and ethical work climate. Past research has suggested a direct impact of team ethical climate on individual ethical reasoning and perhaps the reverse (Hartwell, 1995). As educators, then, we must have tools to measure both individual ethical reasoning and team ethical climate to design appropriate educational interventions and to track the growth of students as they learn. Measurement data also would allow for further research into the relationship between individual ethical reasoning skills and team ethical climate.

While several measures have been designed to assess general moral development, such as the Defining Issues Test (DIT) (Rest, Narvaez, Thoma, & Bebeau, 1999), all are intended to address ethical situations in general, rather than addressing the peculiarities of handling ethical situations in engineering. No single tool or practice has been developed to capture the range of ethical work actually done in engineering. Ethical climate is a generalized quality of the situation that exists at the macro level, whereas an engineer's perceptions and thoughts on ethical challenges operate at the micro or individual level. Our ultimate goal as educators is to develop our students' ethical reasoning skills and equip them to guide themselves through the complexities of today's global, team-based engineering profession. As a significant step in achieving that goal, our project will develop instruments to measure individual ethical reasoning and team ethical climate within an engineering education context. In the development of the instruments, the attributes under investigation are *teamwork, communication, work effectively in diverse & multicultural environments, multidisciplinarity within and beyond engineering,* and *ethical responsibility in a global, social, intellectual, and technological context*.

Background Literature: As engineering continues to expand into all the world's locations and cultures, engineers must be able to practice within a multitude of social and cultural contexts. In addition to the technical skills required, engineers must bring the social skills that will allow them to think reflexively, to quickly assess the social situation in front of them, and to decide on and put into practice the actions that are most befitting of an astute, culturally-sensitive, and ethical professional engineer. We as engineering educators are tasked with preparing students for these challenges by providing curriculum that develops an awareness of ethical, cultural, and social issues, and the ability to reason ethically within those contexts. Research has shown that the undergraduate years are particularly appropriate for this kind of training (Perez, 2007). They also are learning their professional codes of ethics explicitly in college courses and implicitly in the work that they do in class, co-op or internship, and other experiences.

Individual Ethical Reasoning*:* Undergraduate engineering programs are somewhat uniquely situated learning environments, in that they offer instruction in the technical aspects of the engineering disciplines and also commonly allow for an immersive experiential learning experience that is critical for preparation of future practitioners. When engineering students work in diverse, heterogeneous teams, employed on projects for human users, they will be asked to take into consideration the unique requirements dictated by the social contexts of their users. Their designs, and their methods of design, must be morally

responsible relevant to this context, and the engineers should be able to give reasoned explanations for why they made the ethical decisions they did. In practice, this means students must be active moral agents who are able to analyze complex social phenomena, reduce the glut of information to only the pertinent items, recognize that there are ethical issues in the situation, and engage in a process of ethical reasoning that produces a justifiable course of action. Of course, all of this requires that students have skills in ethical reasoning and have knowledge that such reasoning is required in the profession.

Research and measurement of individual ethical reasoning has been developing in the last two decades. Since the appearance of the Defining Issues Test (DIT) from the Center for the Study of Ethical Development at the University of Minnesota, researchers have had a reliable tool to measure individual moral reasoning. The DIT is based on the landmark work in developmental psychology by Lawrence Kohlberg (Colby & Kohlberg, 1987) and works by identifying the stage at which a person is able to engage in moral reasoning in relation to Kohlberg's hierarchical model. Although the Kohlbergian model on which the DIT is based is not without its critics (Gilligan, 1982), nearly all of the recent studies of individual moral reasoning have employed the tool (e.g., Abdolmohammadi, 2008; Heron, 2007; Kukoyi, 2007; Moeder, 2007,). The DIT has been proven effective in measuring general moral reasoning, but it has not been established as an effective tool in measuring reasoning within a professional context, a decidedly different social context than everyday life, that is characterized by a more specific set of behaviors considered right and wrong—behaviors often articulated in codes of ethics.

Our own preliminary research strongly suggests that general, non-engineering-specific ethical dilemmas, such as those encountered in the DIT are not seen as the same types of issues relevant to professional engineers. A student might claim, for example, that the issue of whether a man should steal much needed medicine to save his wife's life is conceptually different from considering whether to steal while on the job. The difference, the student might point out, is that engineers already work under a certain code of behavior that determines what is and what is not permissible. Any ethical reasoning in the professional context must first begin with consideration of what the code of ethics recommends, and then ask whether this behavior is something that should be respected, given the specific circumstance and the ethical principles motivating the engineer. This makes it difficult to use the DIT as a valid way of measuring how students engage in ethical reasoning in their unique professional contexts, contexts complicated by the inclusion of their own codes, their own rules, and their own norms of professional conduct.

To address this need we have begun work on developing a measurement instrument, the Ethical Reasoning Instrument (ERI), based on the successful structure of the DIT but tailored to the specific context of ethics within the engineering profession. The ERI is designed to follow the successful approach of the DIT of tying into Kohlberg's stages of moral development. The instrument features short scenarios that present students with ethical dilemmas then asks them to rate and rank a series of statements representing the types of factors students would weigh when thinking about the dilemmas. The scenarios are adapted from actual student projects and use engineering contexts such as issues of safety, design standards, and constraints of cultural norms to present ethical dilemmas. Analysis of the way students rate and rank the statements will indicate where they fall in Kohlberg's model of moral development. The ERI is intended to be used on a pre- and post-semester basis to measure the growth in student's skills after educational interventions. However, additional work is needed on the development of the instrument and in the demonstration of its validity and reliability.

