

Leadership Development for Engineering Technology Faculty: Becoming an Educational Leader through Knowledge Generation, Application, and Contribution

Executive Summary

Leaders understand that knowledge is power. They also know knowledge creates resilience, flexibility, and adaptability, and therefore provides a competitive edge for those using and applying that knowledge. This paper explores how engineering technology faculty and administrators at two-year colleges can gain, use, and share critical knowledge of what works, and doesn't work, in technician education (TE).

Faculty members who generate, apply, and contribute their knowledge of research-in-action and effective practices give their students, their technical programs, and their colleges a strategic and competitive advantage. Knowledge shared with and by peers in the greater community of practitioners enables faculty to: 1) broaden their own knowledge base and improve their professional practice; 2) strengthen student outcomes across engineering technology courses and programs; and, 3) develop more competitive grant proposals built on an existing body of knowledge. Further, knowledge acquisition and effective dissemination informs and supports the development of leadership skills, thereby enhancing individual faculty status and visibility at home institutions and in the collective community.

This paper introduces and showcases the **Compendium of Research on Technician Education** – a new way relevant targeted research is being published and delivered to the doorstep of faculty leaders – at www.TeachingTechnicians.org. This comprehensive database resource, developed in part with funding from the National Science Foundation (NSF), includes promising and proven practices to assist two-year college faculty in keeping their teaching practice and students' learning rigorous, current, and relevant. The Compendium offers targeted research on a wide array of topics, such as TE technology programs, TE and workforce needs, and TE and student outcomes.

Motivating Rationale

Exciting innovations and shifts in thought and practice are now trending in the post-secondary teaching profession. Two-year college faculty in engineering/engineering technology disciplines can now easily adapt and enhance their: 1) Teaching practices through research and evidenced-based design and outcomes; and 2) Competitive national and local research and development efforts. Faculty leaders can do this through increased scholarship efforts and activities. This paper examines the context and confluence of two motivating trends, and one ready-to-use strategic resource for STEM faculty leaders pursuing the scholarship of teaching and learning.

The two motivating trends are: 1) The body of work and practices known as “Scholarship of Teaching and Learning;¹ and 2) The need for strong, competitive teaching professionals at two-year colleges who continue to develop their faculty leadership skills through knowledge generation, acquisition, and contribution to the greater community of teachers and scholars. The one ready-to-use strategic resource is: SC ATE’s **Compendium of Research on Technician Education**. See www.teachingtechnicians.org for link to Compendium.

Research-based design, practice, assessment, and implementation is *how the scholarship of teaching and learning translates* into STEM faculty leaders advancing their own and others’ scholarship and the teaching profession as a whole.² Fairweather’s commissioned paper, “Linking Evidence and Promising Practices in Science, Technology, Engineering, and Mathematics (STEM) Undergraduate Education: A Status Report for the National Academies Research Council Board of Science Education,” is an excellent source of current state-of-the-profession ideas and strategies for using evidence-based design, and advancing scholarship, teaching, and learning.

Faculty leaders actively participate in, and give back to, the larger community through scholarship and dissemination for peers. These shared contributions of teaching profession practices, strategies, and experiences become available and usable in both the scholarly community and the general community. SC ATE is leading the way in research on TE.³ SC ATE invites and facilitates more faculty leaders, and “teachers-as-scholars,” into the greater TE and scholarship of teaching and learning community.⁴

Faculty Leadership Development through Scholarship

The specific aspect of leadership we are addressing is the need for STEM faculty members to develop themselves as faculty leaders. One key approach to this leadership development is through increased scholarship, and by faculty leaders becoming active participants and contributors to the greater community involved with TE research. The SC ATE Center, and its collective work in TE and the academic community, supports engineering/engineering technology faculty professional development through scholarship. This approach can help drive successful teaching and learning outcomes for students, programs, and their colleges nationwide.

