STEM FACULTY DEVELOPMENT WORKSHOP

Annotated Bibliography

Daniel M. Alston

Notes:

This annotated bibliography is broken up by the threads and sub-threads attended to in the upcoming workshop. Within the given threads and sub-threads, articles are alphabetized by author name. Each article is also delineated into type of faculty work: teaching (T), research (R), service (S), leadership (L), or a combination of these. Along with these categorizations, the context and findings of most of the articles is also supplied. This information was obtained directly from the articles. This was done in an attempt to guarantee the integrity of the articles.

Thread: Inputs

Sub-Thread: Engagement

T	Brewer, C and D. Smith, eds. (2011). Vision and Change in Undergraduate Biology Education 1-80. American Association for the Advancement of Science. Washington, DC

Context: On July 15-17, 2009, more than 500 biology faculty from two- and four-year colleges and universities, researchers, administrators, students and other stakeholders in the future of undergraduate biology education met in Washington, DC. Hosted by the AAAS, with support from the NSF and input from representatives of the Howard Hughes Medical Institute (HHMI) and National Institutes of Health (NIH), the meeting set out to mobilize the nation's educators to ensure that the undergraduate biology they teach in their classrooms reflects the biology they practice in their labs and in the field.
Findings: Introductory biology courses lay the foundation for study in the major, and are often the only college exposure to science for students majoring in other disciplines. Consequently, the scientific process should be introduced to students early in their studies and be integrated throughout all their undergraduate biology courses. To develop an appreciation of the process of science, research experiences should be an integral component of biology education for all students, regardless of their major. Core concepts and competencies should be fostered throughout the curriculum, with well-defined learning outcomes developed for each. Students should gain competency in all recommended areas but be expected to develop high-level expertise in only a few. Concept maps can be extremely helpful in communicating how students experience the introduction and expansion of these concepts through the curriculum. To meet the educational and societal challenges ahead, all stakeholders need to understand the critical role biology courses play in undergraduate education for all students, and make a commitment to improving the quality of that education. In a great irony, the academy itself may be the last obstacle to improving biology education for all students. Thus, raising the profile of science education within biology departments and ensuring the academic culture values both teaching and learning should be everyone's highest priorities, truly a cultural change on many campuses.

TRS	Fairweather, J. (2002). The Mythologies of Faculty Productivity: Implications for Institutional Policy and Decision Making. J. Higher Educ. v. 73 no. 1 26-48

Context: Data obtained in the 1992-1993 National Survey of Postsecondary Faculty. Examined 29,764 part- and full-time faculty in 962 two- and four-year colleges and universities. In all 25,780 full- and part-time faculty from 817 institutions responded. Both public and independent universities were represented. Also universities ranged from research universities to liberal arts colleges. Department chairs were omitted from the data set.
Findings: RQ1:There is variation in teaching and research productivity by type of institution and program area. Publishing productivity ranged from a high of about six refereed publications during the previous two years for faculty members at research universities to a low of less than two publications in the same time period for faculty at liberal arts colleges. Across all types of 4-year institutions, publishing different by program area. In a 2-year period 1.49 pubs in fine arts to 5.08 in health sciences. Faculty who work at liberal arts colleges produced the least number of total student contact hours in Fall term 1992 (which signifies

small class sizes), whereas faculty members in other four-year institutions produced significantly larger numbers of contact hours. Student contact hours randged from a high of about 537 in health sciences to a low ofa bout 223 in engineering. Womean were less likely than men to be highly productive teachers (t=2.67,p< .01) or researchers (t=3.43,p<0.001). Minority faculty members were as likely as majority faculty members to be designated highly productive researchers less likely to be highly productive teachers (t=2.40,p<0.05).RQ2:In 1992-1993 about 22% of all faculty in 4-year institutions simultaneously attained high productivity in teaching and research. This did not vary substantially by institution type. Slightly more men attained to this group (t= -2.40,p< 0.05) and so did non-minorities (t=-2.61,p<0.01).	
RS	Gonzales, L. D., & Rincones, R. (2012). Interdisciplinary scholars: Negotiating legitimacy at the core and from the margins. Journal of Further and Higher Education, 36(4), 495-518.
Context: The data used for this paper is drawn from a larger MSP evaluation project carried out by a research center at Southern University. Limited sample to those returned in 2008 (n=19) and 2009 (n=45). They also conducted interviews to gather a deeper understanding. Used interviews from 2005-6 (n=8) and 2007-8 (n=5). 2008 participants: Majority of respondents were male (13), all had a doctoral degree, majority were assistant professors (8), 6 were associate professors, 3 faculty were full professors, and 2 were lecturers. 10 had not received tenure at the time of the survey. 2009 survey respondents: 29 were male, 16 were female. All had obtained a doctoral degree. Most (24) were tenure-track assistant professors while 12 were full professors and another 6 were associate professors; a few were lecturers. **Findings:** Data showed that boundary crossers assume great personal responsibility as their university failed to make firm structural or policy-based reforms in support of this particular initiative. Personal responsibility manifests in three distinct ways: working overtime, unpacking one's work, and framing one's work as a public good.	
TRS	Mamiseishvili, K., & Rosser, V. J. (2010). International and citizen faculty in the United States: An examination of their productivity at research universities. Research in Higher Education, 51(1), 88.
Context: Utilizes the 2004 National Study of Postsecondary Faculty (NSOPF:04) data set. From this data set, 1,640 faculty members were used (820 full-time international faculty members, 820 full-time citizen faculty members). Faculty members were from research intensive and extensive universities. **Findings:** Results indicated that international faculty members were significantly more productive in research, but less productive in teaching and service than their U.S. citizen colleagues. Found that female international academics were signficantly more engaged in undergraduate teaching than male international academics. International tenured professors were significantly more engaged in service than their untenured international colleagues. International assistant and associate professors were signficantly more engaged in graduate instruction than their international colleagues at the full professor rank.	
T	McKenna, A. F., Yalvac, B., & Light, G. J. (2009). The role of collaborative reflection on shaping engineering faculty teaching approaches. Journal of Engineering Education, 98(1), 17-26.
Context: The participants of this study were engineering faculty who engaged in the work of the Engineering Research Center (ERC). For comparison purposes, they also collected data from faculty who were not formally affiliated with the ERC activities. ERC faculty (n=24) and	