Team Ethical Climate: Team level ethical influences can be evaluated by looking at the team's ethical climate, which is defined as a type of work climate that reflects the organizational procedures, policies, and practices with moral consequences (Martin & Cullen, 2006). Ethical climate manages the organization's norms, standards and practice for ethical behavior by influencing the shared perceptions of the individuals in the organization (Cullen, Parboteeah, & Victor, 2003). Ethical climate sets the tone for how individuals in a group perceive ethical issues and act on them (Victor & Cullen, 1988).

Research suggests a reciprocal relationship between the ethical climate and individual moral behavior, thus examining one without the other provides insufficient understanding of ethical decision making. According to VanSandt (2003), "Not only is an individual's overt behavior a culmination of a series of cognitive and physical processes, but a plethora of factors in the social environment also

influences the individual." Even Kohlberg recognized that the group climate was a significant factor in the ethical decision making of the individuals with the group (VanSandt, 2003). Thus when considering individual ethical reasoning within the engineering context where the typical work context is the team, an understanding of the team ethical climate is necessary.

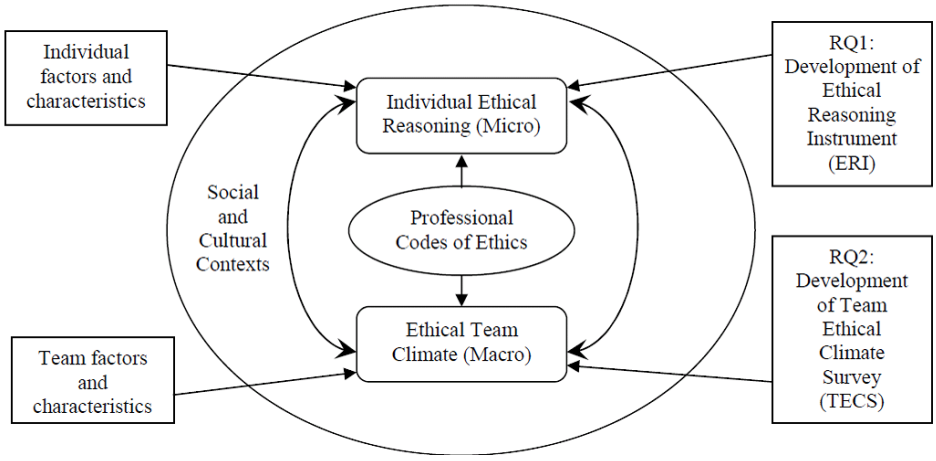
It is also important to consider the influence of the team ethical climate when investigating the impact of educational experiences. Although evidence indicates that people are likely to advance in their moral reasoning skills primarily as a result of formal education, training and development as well as organizational change, specialists note that interventions leveled at individual change may have short-term success but require similar training of the entire team or other organizational unit to be sustainable (VanSandt, 2003). In addition, ethical climate in organizations has been found to influence organizational commitment, job satisfaction, work satisfaction, and observed ethical behaviors (Elci & Alpkan, 2009; Martin & Cullen, 2006; Cullen, Parboteeah, & Victor, 2003; Trevino, Butterfield, & McCabe, 1998) and these outcomes would provide convergent measures for validity analyses.

There are a number of tools for measuring team ethical climate within professions (see, for example, Agrell, 1994; Amabile, 1996; Anderson, 1998; Klein, 2001) but none of these target STEM disciplines. The ethical climate assessment developed by Victor and Cullen (1987) has been widely used. Recently, Arnaud (2010) has developed a promising improvement to the Victor and Cullen model which addressed the criticism that the model really only measured one dimension of team climate, rather than the two ("ethical criteria and loci of analysis") that it claimed (Arnaud, 2010, p. 347). Arnaud's tool, the Ethical Climate Index (ECI), employs a Kohlbergian approach, much like the DIT, and like our own ERI. Basing the measure on Rest's (1999) identification of four dimensions of moral reasoning in Kohlberg's hierarchical model of development (moral sensitivity, moral judgment, moral motivation, and moral character) Arnaud developed questions to address each of these dimensions at the team level, rather than at the individual level which Rest's model does. The ECI looks at *collective* moral sensitivity, *collective* moral judgment, *collective* moral motivation, and *collective* moral character. However, adaptation of the ECI is needed for its application to the student project team context. Therefore, we will be developing a team ethical climate measure, the Team Ethical Climate Survey (TESC). The measurement development will include demonstrating the validity and reliability of the TESC.

Research Questions: This project will investigate two research questions:

RQ1. To what extent does Ethical Reasoning Instrument (ERI) validly and reliably assess an individual's ethical reasoning?

RQ2. To what extent does the Team Ethical Climate Survey (TECS) measure validly and reliably assess the team's ethical climate?