SC ATE continues to advance STEM faculty leadership development through its: 1) Research on TE; and 2) Dissemination of promising practices and evidence-based design and assessment throughout the broader academic and educational community. SC ATE has learned, through generous funding from the National Science Foundation (NSF) of applied research and development activities, that when faculty document and share their research and practices, they become stronger, more competitive **faculty leaders** for their students, peers, colleges, and communities.⁵ When faculty are engaged with the scholarship of teaching and learning, they strengthen and develop themselves. They develop themselves personally and professionally as faculty leaders in the community--with and for their students, peers, and colleges.

The Compendium of Research on Technician Education (TE)

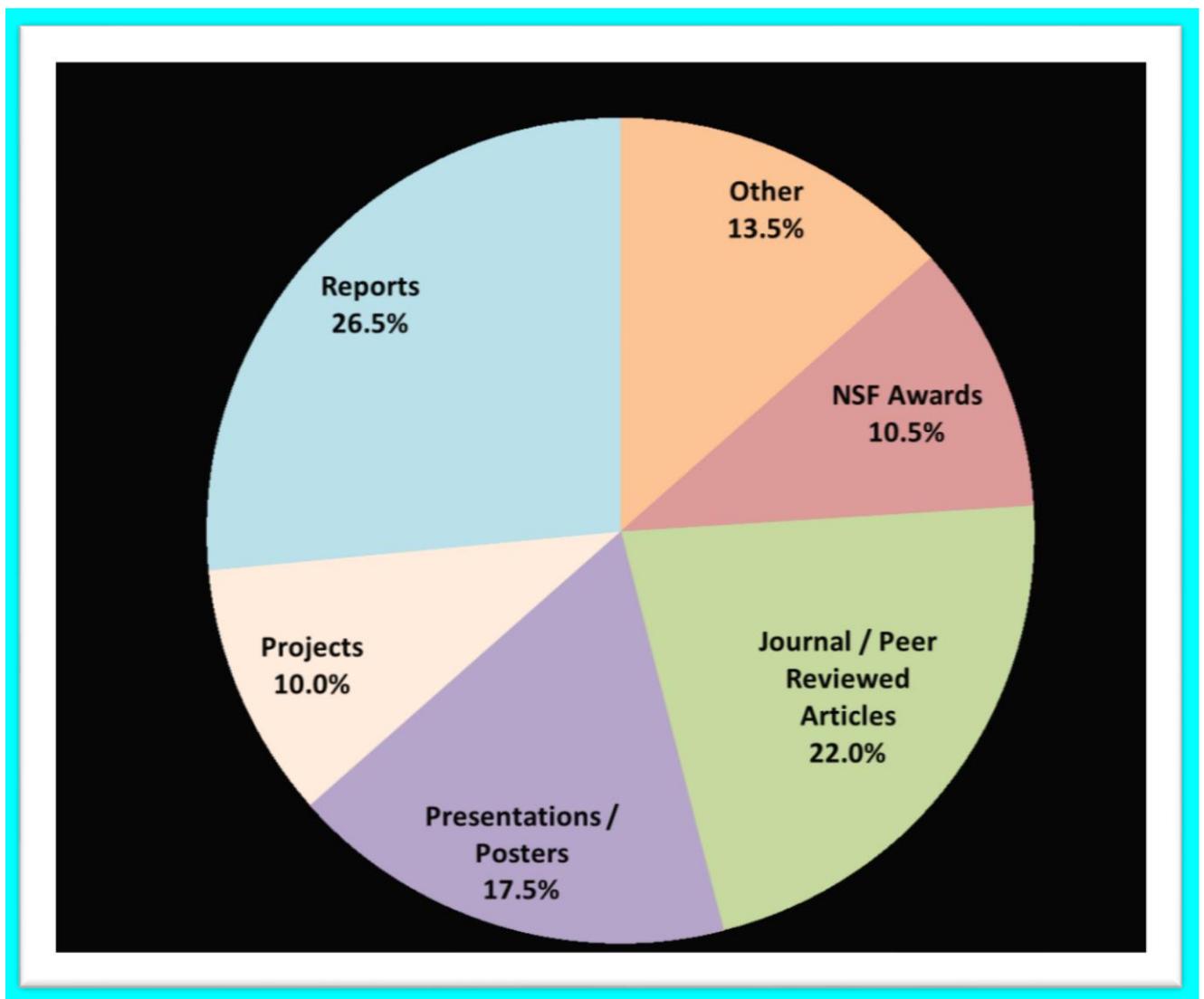
The Compendium is a rich and targeted database of specific research content that supports, enhances, and improves ongoing scholarship of teaching and learning for TE. The Compendium enables engineering/engineering technology faculty to mine research sources on TE and expand their current knowledge base and practices. The Compendium Methods Report outlines key processes, sources, and stakeholder groups used to identify available technician education research resources.⁶