non-ERC faculty (n=30). Total number of female faculty was 12 and male faculty was 42. 22 assistant professors, 8 associate professors, 2 lecturer/adjunct faculty, 22 full professors.
Findings: Finding reveal the role that collaborative reflection plays in shaping teaching approaches. Results from this study provide insights for researchers and other practitioners in engineering and higher education interested in implementing engineering faculty development programs to optimize the impact of teaching.

TRS	ann Rosch, T., & Reich, J. N. (1996). The enculturation of new faculty in higher education: A comparative investigation of three academic departments. Research in Higher Education, 37(1), 115-131.

Context: Questionnaire was distributed to all faculty in the three departments involved in the study. The qualitative portion involved three new faculty. One in each department.
Findings: (pre-arrival stage): Expectations were formulated regarding the new setting based on three interacting factors: the values acquired during graduate training; the role disposition formulated in graduate training; and the differences in the training experiences of each candidate. While professional values are acquired during graduate training, role orientation appears to be tentatively formulated. Role orientations adopted by the new faculty were dissimilar. Role orientations were formulated as each individual weighed the role orientation espoused in graduate school against personal values. (encounter stage): Individual preconceptions were unconsciously formulated to reflect the professional values and role disposition of each new candidate. This suggests that if cognitive distortions occurred during the interview and selection process this information may have been unconsciously underwritten to affirm personal satisfaction of job choice and to facilitate individual assimilation. (adaptation): New faculty reported few deliberate supports were provided to assist them. Three primary socialization dimensions arose: the work itself, the relationship network surround the work, and the climate in which the work was performed. Given such limited direction, new faculty drew from their student experiences as they became immersed in the realities of teaching. (commitment): Cognitive conflicts heightened the new faculty's sensitivities for exploring, diagnosing, and interpreting cultural aspects of their home department. As they reflected upon experiences they did not expect to encounter in the new setting, they learned about the assumptions, beliefs, and practices of the academic community they had joined. In all three cases, the perceptions of new faculty clearly reflected elements of culture cited previously by current faculty in the questionnaire.

TRSL	van Emmerick, H., & Sanders, K. (2004). Social embeddedness and job performance. Human Resource Management Journal. 14(1), 40-54.

Context: Study took place at a Dutch university. 509 participants responded to a survey. 59% were female and 41% were male, 49% were non-tenured and 32% were tenured. Mean age of non-tenured faculty members was 32.08 years and of tenured was 43.04 years.
Findings: Employees' efforts to perform well can be explained by social embeddedness. Temporal embeddedness appears to be important in explaining the job performance efforts of tenured faculty members while network embeddedness seems important in explaining the efforts of non-tenured faculty members. Institutional embeddedness explained the efforts of both groups of faculty members.

T	Arreola, R. A., Theall, M., & Aleamoni, L. M. (2003). Beyond Scholarship: Recognizing the Multiple Roles of the Professoriate. AERA Annual Convention. Chicago, IL.
Context: Article focused on faculty and the fact they have a myriad of roles to embody at universities. **Findings:** Although the skills and knowledge associated with a faculty member's base profession (i.e., content expertise, techniques for keeping current in the field, practice and/or clinical skills appropriate to the field, research skills and techniques appropriate to the field) are necessary for effective college teaching, they are insufficient. In its full professional expression college teaching has been found to require at least four different, though related professional dimensions: Base profession skills, instructional design skills, instructional delivery skills, instructional assessment skills.	