Evaluation Method: Our approach to assessing individual moral decision-making and team ethical climate might be called *the psychometric approach* (Allen & Yen, 2001). That is, we have created self-report measures of these concepts and propose to finish that work by rigorously assessing the reliability and validity of these measures using a mixed-method approach. The use of self-reports to assess these concepts is beneficial not only because of their efficiency (i.e., such measures are quickly administered), and they are transferrable to different contexts. This approach used in other areas of STEM education, including various physics concept inventories (e.g., Hestenes, Wells, & Swackhamer, 1992) and learning styles (Felder & Silverman, 1988). Another advantage of these measures is that they enable examination of change in team interactions and individual behaviors over time (e.g., observations of teams for a semester or more) and they also enable researchers to track team dynamics and ethical climate when new team members are introduced to projects, as typically happens in the workplace.

In collaboration with Illinois Institute of Technology, we have drafted initial measures of individual ethical reasoning and team ethical climate. However, these measures have not been validated, so our project will focus on refining, shortening, and validating these measures. Refinements include pilot-testing the instruments in new contexts, analyzing the psychometric qualities of the measures, and replacing items as needed to create precise measures appropriate across the STEM disciplines. Psychometric analyses will also assist in creating the shortest, least intrusive possible instruments, which is extremely important for practical use.

In order to establish the reliability and validity of the individual ethical reasoning and team ethical climate measures a combination of reliability analyses (e.g., coefficient alpha) and structural equation modeling (SEM; Sharma, 1996) will be employed. During the academic year, we will conduct psychometric analyses of existing data, and consultation with experts in ethical reasoning, to identify poorly functioning and construct-poor items, which will be removed. Coefficient alpha reliabilities will then be calculated at the scale and total score levels. Additional items will be added, as needed, to create pilot instruments with acceptable levels of reliability (at least 0.70, and preferably 0.80 or higher; Allen & Yen, 2001).

Using this pilot form, a sample of at least N=200 Purdue engineering students engaged in interdisciplinary teams will be tested at the beginning and end of the Fall and Spring semesters. Validation measures, such a peer ratings of ethical reasoning, reflections about lessons learned during the semester, and correlations and factor analyses with an existing measure (the DIT) will also be collected.

A second round of psychometric item analyses of the data will identify and remove poorly-performing items. Coefficient alpha reliabilities will then be calculated and compared to targets (at least 0.70, and preferably 0.80). In addition, ethics and climate assessment scores from the beginning and end of the semester will be correlated as "test-retest" reliability estimates. Based on these psychometric analyses, additional item authoring may be needed. A second major theme of these item analyses will be shortening the instrument to minimize student response time. This phase involves the same sort of psychometric item-analysis, but with a goal of shortening rather than improving precision. Ethics content experts will review the final forms to ensure that content validity has not been negatively affected. Initial validity information will then be analyzed by correlating the measured ethical reasoning at the end of the semester with peer ratings, self-reported evidence of growth in ethical reasoning, and DIT scores. Additional validity information will be extracted from the written reflections on topics of ethics. Samples of the reflections will be coded and compared to the individual and team scores on the instruments under development.

An advisory board of experts in the field will serve as internal evaluators. The advisory board members bring strong backgrounds and experience in the area of ethics and team development. The advisory board members include

Michael Davis is Senior Fellow at the Center for the Study of Ethics in the Professions and Professor of Philosophy, Illinois Institute of Technology, Chicago. Davis has published more than 160 articles.

Darcia Narvaez is an Associate Professor in the Department of Psychology at the University of Notre Dame. She is director of the Collaborative for Ethical Education.

Rachelle Hollander directs the Center for Engineering, Ethics, and Society (CEES) at the National Academy of Engineering. CEES manages the NAE Online Ethics Center (www.onlineethics.org).

The advisory board will review the pilot drafts during the summer and will meet with the project team in the fall semester to review the instruments, data from the pilots and the approach at validating the instruments.

Plan for dissemination of findings within College of Engineering

The results of the proposed work have the potential to impact many College of Engineering graduates through integration of the instruments into EPICS and other courses using design or project-based learning or courses with a significant ethics component. While the assessment tools will be developed within EPICS, results of the work will be designed to be used in other contexts.

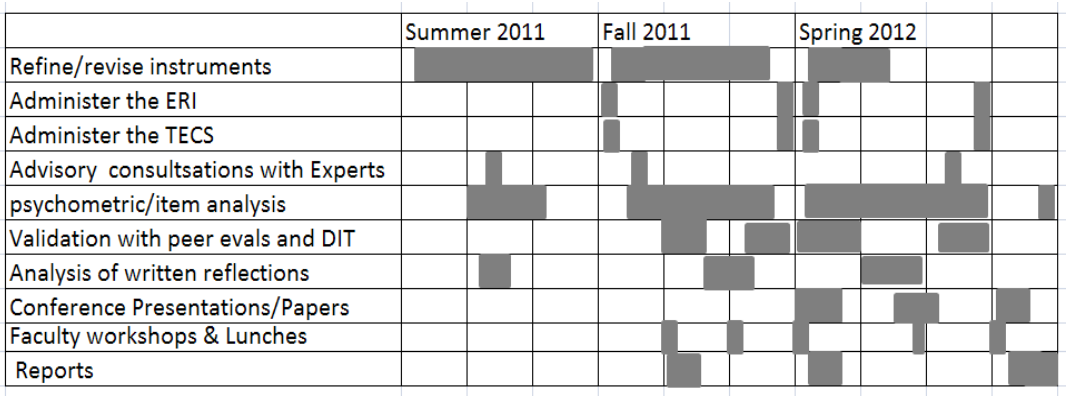
EPICS is uniquely positioned to directly impact multiple schools within the college by the fact that currently six of the schools provide faculty to teach within the EPICS program. These faculty advisors will learn about the tools during the project period as part of their participation in EPICS itself. They will be engaged during the entire project period, including the development phases. Part of the advisor training sessions will be devoted to these topics and the results of the studies. Their input and views of how it can be used in their home schools provides direct connection to the respective schools. To further disseminate the results and to engage more faculty in the development of the tools, EPICS will host workshops and luncheon discussions around the topics of ethics, moral decision making and team climate. EPICS will also post the materials on the program's website for easy access by other faculty and will assist interested faculty in adapting the materials to their own courses or curriculum.