The Compendium resources include research on a broad spectrum of rich topics, from: students, student recruitment, retention; to research on innovations in scholarship/teaching/learning,

measuring student success and outcomes; and effectiveness and sustainability of TE centers and projects; to accessible, trending ideas for learner-centered programs and problem-based learning methods such as case studies.

The following chart shows the breakdown of types of resources within the **Compendium of Research on Technician Education**. See full Compendium Methods Report at:

www.teachingtechnicians.org. The Compendium Methods Report provides an in-depth background on the database's design, development, and alignment with strategic Technician Education (TE) research sources.



Sample search/research entries range from: “Maximizing Retention in Engineering/Engineering Technology” to “Using Problem-based Learning to Modify Curriculum to Meet Industry Needs” to “Learning and the New Workplace: Impacts of Technology Change on Postsecondary and Technical Education.”

Searches within TE can be tailored to specific program and/or course needs for up-to-date and pertinent models, examples, and implementation practices. The ability to customize searches can also assist faculty in developing competitive grant concepts and strong, evidence- and research-based proposals. Faculty accessing and searching the Compendium can use the research findings in multiple ways to enhance their work and improve program success. In addition, faculty members can become active contributors to the Compendium, thereby expanding the body of knowledge generated and applied in the field, and gaining or expanding their own leadership skills.

What the Compendium Offers

The Compendium offers direct faculty access to the latest Science and TE, and STEM and TE connections. With the Compendium, faculty leader colleagues can: 1) Expand their own knowledge base; 2) Inform and improve their teaching profession practice and scholarship; and 3) Use the research and content from the Compendium to develop and write competitive grants. Use of the Compendium potentially increases a faculty leader’s “scholarship quotient” through hands-on research and practices, and via dissemination to peers and/or peer reviews.

In turn, scholarship can increase faculty leadership and visibility, recognition, and hopefully reward, at their home college and among colleagues nationwide. Engineering/engineering technology faculty leaders can easily engage and advance their research and scholarship by accessing and using the Compendium. Being able to use and contribute to the Compendium will hopefully bring to light the recognition of two-year faculty members’ work as faculty and faculty leaders in the profession.

The Compendium enables faculty leaders to access and use the latest applied research on a comprehensive set of topics, tools, and sources. The Compendium database was designed to be an accessible and evidence-based research “engine.” The engine allows and assists engineering/engineering faculty leaders to **immediately use** the latest TE research and practices.

The Compendium boosts and supports faculty leaders conducting their own research; facilitates strategic literature reviews of other scholars/faculty leaders' contributions; and finally, delivers a wealth of application ideas and new knowledge (research-in-action) on programs, methods, and implementation strategies.

SC ATE invites engineering/engineering technology faculty leaders to “play around with” the actual database at <http://www.teachingtechnicians.org/Resources/PPP/>. Just type in search words like “experiential learning” or “sustainability” or “evidence-based design,” and see what happens.