Thread: Inputs	
Sub-thread: Institutional Expectations	
TRSL	Allen-Ramdial, S. A. A., & Campbell, A. G. (2014). Reimagining the pipeline: advancing STEM diversity, persistence, and success. BioScience, biu076.
Findings: They highlight strategies for building agency of the scientific community to achieve greater diversity by focusing on 4 key action areas: 1) aligning institutional culture and climate; 2) building interinstitutional partnerships; 3) building and sustaining critical mass; 4) ensuring, rewarding, and maximizing faculty involvement.	
T	Association of American Colleges and Universities. 2002. Greater expectations: A new vision for learning as a nation goes to college. Association of American Colleges and Universities Washington, DC.
Context: The report calls for a dramatic reorganization of undergraduate education to ensure that all college aspirants receive not just access to college, but an education of lasting value. The panel offers a new vision will promote the kind of learning students need to meet emerging challenges in the workplace, in a diverse democracy, and in an interconnected world. The report also proposes a series of specific actions and collaboration to raise substantially the quality of student learning in college. **Findings:** At the center of Greater Expectations is an analysis of the challenges facing higher education and an honest appraisal of our successes and failure in meeting them. This report speaks to college in the 21st century, barriers to quality from school to college, the learning students need for the 21st Century, principles of good practice in the new academy, and achieve greater expectations.	
TRS	Austin, A. E. (2002). Preparing the next generation of faculty: Graduate school as socialization to the academic career. The Journal of Higher Education, 73(1), 94-122.
Context: Discusses using a specific study she worked on, as well as, looking at quantitative studies to support what she saw in her study. Her study was a 4-year qualitative study. There were 79 graduate students from three different universities. Two of the universities were research oriented and one primarily prepares teachers. Participants were from various disciplines (e.g., humanities, social sciences, sciences, professional areas). **Findings:** The results discussed show disconnect between the preparation of graduate students and the academic environments. Graduate students typically receive a lot of preparation in the area of research and publishing but not much assistance in the areas of teaching and service.	
T	Barnett, L., & San Felice, F. (2006). Teaching by Choice: Cultivating Exemplary Community College STEM Faculty. American Association of Community Colleges. One Dupont Circle NW Suite 410, Washington, DC 20036.
Findings: This report speaks to key aspects that community colleges should attend to regarding students of STEM fields. These aspects include: learning environment, recruitment, professional development, retention, adjunct faculty, partnerships, national pathways.	
T	Borrego, M., Froyd, J. E., & Hall, T. S. (2010). Diffusion of engineering education innovations: A survey of awareness and adoption rates in US engineering departments. Journal of Engineering Education, 99(3), 185-207.

Context: U.S. engineering department chairs (n=197) were surveyed. 72% were at extensive/intensive research institutions, 13% at masters, 15% at others. **Findings:** Overall, the awareness rate of engineering education innovations was 82%, while the adoption rate was 47%. 82% of engineering departments employ student-active pedagogies. Mechanical and civil engineering had the highest rates, in part due to many design-related innovations in the survey. Few differences by institution type were evident. In the past, word of mouth and presentations were for more effective than publications in alerting department chairs to engineering education innovations. Department chairs cited financial resources, faculty time and attitudes, and student satisfaction and learning as major consideration in adoption decisions.	
TRSL	Bouwma-Gearhart, J., Sitomer, A, Fisher, K.Q., Smith, Christina, Koretsky, M. (2016). Studying organizational change: Rigorous attention to complex systems via a multi-theoretical research model. Paper presented at the American Society of Engineering Education. New Orleans, LA.
Context: 142 survey responses from tenure-line and non-tenure line in seven STEM units. 18 participants that engaged in educator interviews and teaching observations. These educators were adopting and adapting EBIPs in six STEM units. 13 administrators engaged in interviews. These participants were in six STEM units and one college, two were center directors, and one vice provost. **Findings:** They identify the need for a multi-theoretical research model that allows researchers to more rigorously describe potential for organizational change at the start of an educational change intervention in higher education and to document change over time. They also propose a multi-theoretical model that remedies noted ontological, epistemological, and methodological limitations to studying change in postsecondary education organizations, better attending to the multi-dimensional, multi-level organizational phenomena and factors we determined to be important (see Figure 3 on page 14).	
RS	Fleming, S. S., Goldman, A. W., Correli, S. J., & Taylor, C. J. (2016). Settling In: The Role of Individual and Departmental Tactics in the Development of New Faculty Networks. The Journal of Higher Education, 87(4), 544-572.
Context: 34 untenured, tenure-track faculty members at a large (over 20,000) students and over 1,500 faculty), highly competitive, research university in the NE U.S. 41% were women, 58.8% were men. Faculty were from the fields of engineering; physical, biological, and social science; and the humanities. **Findings:** While individual faculty differ in how active and intentional they are in creating their social networks, departments matter just as much, if not more. They developed a typology that categorizes faculty as either active networkers or reluctant networkers and departments as either enhancing or dampening new faculty integration. They also identified seven factors that affect faculty experiences in network formation and the text to which faculty feel integrated into their department. The factors include: 1) department culture and department chair; 2) mentoring; 3) research collaboration; 4) degree of interdisciplinarity of the participant's field; 5) physical location of the participant's office; 6) degree of involvement in department committee work; 7) breadth of the participant's peer network.	
T	Kezar, A., & Maxey, D. (2015). Adapting by design: Creating faculty roles and defining faculty work to ensure an intentional future for colleges and universities. Retrieved from The Delphi Project web site http://www. uscrossier.