The instruments will be presented at the Annual Conference of the American Society for Engineering Education in the summer of 2012.

This work fills a needed gap in the existing set of assessment tools. The tools will have applicability across the college with the potential for a broad national impact.

Potential Follow-on Funding: We view this proposal as seeding larger efforts that align with the goals of EPICS and the CoE. Opportunities for federal grants have been identified including the NSF REESE, TUES and IEECI. The PIs are part of an active, multi-university Phase II effort around ethics and multidisciplinary teaming and are looking at continuing with a follow-on Phase II or a larger Phase III. Grant opportunities are available both for the instrument development and also using the validated instruments to assess programs across departments and even institutions. In addition to federal grants, corporate grants and gifts will be sought to support and expand the work of this study. Current support from the Motorola and Eli Lilly Foundations are being used as part of the program to develop curricular components and a grant from National Instruments has funding an EPICS research assistant. Foundations are opportunities for significant funding with targets identified that align with these attributes. Foundations are also possible funding sources, such as the Templeton Foundation, which has a specific interest in moral decision making. Discussions are beginning and this seed grant is viewed as a strategic step in cultivating multi-million dollar asks.

Timeline



C. Personnel Requirements
Please indicate the portion of FTE that each faculty member will dedicate to the project

Faculty member	Summer 2011	Fall 2011	Spring 2012
William Oakes	20%	15%	15%
Patrice Buzzanell	20%	10%	10%
William McBride	5%	5%	5%
Carla Zoltowski	15%	15%	15%

D. Budget
Total requested is $39,965

Faculty/Staff Member Funding
Please indicate the funding (dollars and time) you are requesting for the grant for this project)

	Grant funds requested		
Faculty/Staff Name:	% Time	Fringe Benefits	$$
William Oakes	5%	$1,735.34	$6,264.77
Patrice Buzzanell	5%	$1,553.91	$5,609.80
Carla Zoltowski	5%	$1,392.66	$4,072.11
Subtotal Faculty/Staff Funding		$4,681.91	$15,946.68

Graduate Students

	Grant funds requested			
Type of position	% Time	Insurance + Fee Remit	Fringe Benefits	$$
Research Assistant	¼	$4,748.00	$658.98	$13,251.95
Subtotal Grad Student Personnel		$4,748.00	$658.98	$13,251.95

Undergraduate Student Funding
Please indicate the student resources (funding and time) you are requesting from the grant for this project.

	Grant funds requested		
Type of position	Hrs/week	Fringe Benefits	$$
Research Assistant	10	$138.06	$1,500.68
Subtotal Undergrad Student Personnel		$138.06	$1,500.68

Equipment $ Software Funding

Please list all specialized equipment and software required for the project. (Do not include standard computer equipment and commonly-available software, e.g. Microsoft Office, Microsoft Windows). Mark whether any of the equipment or software is provided by the department. (Note that only 10% of the funds can be used to purchase equipment and it needs to be dedicated to the goals of the project.	
Name of Equipment	Funds Requested
Subtotal Equipment	$0.00
Name of Software	
Subtotal Software	$0.00
Other miscellaneous items (Computer media, cables, etc)	
Subtotal miscellaneous	$0.00
Other expenses	
Consultants	$2000
Travel for dissemination	$2450
Subtotal other expenses	$4450

E. Budget Justification

Faculty and Staff time: Two weeks of summer funding for the Director and Prof. P. Buzzanell are included for time on the project. Dr. Carla Zoltowski's time as Academic Administrator is included for 5% time for the project. The effort level and funding show the leverage that EPICS is using to implement this project.

Graduate Student salary for one ¼ time RA from philosophy with experience in applied ethics is included in the proposal for one year with fee remits and insurance. This student has been selected, under the direction of Prof. McBride and has experience in EPICS and will work under the supervision of the co-PI's. The ¼ time will be matched with a ¼ time from EPICS.

$2000 is included to offset expenses for the consultant team that will advise the project and provide expert guidance for the development of the scales. Travel and $500/day consulting will be included. Additional funds for consultants will be provided by EPICS.

$2450 is included for consultation travel and trips for dissemination. These will include conferences such as the ASEE Annual and FIE conferences.