Here are screen shots of a search for “females” using the Compendium:



Here are partial results of the search:



Search results for "females" showing two entries:

- 2006 STEM Recruitment Survey**
Author: Edmonds Community College
Abstract: As part of our ATE grant (DUE # 0501971), we conducted a two-week online survey using SurveyMonkey.com in February 2006. Our sample for this survey consisted active ATE projects and centers funded under DUE in the 2006-2007 academic year. We required each grant in the sample to have started before 6/30/06 and been in operation until at least 12/31/06 to allow for the preparation of activities. Special grants concerning such topics as research, library collections, and planning grants, were exclu...
[VIEW DETAILS](#) [DOWNLOAD FILE](#)
- Innovative Technical College-Industry Partnerships Impact the Bottom Line of Recruiting Technicians**
Author: Elaine L. Craft
Abstract: An innovative education/economic development partnership to attract students into engineering technology careers is being led by the South Carolina Advanced Technological Education (SC ATE) Center of Excellence, South Carolina's technical colleges and local industries. This partnership is taking place at multiple levels: • Industry leaders have been active participants developing and refining a new engineering technology curriculum to ensure workplace relevance and classroom environments th...
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And here are each of the abstracts pulled up and available for reading and downloading:



Full abstract for "2006 STEM Recruitment Survey":

Author: Edmonds Community College
Title: 2006 STEM Recruitment Survey
Year: 2006
Place Published: Lynwood, WA
Publisher: Edmonds Community College
Pages: 11
Document Type: Report

Abstract: As part of our ATE grant (DUE # 0501971), we conducted a two-week online survey using SurveyMonkey.com in February 2006. Our sample for this survey consisted active ATE projects and centers funded under DUE in the 2006-2007 academic year. We required each grant in the sample to have started before 6/30/06 and been in operation until at least 12/31/06 to allow for the preparation of activities. Special grants concerning such topics as research, library collections, and planning grants, were excluded from the sample, because they were not expected to be doing recruitment. This left 202 projects and centers to which email invitations were sent. The final number of respondents participating in the survey was 81 of which 47 (58%) completed the entire survey. 10 emailed saying they do not target women specifically, and 8 more emailed with technical issues. We responded to the technical issues and encouraged those who experienced them to complete the survey. The total response rate for the survey was 45% (81 out of 202). There were thirteen questions in the survey. The results of the first close ended question show that the majority of respondents recruit the following underrepresented populations: women specifically (71.4%), Blacks/Africans (61.0%), and Hispanics (56.4%). The results of the second close ended question show that the majority of respondents recruit students in high school (75.6%), followed closely with 2-year college students

2008 STEM Recruitment Survey

Summary

As part of our ATE grant (DUE # 0501971), we conducted a two-week online survey using SurveyMonkey.com in February 2008. Our sample for this survey consisted active ATE projects and centers funded under DUE in the 2006-2007 academic year. We required each grant in the sample to have started before 6/30/06 and been in operation until at least 12/31/06 to allow for the preparation of activities. Special grants concerning such topics as research, library collections, and planning grants, were excluded from the sample, because they were not expected to be doing recruitment. This left 202 projects and centers to which email invitations were sent. The final number of respondents participating in the survey was 81 of which 47 (58%) completed the entire survey. 10 emailed saying they do not target women specifically, and 8 more emailed with technical issues. We responded to the technical issues and encouraged those who experienced them to complete the survey. The total response rate for the survey was 45% (91 out of 202).

There were thirteen questions in the survey. The results of the first close ended question show that the majority of respondents recruit the following underrepresented populations: women specifically (71.4%), Blacks/Africans (61.0%), and Hispanics (58.4%). The results of the second close ended question show that the majority of respondents recruit students in high school (75.6%), followed closely with 2-year college students (59.0%), and people already in or

When engineering/engineering faculty use the Compendium, they demonstrate leadership by helping to sustain and invigorate the practice and profession of teaching and TE. This is the essence of scholarship in teaching and learning. Scholarly teachers' teaching and learning practices integrate evidence-gathering and reporting, research methods, and relevant standards with the discipline and profession. As faculty leaders use the Compendium and their own and others' state-of-the-art research, they advance scholarship, teaching, and learning, along with their own personal and professional practice.