	org/pullias/wp-content/uploads/2015/06/DELPHI-PROJECT_ADAPTING-BY-DESIGN_2ED. pdf.
Findings: The backward design process articulated in the report presents a method for considering what the faculty out to look like in order for an institution to address its various stakeholder priorities and the important aspects of its mission.	
T	Lattuca, L. R., Bergom, I., & Knight, D. B. (2014). Professional development, departmental contexts, and use of instructional strategies. Journal of Engineering Education, 103(4), 549-572.
Context: Nationally representative survey data of 906 tenured or tenure-track engineering faculty members from 31 four-year institutions. 85% male, 15% female, 55% white, 14% naturalized U.S. citizen, 13% foreign national, 9% Asian American, 4% underrepresented minority, 5% other, 46% full professor, 28% associate professor, 25% assistant professor. **Findings:** PD activities and, to a lesser extent, graduate training in teaching positively related to the use of student-centered teaching practices. First evidence provided that graduate training in teaching is linked to the use of student-centered teaching practices. Only modest relationships were observed between departmental environments and teaching practices.	
TR	Litzinger, T. A. & Lattuca, L. R. 2014. Cambridge Handbook of Engineering Education and Research Translating research to widespread practice in engineering education. 375-392. Cambridge University Press. New York, NY.
Context: This handbook is the critical reference source for the growing field of engineering education research, feature the work of world luminaries writing to define and inform this emerging field. The handbook draws extensively on contemporary research in the learning sciences, examining how technology affects learners and learning environments, and the role of social contexts in learning.	
T	Matz, R. L., & Jardeleza, S. E. (2016). Examining the Role of Leadership in an Undergraduate Biology Institutional Reform Initiative. CBE-Life Sciences Education, 15(4), ar57.
Context: Research-intensive university (RIU), a large 4-year public university with very high research activity. The undergraduate enrollment in RIU's Natural Science College is ~5000 students. There are nine unique departments involved in biology education at RIU. **Findings:** Found that easing the burden of an undergraduate education reform initiative on faculty through articulating clear outcomes, developing shared vision across stakeholders on how to achieve those outcomes, providing appropriate reward systems, and ensuring faculty have ample opportunity to influence the initiative all appear to increase the success of reform. An extended model of change is presented that moves from change in STEM instructional strategies to STEM organizational change strategies.	
TRS	Mutisya,P. M., Osler II, J. E., Bitting, P. F., & Rotich, J. P. (2014). The Need for a Conceptual Framework for Leadership and Shared Governance between Faculty and Administrators. International Journal of Process Education. 6 (1), 43-52. Academy of Process Educators.

Context: Faculty at North Carolina Central University **Findings:** The Process Education-based Compass of Higher Education is affirmed as a conceptual framework for diffusing current tensions surrounding shared governance. Helpful administrator and faculty actions are mapped within five points of the compass: self-development, learner development, institutional development, intellectual development, and faculty development.	
T	Nebres, F. B., Cheng, S. Y., Osterwalder, K., & Wu, H. H. (2006). The role of mathematicians in K-12 mathematics education. In International Congress of Mathematicians, ICM 2006, Madrid, Spain.
Findings: The challenge of the mathematics educator and the school teacher is to customize mathematics to students' needs. The role, in turn, of the university mathematician is to customize mathematics for the different needs of their students.	
TR	Prince, M. J., Felder, R. M., & Brent, R. (2007). Does faculty research improve undergraduate teaching? An analysis of existing and potential synergies. Journal of Engineering Education, 96(4), 283-294.
Context: Literature reviewed on the current state of the research-teaching nexus. **Findings:** Several meta-analyses of the literature on the research-teaching nexus discredit the notion that faculty research productivity improves students' educational experience. Faculty research is not widely and effectively integrated into undergraduate courses. There are barriers to doing so in engineering and the sciences, and when integration does occur it may have both positive and negative effects on the quality of instruction. Undergraduate research produces several documented educational benefits: some studies show that research involvement improves student retention (notably that of African-Americans) in academic programs and influences students to pursue graduate study, but there is little direct evidence that it enhances learning and skill development and benefits of research normally reach only a limited subset of the student body. They provide several recommendations for strengthening the research-teaching nexus.	
TRS	Reybold, L. E. (2003). Pathways to the professorate: The development of faculty identity in education. Innovative Higher Education, 27(4), 235-252.
Context: This study includes 30 participants at 14 institutions. Data was collected from 22 doctoral students and 8 new faculty. **Findings:** Each participant exhibits a dominant faculty identity archetype, or pathway to the professorate. Five dominant identity archetypes were identified: 8upport8, pilgrim, visionary, philosopher, and drifter. Annointed: The doctoral program is a formal apprenticeship toward the professorate and is generally initiated by a faculty mentor. The 8upport8 devotes considerable time and energy to the primary professional goal of establishing and maintaining a relationship with the mentor. Pilgrim: The doctoral program is experienced as a carefully planned journey to the professorate. This plan is strategic, concentrating on the accumulation of academic experiences commensurate with a faculty position. Faculty mentors may be utilized as resources to accomplish these strategic goals, but any mentoring association between the student and faculty member is more functional than relational. Visionary: The doctoral program is a calling toward a higher goal to be accomplished through the professorate. The students characterize their future faculty position, particularly their teaching and research roles, as a forum for achieving social change or educational reform. Philosopher:	