F. References

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G. PI Biosketch (1-2 pages following similar format used for NSF grants)

Biographical Sketch for William C. Oakes

Contact: EPICS Program, Purdue University
701 West Stadium Ave, West Lafayette, IN 47907-2045
Email: oakes@purdue.edu, Phone: 765-494-3892

(a) Professional Preparation

Michigan State University, Mechanical Engineering, BS, 1985
Michigan State University, Mechanical Engineering, MS, 1987
Purdue University, Mechanical Engineering, Ph.D., 1997

(b) Appointments

Associate Professor, Engineering Education, Purdue University, 2004
Associate Professor, (Courtesy), Mechanical Engineering, Purdue University, 2007
Associate Professor (Courtesy), Curriculum and Instruction, Purdue University, 2004
Director, EPICS Program, Purdue University, 2006 – present (Co-Director 1998-2006)
Assistant Professor, Freshman Engineering, Purdue University, 1997

(c) Publications

Five relevant publications

1. Coyle, Edward J., Jamieson, Leah H., Oakes, William C , "Integrating Engineering Education and Community Service: Themes for the Future of Engineering Education", *Journal of Engineering Education,* Vol. 95, No. 1, January 2006, pp. 7-11.
2. Coyle, Edward J., Jamieson, Leah H., Oakes, William C, "EPICS: Engineering Projects in Community Service", Accepted for publication in the *International Journal of Engineering Education, 2004,* Vol 21, No. 1, Feb. 2005, pp. 139-150..
3. Lima, Marybeth and Oakes, William, *Service Learning: Engineering in Your Community,* Great Lakes Press, 2005.
4. Jamieson, L., Oakes, W. and Coyle, E., *EPICS: Serving the Community Through Engineering Design Projects*, Chapter in *Learning to Serve: Promoting Civil Society Through Service Learning*. L. A. K. Simon, M. Kenny, K. Brabeck, and R. M. Lerner, editors. Norwell, MA: Kluwer Academic Publishers, 2001.
5. Titus, C., Zoltowski, C., Oakes, W. "Integrating Ethics Curriculum Within A Service-Learning Design Context" Proceedings of the 2010 ASEE Annual Conference, Louisville, KY June 2010

Five additional publications

1. *French, B. F*. & Oakes, W. "Measuring academic intrinsic motivation: Evidence of validity and reliability for a new instrument", *Journal of the First-Year Experience & Students in Transition*. Vol. 15, No. 1, pp. 83-102, 2003.
2. *French, B. F*., & Oakes, W. "Reliability and Validity Evidence for the Institutional Integration Scale", *Educational and Psychological Measurement* ,Vol. 64 No. 1, Feb. 2004
3. Oakes, W.C., Lawless, P.B. Fagan, J.R., and Fleeter, S.. "High Speed Centrifugal Compressor Surge Initiation Characterization", *AIAA Journal of Prop. and Power,* V. 18, N. 5, Sept 02, pp. 1012-1018.
4. Oakes, W., Leone, L., Gunn, C., Dilworth, J., Young, M., Diefes, H., Flori, R, Potter, M., *Engineering: Your Future,* 3rd Edition, Great Lakes Press, Okemos, Mich., 2002

5. Oakes, W., *Service-Learning in Engineering: A Resource Guidebook*, Campus Compact, Brown University, Providence, RI, 2004.

(d) Synergistic Activities

- *Engineering and Service:* Interim-director of the Engineering Projects in Community Service (EPICS) Program. Currently over 400 students from 20 departments participate in the Purdue EPICS program each year. EPICS has been adopted by seventeen other institutions (http://epicsnational.ecn.purdue.edu/) Oakes was a co-recipient of the National Academy of Engineering's Bernard M. Gordon Prize for Innovation in Engineering and Technology Education in 2005 for his work with EPICS.
- *Engineering Education:* Oakes is one of the founding research faculty members in the Department of Engineering Education that started its graduate program in the fall of 2005.
- *Introductory Engineering Texts:* Oakes has served as the lead author on an introductory engineering text targeted at first year undergraduates.
- *National service:* Oakes has served on the board of directors for the ASEE FPD and ERM Divisions, chaired the Illinois-Indiana Section of ASEE and was general co-chair for the 2005 Frontiers in Education Conference. He currently serves on the boards of the Engineers in Education for NSPE and the Corporate Industry Partnership Division of ASEE.