Dissemination for faculty leaders sharing good work can be local (within the TE department, college, or state) to regional and national (e.g., professional annual conferences). Scholarship results may be peer-reviewed and published for broader impact and contribution.

Using the Compendium of Research on TE

It is easy to benefit from, and contribute to, the Compendium of Research on TE, and thus enhance and improve scholarship in teaching and learning practice – by virtue of use of this handy and strategic tool/resource. Here is the basic process for knowledge search, retrieval, and implementation for applied research and scholarship gains. Faculty leaders:

- 1) Decide what is relevant to their topic/program/discipline/grant proposal.
- 2) Discover what can be found in an active review of the literature.
- 3) Extract some jewels that can help inform their work; implement and assess them.
- 4) Raise research questions for future investigation and work. What to study next?
- 5) Share results, outcomes, and inquiries (new learning and achievement in practice) with peers and colleagues for broad impact.

It is vital to collaborate with others, present and disseminate with and through others. It takes the proverbial “village” of individuals/faculty leaders to advance and sustain scholarship in teaching and learning for generations to come. Engineering/engineering technology faculty can reap great benefit from an enhanced, informed approach to scholarship at the same time they can actively benefit from, and contribute to, the Compendium of Research on Technician Education. In doing so, they participate in the wider community of scholars and educators.

The Compendium is designed to grow as the community of practice grows and adds value to the scholarship of teaching and learning, especially in relation to TE.⁶ The Compendium for TE is organized to promote and support proven and promising practices among engineering and engineering technology faculty. With this growing database of easy-to-access and rich content of research on TE, faculty can use the database and body of work, to inform and improve their practice. Further, faculty can develop and distinguish themselves, becoming an integral and active part of the legacy of work as the database is improved and expanded (future versions) over time. This ensures broad impact throughout the TE community, led by faculty leaders sharing research and practices.

The TE Community and Future Work

Using and expanding the Compendium supports the national picture on innovative TE and the growing trend toward increased scholarship goals and activities among two-year college engineering/engineering technology faculty. Developing STEM faculty as faculty leaders within two-year colleges and programs can be a strategic and competitive direction for community colleges and the greater education community.

An ongoing and rigorous look into the scholarship of teaching and learning may well raise more research questions for future work. This is important and appropriate. It is incumbent upon engineering/engineering faculty to advance their own knowledge base and professional practice.

Accessing and applying targeted research and knowledge gained from using the Compendium will help support faculty leaders, and engineering/engineering technology educators and their students nationwide. Additionally, evidence-based assessment and broad dissemination of TE outcomes and inquiries will help ensure broad impact of the Compendium and TE research over time.

References

1. Carnegie Academy for the Scholarship of Teaching and Learning (CASTL). <http://www.carnegiefoundation.org/scholarship-teaching-learning>
2. James Fairweather, Center for Adult and Higher Education, Michigan State University. http://7.nationalacademies.org/bose/Fairweather_CommissionedPaper.pdf
3. SC ATE National Resource Center for Expanding Excellence in Technician Education (National Science Foundation, DUE#1003733). www.teachingtechnicians.org
4. Mentor-Connect: Leadership Development and Outreach for ATE (National Science Foundation DUE#1204463). www.teachingtechnicians.org
5. Bhattacharya, S., Alfeld, C., & Feldbaum, M. "Technician Training Trajectories: Employment Outcomes of Advanced Technician Education Programs." 05/15/2011-04/30/2012, 2012, Paper presented at the annual meeting of the American Educational Research Association, Vancouver, April 2012. (Conference Paper)
6. Bragg, Debra D. (2012). "Career and Technical Education." In *Understanding Community Colleges*, edited by John S. Levin and S Kater, 187-202. Routledge/Taylor Francis. (Book Chapter)