Becoming a professor is a personal quest for intellectual growth and enlightenment. The philosopher's goal is to encourage their students and colleagues toward their own quest for personal development. Drifter: They express no singular commitment to academe. The professorate is neither an ultimate goal nor a penultimate bridge to some greater personal or social cause.	
TRSL	Seltzer, R. (2015). The Coach's Guide for Women Professors. Stylus Publishing. Reston, VA.
Context: Using telling but disguised vignettes of the experiences of women she has mentored, Rena Seltzer offers insights and strategies for managing the situations that all women face. **Findings:** This is a practical guide for women in academe – whether adjuncts, professors or administrators – who often encounter barriers and hostility, especially if women of color, and generally carry a heavier load of service, as well as household and care responsibilities, than their male colleagues. Rena Seltzer, a respected life coach and trainer who has worked with women professors and academic leaders for many years, offers succinct advice on how you can prioritize the multiplicity of demands on your life, negotiate better, create support networks, and move your career forward.	
TRS	Shagrir, L. (2012). How Evaluation Processes Affect the Professional Development of Five Teachers in Higher Education. Journal of the Scholarship of Teaching and Learning, 12(1), 23-35.
Context: Participants in the study were 5 tenure-track faculty (4 women; 1 man) who taught undergraduates. Their experience ranged from 1-10 years. Each participant had a mentor who they could talk to about challenges they were facing and who could provide them with assistance in becoming proficient at their faculty positions. **Findings:** RQ1 & 2: Faculty members were involved in all three activities (Research, Service, and Teaching) but to different extents due to seniority. 1-2 year faculty prioritized teaching. They were still in the pre-research stage (e.g., scouting out research topics and writing for grants). More than 2 years of seniority resulted in faculty taking part in more research and service. RQ3: The majority found that the evaluation/expectations for reappointment and tenure motivated them to engage in these practices. They felt obligated and deprived of choice. They considered scholarship to be an obligation and only did the minimum. However, one of the veteran teachers said evaluation was not a motivator but just wanting to be an effective faculty member caused her to engage in teaching, research, and service.	

Thread: Inputs

Sub-thread: Motivation

TRS	Åkerlind, G. S. (2005). Academic growth and development-How do university academics experience it?. Higher Education, 50(1), 1-32.

Context: 28 academics were interviewed. All were on teaching and research appointments at a traditional research intensive university in Australia. 18 men, 10 women. Faculty experience from a few months to 35 years. 6 social sciences, 2 economic/commerce, 8 natural sciences, 8 humanities/languages, 4 information sciences. 12 tenured/tenureable appointments, 12 fixed-term (3-5 years), 4 short-term (12 months).
Findings: The group as a whole showed a range of views of academic development, representing in particular a varying focus on: academic performance, in terms of increasing work output, academic standing or work quality; personal learning, in terms of ongoing accumulation of new knowledge and skills or increasing depth of understanding in one's field of study; disciplinary or social change, in terms of contributions to one's field of study or a relevant social community.

T	Bouwma-Gearhart, J. (2012). Research university STEM faculty members' motivation to engage in teaching professional development: Building the choir through an appeal to extrinsic motivation and ego. Journal of Science Education and Technology, 21(5), 558-570.

Context: 12 science and engineering faculty at one research university who have voluntarily been engaged in a teaching PD. 4 were assistant professors; 4 were associate professors; 4 were full professors. 4 males; 8 females.
Findings: Faculty members were motivated to engage in teaching professional development due to extrinsic motivations, mainly a weakened professional ego, and sought to bring their teaching identities in better concordance with their researcher identities.

TR	Bozeman, B., & Gaughan, M. (2011). Job satisfaction among university faculty: Individual, work, and institutional determinants. The Journal of Higher Education, 82(2), 154-186.

Context: This is a study on research faculty in the U.S. This study was conducted in 2004-2005. Population was tenured and tenure-track faculty members in research extensive universities. Faculty were in STEM disciplines: biology, computer sciences, agriculture, and sociology, and different fields of engineering (i.e., chemical, civil, electrical, materials, and mechanical). There was a total of 1,794 respondents.
Findings: The results were that job satisfaction was tied to whether faculty felt respected by their co-workers, if they felt their pay reflected their market value, if they were tenured, gender (with males being more satisfied in their jobs than females). Working with industry, having center affiliation, being married, hours teaching undergraduate, and being an engineer are not predictors of job satisfaction.

T	Brownell, S. E., & Tanner, K. D. (2012). Barriers to faculty pedagogical change: Lack of training, time, incentives, and… tensions with professional identity?. CBE-Life Sciences Education, 11(4), 339-346.