(e) Collaborators & Other Affiliations

R. Adams (Purdue), H. Alfaro (San Jose State), F. A. Al-Khayyal (Georgia Tech), A. Bajaj (Purdue), S. Bagchi (Purdue), K Banks (Purdue), Tridip K. Bardhan, (Morgan State), D. Berliant (Iowa State), M. Besterfield-Sacre (Pittsburgh), G.M. Bodner (Purdue), M. Borrego (Va Tech), P. Buzzanell (Purdue), Monica Cardella (Purdue), Timothy N. Cason (Purdue), J. Cawley (Case Western), G. Chen, (Morgan State), B. Colucci (UPR Mayaguez), L. A. Corson, (Purdue), E. J. Coyle (Purdue), P. Culligan (Columbia), H. Deifes-Dux (Purdue), D. Fergesen (IIT), J. Ferrante (UC San Diego), D. Follman (Purdue), B. French (Purdue), F. J. Fronczak (U. Wisconsin), J. Froyd (TAMU), J. Garton Kreuger (Purdue), Suresh Garimella (Purdue), J. Gaunt (Purdue), John Grandin (Rhode Island), Kevin Gurney, (Purdue), K. Haghighi (Purdue), J. Harbor (Purdue), S. Keith Hargrove (Morgan State), E. D. Hirleman (Purdue), A. Hoffman (WPI), E. Holloway (Purdue), Inez Hua (Purdue), P.K. Imbrie (Purdue), Ananth Iyer, (Purdue), T. Jacobius (IIT), L.H. Jamieson (Purdue), K. Jenkins (Penn State), J. Jones (Purdue), L. Katehi (Purdue), P.B. Lawless (Purdue), E. Leahey (Arizona), S. W. Lee, (Morgan State), V. Leppert (UC Merced), R. Lesh (Indiana), B. Lichfield (Illinois), M.B. Lima (LSU), S. Maller (Purdue), J. Martin (U. Wisconsin), J. Mc Gourty (Columbia), J. Murthy (Purdue), S. Nation (NSWC Crane), E. Nauman (Purdue), F. Patron (UPR Mayaguez), K. Ramani (Purdue), T. Reed-Rhoads (Purdue), A.G. Rud (Purdue), A. Samarapungavan (Purdue), S. Schaffer (Purdue), L. Shuman (Pittsburgh), L. Slivovsky (Cal Poly), M. Smith (Purdue), John P. Sullivan(Purdue), M. Tomovich (Purdue), P. Wankat (Purdue), Aman Yadav (Purdue), Jeffrey P Youngblood (Purdue), E. Zlotkowski (Bentley College), C. Zoltowski (Purdue)

Advisors: Ph.D.: Sanford Fleeter (Purdue University);
M.S.: John Lloyd (Michigan State University and U. Renz (University at Aachen, Germany)
Graduate Students and Postgraduate-Scholars: Post-Graduate: Joy Garton Kreuger (2004-2006); Ph.D. Students: Carla Zoltowski, Gregory Bucks, Michael Thompson

Biographical Sketch for Patrice M. Buzzanell

Education:

Towson University	English, Speech & Drama, Secondary Education	BS	1975
Ohio University	Interpersonal Communication		
Purdue University	Organizational Communication	Ph.D.	1987

Appointments:

2004-present	Professor	Communication	Purdue University
2003	Adjunct Professor	Communication	CIMBA, Italy
1999-2004	Associate. Professor	Communication	Purdue University
1985-2003	Instructor	Krannert Exec. Ed. Prgms.	Purdue University
1994-1999	Asst./Assoc. Prof.	Communication	Northern Illinois University
1992-1994	MBA Lecturer	Eli Broad School of Mgt.	Michigan State University
1993	MBA Lecturer	Management	University of Michigan-Flint
1992-1994	Visiting Asst. Prof.	Communication	Michigan State University
1987-1992	Assistant Professor	Communication	Marquette University

Five Most Relevant Publications:

1. P. M. Buzzanell, "Feminist discursive ethics," in G. Cheney, S. May, & D. Munshi, editors, *Handbook of Communication Ethics*, Routledge, New York, 2011, pp. 64-83.
2. J. Krueger, P. Morris, P. M. Buzzanell, & F. DeRego, "The academic advantage: Interdisciplinary faculty teams in engineering service learning," *Proceedings of the 2006 International Conference on Engineering Education Conference*, ICEE, San Juan, PR, 2006.
3. P. M. Buzzanell, E. J. Coyle, L. H. Jamieson, & W. C. Oakes, "Engineering difference: Communication in and paradoxes of multidisciplinary teams in EPICS," in *Case Studies for Organizational Communication: Understanding Communication Processes*, P. Shockley-Zalabak & J. Keyton, editors, Roxbury, Los Angeles, CA, 2004, pp. 157-167.
4. P. M. Buzzanell, "Engineering Successful Careers," Keynote Address to the first International Conference on Soft Skills Development Strategies, Birla Instititue of Technology and Science in Pilani, Rajasthan, India (Bits-Pilani), 2008.
5. P. M. Buzzanell, "Assumptions inhibiting effective communication," in *Proceedings of the Eighth Structures Congress, American Society of Civil Engineers*, R. Corotis & B. Ellingwood, editors, ASCE, Baltimore, MD, 1990, pp. 53-54.

Five Additional Significant Publications:

1. D. Carbaugh, & P. M. Buzzanell, *Distinctive Qualities in Communication Research*. Routledge, New York, 2010.
2. P. M. Buzzanell, H. Sterk, & L. Turner, *Gender in Applied Communication Contexts*, Sage, Thousand Oaks, CA, 2004.
3. P. M. Buzzanell, *Rethinking Organizational and Managerial Communication from Feminist Perspectives*, Sage, Thousand Oaks, CA, 2000.
4. L. Kisselburgh, B. Berkelaar, & P. M. Buzzanell, "Discourse, gender, and the meanings of work: Rearticulating science, technology, and engineering careers through communicative lenses," *Communication Yearbook*, Vol. 33, 2009, pp. 258-299.

5. M. Liu, & P. M. Buzzanell, "Negotiating maternity leave expectations: Perceived tensions between ethics of justice and care," *Journal of Business Communication,* Vol. 41, 2004, pp. 323-349.

Synergistic Activities:

1. *Interdisciplinary research:* Focused on organizational communication research and interventions to achieve greater participation of underrepresented minorities and to change institutional structures, policies, and processes. Commitments are evident through: Purdue (NSF) ADVANCE Diversity Catalyst and Steering Committee training on diversity, inclusion, and institutional transformation; service-learning courses, collaborative research projects, engineering management executive instruction, keynotes on engineering teams and professional development. *Awards include*: National Communication Association (NCA) Distinguished Lecture, 2010; Redding Faculty Fellow, Purdue, 2008-2010; recognition for the promotion of women in the field of Communication and at Purdue (Francine Merritt Award, NCA, 2005; Violet Haas Award, Purdue, 2003; Schleman Gold Medallion, Purdue, 2010); Outstanding Graduate Faculty (Purdue, 2005; Northern Illinois U, 1998); Excellence in Teaching (Purdue, 2004, 2009; NCA, 2008); Teacher-Mentor, Organization for the Study of Communication, Language and Gender (OSCLG), 2002); 16 Top Paper, Book, and Article Awards; Alumnus of the Year (Ohio U, 2000); Jablin Outstanding Member, International Communication Association (ICA), 2009, 1994); ICA's Redding Dissertation Award (1988).
2. *Engineering education:* PI, Engineering YES Grant in Purdue's INSPIRE program (interview and focus group data from 800 pre-K-4th graders in China, Lebanon, Belgium, and USA). Advisor of 3 teams and instructor of communication and teamwork modules in EPICS.
3. *Women in engineering, computing, and academia:* Speaker to women in campus engineering and science groups, to international audiences on STEM, and to companies about diversity.
4. *National service:* President, Council of Communication Associations; Past President, ICA; Past President, OSCLG; NCA Research Board; Editor, *Management Communication Quarterly*; Advisory Boards for 2 journals and member of 20 (11 current) Editorial Boards.

Collaborators (2007-2011): V. Agarwal (U Kentucky), W. Anderson (MI Tech), B. Bach (NCA hdq.), B. Berkelaar (Northeastern), D. Braithwaite (UNL), M. Bridgewater (U Trinidad), D. Carbaugh (U MASS), D. Cruz (USD), S. D'Enbeau (U Kansas), R. Dohrman (Maryville), J. Duckworth (Financial analyst), A. Golden (SUNY Albany), L. Harter (Ohio), M. Jackson (U U CO, Boulder), J. Jorgenson (USF), S. Kleinman (Quinnipiac U), L. Kisselburgh (Purdue), T. Kuhn (CO, Boulder), M. Liu (UMD), K. Lucas (UNL), M. Mastronardi (Northwestern), R. Meisenbach (U Missouri-Columbia), M. Pal (USF), L. Putnam (UCSB), R. Remke (Copenhagen Business School), C. Self (Oklahoma), S. Shenoy (DePaul), P. Sotorin (MI Tech), H. Sterk (Calvin), K. Stoltzfus (UCSB), M. Tagle (P. Universidad Católica), L. Turner (Marquette), J. Wang (USF), Z. Wang (McKinsey), D. Waymer (VA Tech).
Advisors: Ph.D., Linda L. Putnam (UCSB); M.A.: William F. Eadie (San Diego State U).
Advisee summary: Supervised & completed: 20 dissertations**,** 13 M.A. theses. Current advising: 9 Ph.D.s., 2 MA theses. Member of 13 current & 19 completed Ph.D. committees; 1 current & 7 completed M.A. thesis committees.
Advisees (completed 2007-2011; if coauthor, see above for university affiliation: *Ph.D.,* C Arendt (Fairfield), B. Berkelaar, R. Dohrman, S. D'Enbeau, E. Gabor (Bradley U), L. Kisselburgh, S. Shenoy, M. Tagle. ***M.A.,*** M. Bridgewater, J. Dietz (Purdue), N. Litera (manager).

Biographical Sketch for Carla B. Zoltowski

Contact: **EPICS Program, Purdue University**
701 West Stadium Ave, West Lafayette, IN 47907-2045
Email: cbz@purdue.edu, Phone: 765-494-3559

(a) Professional Preparation

Purdue University, Electrical Engineering, BS, 1985
Purdue University, Electrical Engineering, MS, 1987
Purdue University, Engineering Education, PhD, May 2010

(b) Appointments

Education Administrator, EPICS Program, Purdue University, 2003 – present
Limited-term Lecturer, Electrical Engineering, Purdue University, 2001-2003

(c) Publications

Five relevant publications

1. C. Zoltowski and W. Oakes, "Developing an Understanding of Instructors' Design Learning Philosophies in a Service-learning Context," *Proceedings of the 2007 ASEE Annual Conference,* Honolulu, HI, June 2007.
2. G. Bucks, W. Oakes, C. Zoltowski, F. DeRego, S. Mah, "Facilitating Multidisciplinary Teams in a Service-learning Environment," *Proceedings of the 2007 ASEE Annual Conference,* Honolulu, HI, June 2007.
3. S. Schaffer, K. Lei, L. Reyes, W. Oakes, C. Zoltowski, "Assessing Activity Systems of Design Teams in a Collaborative Service Learning Environment," *Proceedings of the 2007 ASEE Annual Conference,* Honolulu, HI, June 2007.
4. S. Schaffer, K. Lei, L. Reyes, W. Oakes, C. Zoltowski, "Analyzing Cross-disciplinary Design Teams," *Proceedings of the 2006 Frontiers in Education Conference*, San Diego, CA, October 2006.
5. C. Zoltowski, W. Oakes, B. Myers, "Multi-campus Collaborations Among Undergraduate Design Teams: Opportunities and Challenges," *Proceedings of the 2006 American Society for Engineering Education Annual Conference & Exposition*, Chicago, IL, June 2006.