Findings: Suggest that professional teaching identity can be deemphasized by working in an environment where research is prioritized and leads to a higher professional status, both within the confines of the institution and within the larger context of the discipline. They also suggest that participation in teaching or research is often seen as a choice, as a set of alternatives rather than an integrated whole. They note that if scientists do not consider teaching as a part of their professional identities, then how can we expect them to change theory own teaching and even more importantly, support and encourage other to change as well?	
TRS	Campbell, C. M., & O'Meara, K. (2014). Faculty Agency: Departmental Contexts that Matter in Faculty Careers Research in Higher Education 55(1)49-74.
Context: Site: Large, public, research-extensive institution in the mid-Atlantic region. Data was collected as a part of the MAU Faculty Work Environment Survey. Sample included tenure or tenure-track (n=488) faculty at MAU. 43% were female and 57% were male. 9% Asian American, 3% Black/African American, 5% Hispanic, 3% International, 78% White, <1% Multi-racial, and 3% unreported. 24% were Assistant Professors, 32% were Associate Professors, and 44% were Full Professors. **Findings:** Results showed that faculty perceptions of certain departmental contexts do matter in faculty career agency, such as work-life climate, person-department fit, and professional development resources. The contexts have a particular influence on faculty agentic perspective. Results also showed a large effect of agentic perspective on agentic action.	
T	Gess-Newsome, J., Southerland, S. A., Johnston, A. and Woodbury, S. (2003). Educational Reform, Personal Practical Theories, and Dissatisfaction: The Anatomy of Change in College Science Teaching. American Educational Research Journal. 40(3), 731-767.
Context: 3 college science faculty members who taught a class (The Natural World) with 19 students. 17 of the students were of European ancestry and 2 were African American. 11 were pursuing their college education full time, 8 had full-time employment in addition to their school duties, and 3 were second-career students. Two students planned to major in science; another was pursuing a secondary education certificate. Of the 17 non-science majors, four were majoring in elementary education. One of the faculty members is a physicist and chemist, one was a biologist, and one was a physicist. **Findings:** Results suggest that grant-supported mitigation of structural barriers is a necessary but insufficient precursor to change and that personal practical theories are the most powerful influence on instructional practice. Findings highlight the crucial role of pedagogical and contextual dissatisfaction in creating a context for fundamental change.	
TRSL	Gibbs Jr., K. D., & Griffin, K. A. (2013). What do I want to be with my Ph.D.? The roles of personal values and structural dynamics in shaping the career interests of recent biomedical science Ph.D. graduates. CBE Life Sciences Education. 12(4), 711-723.
Context: 38 biomedical scientists who received PhDs between 2006 and 2011, including 23 women and 18 individuals from underrepresented minority (URM) backgrounds. **Findings:** Objective performance and quality of advisor relationships were not significantly different between scientists with high versus low interest in faculty careers. Career interests were fluid and formed in environments that generally lacked structured career development. Vicarious learning shaped similar outcome expectations about academic careers for all	

scientists; however, women and URMs recounted additional, distinct experiences and expectations. Scientists pursuing faculty careers described personal values, which differed by social identity, as their primary driver. For scientists with low interest in faculty careers, a combination of values, shared across social identify, and structural dynamics of biomedical workforce played determinative roles.	
T	Gilmore, J., Maher, M., Feldon, D., & Timmerman, B. (2014). Exploration of factors related to the development of science, technology, engineering, and mathematics graduate teaching assistants' teaching orientations. Studies in Higher Education. 39(10), 1910-1928.
Context: 65 graduate teaching assistants (GTAs) from STEM fields. Participants were enrolled in STEM masters and doctoral programs at three universities. 2 institutions are located in the Southeastern USA, including a research-extensive university. Participants worked as traditional university-level GTAs (n=32), co-taught in middle school through the Graduate Teaching Fellows in K-12 Education program or a similar university-funded program that mirrors GK-12 (n=20 and 8, respectively), or were full-time teachers in K-12 education or at local colleges in STEM (n=5). The sample was heavily weighted toward I sciences (55.4%) and engineering (18.5%). Over 60% of participants were first-year graduate students, and 20% were non-native speakers of English. **Findings:** Mentor involvement in teaching and departmental/university training and support for teaching were significantly related to change in teaching orientation toward more student-centered beliefs. Surprisingly, neither the duration of GTAs' prior teaching or research experience were significantly related to change in teaching orientation over time. Mentor involvement in GTAs' teaching was positively associated with change in teaching orientation. The relationship between departmental or university training for teaching and teaching orientation change was not significant.	
TRSL	Gonzales, L. D., & Terosky, A. L. (2016). From the Faculty Perspective: Defining, Earning, and Maintaining Legitimacy Across Academia. Teachers College Record. 118 (July) 1-33.
Context: Faculty members across 2 community colleges (n=14), 2 regional comprehensive universities (n=17), 1 liberal arts colleges (n=1), and 1 high activity research university (n=10). 39 tenured professors and 12 tenure-track faculty. 32 women and 18 men. 8 faculty identified as underrepresented People of Color. **Findings:** Found that all faculty members, regardless of institution type, discipline, or tenure status, held ideas as to what constitutes legitimate work/legitimacy within academia. Determined that professors spend most of their time describing professional legitimacy. Professional legitimacy seemed to be contingent on 1) research, 2) institutional type. However, faculty also described what can be understood as normative legitimacy, which is an endorsement granted when one conforms to implicit cultural rules and ideals held by any community of relevance. Normative legitimacy seemed to be granted to professors who presented themselves as selfless, ideal workers who could account for and maximize their productivity.	
TS	Griffin, K. A., Pérez II, D., Holmes, A. P. E., & Mayo, C. E. P. (2010). Investing in the future: The importance of faculty mentoring in the development of students of color in STEM Students of color in STEM: Engineering a new research agenda. New Directions for Institutional Research. No. 147. Pp. 95-103. Jossey-Bass. San Francisco, CA.