Five additional publications

1. T. Hong, S. Maller, W. Oakes, C. Zoltowski, "Construct Validity of the EPICS Scales Across Groups: A MIMIC Modeling Investigation," *Proceedings of the 2007 ASEE Annual Conference,* Honolulu, HI, June 2007.
2. S. Maller, T. Hong, W. Oakes, C. Zoltowski, P. McDermott, "Normative Typologies of EPICS Students on ABET EC Criterion 3: A Multistage Cluster Analysis," *Proceedings of the 2007 ASEE Annual Conference,* Honolulu, HI, June 2007.
3. F. R. DeRego, Jr., C. Zoltowski, L. Jamieson, W. Oakes, "Teaching Ethics and the Social Impact of Engineering within a Capstone Course," *Proceedings of the ASEE/IEEE Frontiers in Education Conference, October 2005.*
4. C. Zoltowski, W. Oakes, L. Jamieson, "Equipping Multi-disciplinary Student Teams to Manage Multi-Semester Design Projects," *Proceedings of the 2005 ASEE Annual Conference,* Portland, OR, June 2005, 16 pages.
5. M. P. Harper, R. A. Helzerman, C. B. Zoltowski, B. L. Yeo, Y. Chan, T. Stewart, and B. L. Pellom, "Implementation Issues in the Development of the PARSEC Parser," *SOFTWARE – Practice and Experience,* Vol. 25, No. 8, August 1995, pp. 831-862.

Advisor: Ph.D.: William C. Oakes (Purdue University).

Biographical Sketch for William Leon McBride

Current Rank and Title: Arthur G. Hansen Distinguished Professor of Philosophy

Academic Training:

Georgetown University, A.B., 1959
Université de Lille, 1959-60
Yale University, M.A., 1962
Yale University, Ph.D., 1964

Career:

Yale University, Instructor, 1964-66
Yale University, Assistant Professor, 1966-70
Yale University, Associate Professor, 1970-73
Northwestern University, Summer 1972
Purdue University, Associate Professor, 1973-76
Purdue University, Professor, 1976-
Sofia University "St. Kliment Ohridski", Visiting Professor, fall 1997

Published Books:

A. Single Authorship

Fundamental Change in Law and Society: Hart and Sartre on Revolution, Mouton and Co., The Hague, 1970

The Philosophy of Marx, Hutchinson Univ. Library, London;St. Martin's Press, New York, 1977

Social Theory at a Crossroads, Duquesne University Press, Pittsburgh, 1980

Demokrati og Autoritet (with response by Robert A. Dahl), Dreyers, Oslo, 1980

Sartre's Political Theory, Indiana University Press, 1991

Social and Political Philosophy, Paragon Press, 1994

Philosophical Reflections on the Changes in Eastern Europe, Rowman & Littlefield, 1999.

From Yugoslav Praxis to Global Pathos: Anti-Hegemonic Post-Post-Marxist Essays, Rowman & Littlefield, 2001.
2010, pp. 509-520.

Selected Published Articles:

"Sartre at the Twilight of Liberal Democracy as We Have Known It," *Sartre Studies International* 11, 1/2 (2005), pp. 311-18; reprinted in book, *Sartre Today: A Centenary Celebration*, ed. A. van den Hoven & A. Leak, Oxford and New York, Berghahn, 2006 (same pagination).

"Marxian Social Justice and Resurgent Capitalist Ideology", *φιλοσοφια* (Philippines) 35, 2 (May 2006), pp. 166-75. Korean translation by Sang-Hoon Lee in *Epoch and Philosophy* XVII, 1 (spring 2006), pp. 39-52.

"Integration into What? The International Arena in Mid-2007," in *Новa Парадигма* (Ukraine) 65, 1 (2007), pp. 32-39.

"Revisiting Marx's *Capital* in the Twenty-first Century," in *The Remnant Review* 4, 1 (2008), pp. 165-87.

"The Crisis in the Rule of Law in the Contemporary American Context: A Report," in *Synthesis Philosophica* (Zagreb) 23/2 (2008), pp. 305-315.

"Comments on W. Creighton Peden, *A Good Life in a World Made Good*," in *Social Philosophy Today* 24, ed. J. Rowan (2009), pp. 171-175.

"La cuestión de la culpabilidad EE.UU.", in *Revista de la Sociedad Argentina de Filosofía* X-X, 11 (2007 – received 2009), pp. 73-80.

"El desafio de acomodarla diversidad de creencias dentro de una filosofia globalizada", in *Revista de la Sociedad Argentina de Filosofia* XII (2009), pp. 27-35.

Submission Deadline is January 24, 2011. Send this application along with the biographical sketches by either an electronic submissions to **lhiggins@purdue.edu** or hardcopies send to

Associate Dean Michael T. Harris,
attn. Engineer of 2020 Committee,
CoE Dean's Office, ARMS 3007

You will receive an email confirming receipt of your application materials.