Context: Phase 1: All Black respondents to the 2004 Higher Education Research Institute at UCLA (HERI) Faculty Survey (1,465 professors employed at over 200 different institutions across the U.S.). Of the total, 320 were faculty in STEM-related fields; 258 were employed at PWIs. Phase 2: 28 Black professors employed at 2 PWI of similar size and academic mission. **Findings:** Participants described various sources of support and strategies that facilitated their success in STEM, including personal motivation and drive, family members who encouraged their educational goals, a strong sense of intellectual curiosity, and a desire to make a contribution to their respective fields. Consistent across all interviews was a shared expression of the significance of mentoring and advising to long-term success in STEM.	
N/A	Jett, C. C. (2013). HBCUs propel African American male mathematics majors. Journal of African American Studies, 17(2), 189-205.
Context: Participants for this study included 4 African American men who met the following criteria: 1) self-identify as an African American man, 2) have majored in mathematics as an undergraduate student, 3) be currently pursuing a graduate degree in mathematics or mathematics education. **Findings:** Highlights the importance of HBCUs in producing successful African American male mathematics majors. Findings provide evidence that HBCUs provide supportive structures, mechanisms, and people, especially African American male mathematics professors, who contribute to the mathematical success of African American male mathematics majors.	
TRSL	Kegen, N. V. (2015). Cohesive subgroups in academic networks: Unveiling clique integration of top-level female and male researchers. Scientometrics, 103(3), 897-922.
Context: RQ1: Participants showed significant increases$F(1,144 = 31.03, p < 0.001$, partial eta squared = 0.177; by the end of the seminar in their views of service-learning as a practice that enhances student development across a variety of domains, provides benefits to the community, and enriches their own instructional efforts.RQ2:Participants showed significant increases$F(1,135 = 202.36$, $p < 0.001$, partial eta squared = 0.600; in knowledge of key programmatic components of service learning (e.g., distinctions of service-learning from other forms of experiential education, role of reflection, elements of high quality practice) The participants also indicated their efficacy in managing the various components needed for a successful service-learningn experience. Participants also repored a statistically significant change in self-evaluated skill in working with community partners$F(1,131 = 102.00$, $p < 0.001$, partial eta squared = 0.438.RQ3:Participants began with positive views of support for service-learning at their instituions; however, by the end of the learning community seminar, the participants showed significantly greater awareness of this 13upport$(1,144 = 22.59$, $p < 0.001$, partial eta squared = 0.136.RQ4:Pre-test scores were lowest for this scale; however participants came to an increased awareness that service-learning could contriburte to their teaching, research, and service at the institution $F(1,133 = 21.98$, $p < 0.001$, partial eta squared = 0.142. **Findings:** Results imply that the general hypothesis of unfavorably embedded female researchers cannot be supported. Although women are less integrated in scientific cliques, the majority is involved in an inner social circle which enables access to career-relevant network resources.	

TRSL	Lester, J. (2016). Complexity of work-life identities and policy development: Implications for work-life in higher education. New Directions for Higher Education 2016(176) 7 97-105. Jossey-Bass. San Francisco, CA.
Findings: What is revealed across the chapters is an acknowledgement of the multi-faceted and abstract nature of the ideal-worker phenomenon. The conception of organizations as gendered is introduced. Ideal-worker norm, framed around the traditional life patterns of men, excludes most mothers of childbearing age. Discussion of gender salary inequities that were justified by the prevailing assumption that women faculty with children were less productive than men. Discussion of the need to look beyond parenting and to begin a discourse on work-life as an issue of health, caring for aging parents, and balance for all, including those individuals without children. Also discussed the need to complicate work-life beyond conversations of gender to a more intersectional view of identities. Lastly, a discussion was broached regarding the role of the academic department in the ways in which individuals are or are not able to experience work-life balance.	
T	Luft, J.A., Bang, E.J., & Hewson, P.W. (2016). Help yourself, help your students. The Science Teacher. 83(1)49-53.
Findings: In order to determine if a PDP is a good fit, science teachers should ask themselves questions about the PDP's design, whether the PDP will improve teacher knowledge, and whether the PDP will improve teacher instruction.	
T	Luft, J.A, & Hewson, P.W. (2014). Research on teacher professional development programs in science. In S. K. Abell & N. Lederman (Eds.), Handbook of Research in Science Education 2nd edition, 889-909. Routledge. New York.
Findings: The content of PDP's for science teachers should focus on a discipline, and consist of domains and knowledge. National context is also important to consider, as there is a global call for scientifically oriented citizens in our ever-changing world. The process within a PDP for science teachers includes setting goals, planning, enacting, looking at outcomes, and reflecting on the entire process. There is a need for reporting standards in the area of PDP research. Standards should include a clear statement about the orientation of the research as associated with the PDP. Standards for research involving PDPs should also require clear statements about the PDP. Standards in professional development research should also include suggestions or implications that have some pragmatic value.	
TR	Matusovich, H. M., Paretti, M. C., McNair, E. D., & Hixson, C. (2014) .Faculty motivation: A gateway to transforming engineering education. Journal of Engineering Education. 103(2) 183-361.
Context: Two participant sources: Networking Conference [n=164; approximately half of the respondents indicated affiliation with engineering education research programs and half with programs promoting research experiences for undergraduates and K-12 teachers. 60% were PI or co-Pis, 20% were graduates students, 6.6% were K-12 teachers, 1% were undergraduates. Approximately half of the respondents identified more with research, while a third of them positioned themselves at the center, balancing teaching and research]. Change Conference [n=20 faculty and staff from large, small, public, and private institutions; included academic disciplines such as science, engineering, and mathematics; some held administrative positions.	

14 men and 4 women; respondents were predominantly tenured or tenure-track faculty (61%). Six months after the workshop, 11 respondents completed a follow-up survey.] **Findings:** Identified expectancy of success and cost value and utility value as important to participants. Notably, the same motivation constructs generally matter for research, practice, and research-informed practice, although practice-informed research was nearly absent from the data. Regarding expectancy of success respondents said the conferences helped them in the areas of "How to" knowledge and interdisciplinary/interpersonal. They still wanted support regarding content knowledge. Regarding cost value, respondents said the conferences supported them in dealing with the factor of time but they needed more support in the factor of achieving tenure. Regarding utility value, respondents said the conference supported them in the factor of support from administrators/peers but needed more support regarding the factor of funding.	
N/A	McGee, E. O., & Martin, D. B. (2011). "You would not believe what I have to go through to prove my intellectual value!" Stereotype management among academically successful Black mathematics and engineering students. American Educational Research Journal, 48(6), 1347-1389.
Context: 23 black mathematics and engineering college students (juniors, seniors, graduate students) from four Midwestern universities. 14 males; 9 females; age ranged from 19-45. 4 males and 2 females were attending graduate school. Of the 6 graduate students, 3 were in master's programs, and the other 3 students were in PhD-level mathematics or engineering programs. **Findings:** Although stereotype management facilitated success in these domains, the students maintained an intense and perpetual state of awareness that their racial identities and Blackness are undervalued and constantly under assault within mathematics and engineering contexts. With age development and maturity, the students progressed from being preoccupied with attempts to prove stereotypes wrong to adopting more self-defined reasons to achieve. The results suggest that stereotype threat is not deterministic.	
T	Nelson, C. E. (2010). Dysfunctional illusions of rigor: Lessons from the scholarship of teaching and learning. To improve the academy: Resources for faculty, instructional, and organizational development, 28, 177-192.
Findings: Dysfunctional Illusion of rigor 1: Hard courses weed out weak students. When students fail it is primarily due to inability, weak preparation, or lack of effort. More realistic view: When students fail it is often due to inappropriate pedagogy. Dysfunctional illusion of rigor 2: Traditional methods of instruction offer effective ways of teaching content to undergraduates. More realistic view: Evidence is equally clear that these conventional methods are not as effective as some other far less frequently used methods. Dysfunctional illusion of rigor 3: Massive grade inflation is a corruption of standards. More realistic view: We need to distinguish between bad grade inflation from more effective pedagogy and consequently improved achievement. We need a lot more of the good kind of grade inflation. Dysfuntional illusion of rigor 4: Students should come to us knowing how to read, write, and do essay and multiple-choice questions. More realistic view: Each of us needs to teach our students how to read pertinent materials and evaluate arguments and evidence. Dysfuntional illusion of rigor 5: Traditional methods of instruction are unbiased and equally fair to a range of diverse students of good ability. More realistic view: Traditional methods of instruction factor students who have had multiple AP courses and have otherwise had the exceptional preparation for college offered by elite high schools. Dysfuntional illusion of rigor 6: It is essential that students hand	

in papers on time and take exams on time. More realistic view: Giving limited time flexibility on some assignments and a limited number of repeats on exams can be a way of fostering increased achievement and increasing fairness. Dysfunctional illusions of rigor 7: If we cover more content, the students will learn more content. More realistic view: The best courses are those that most successfully achieve the outcomes we see as most important.	
TRSL	O'Meara, K., Bennett, J. C., & Neihaus, E. (2016). Left unsaid: The role of work expectations and psychological contracts in faculty careers and departure. The Review of Higher Education. 39(2), 269-297. Johns Hopkins University Press. Baltimore, MD.
Context: 33 faculty who were leaving a Land Grant University (LGU). The LGU is highly selective in terms of admissions, serves approximately 40,000 students, and engages in extensive research activity. 33% men, 67% women, 58% white, 27% Asian/Pacific Islander, 9% Black/African American, 6% Hispanic, 76% Assistant Professor, 24% Associate Professor. **Findings:** Early career faculty members entered their careers wanting and expecting some degree of community, collaboration, mentors, and colleagues to work with inside their departments. Regarding collaboration, faculty described the greatest expectations and most contracts regrading research. Early career participants expected help to obtain research grants, learn new research techniques, and publish articles, and in some cases felt their colleagues were obliged to provide it. Faculty members entered their academic appointments with strong expectations for fairness in how their work would be evaluated. Participants did not expect or think it was fair for standards to change while on the tenure track. Finally, they found a continuum of expectations regarding resources, from the very general sense that faculty members of color would be given additional research funding, to transactional psychological contracts regarding funding for labs in exchange for hard work. Unmet expectations and broken contracts shaped the departure decisions of leaving faculty.	
TRSL	O'Meara, K., & Campbell, C. M. (2011). Faculty sense of agency in decisions about work and family. The Review of Higher Education, 34(3), 447-476.
Context: Conducted 20 interviews with 5 men and 15 women at one research university that had initiated parental leave policy for academic parents five years prior to the study. 10 were assistant professors, 7 were associate professors, 2 were lecturers, and 1 was a full professor. All but two were tenured or tenure track. **Findings:** Found that factors that inhibited a sense of faculty agency in making parental-leave decisions and in other work/family balance decisions included: the presence or lack of role models, department norms and culture for or against care-giving, and temporally related perceptions of personal and professional capital at the time of decision-making. Also found a factor less often explored in relationship to agency and balance of work/family issues in academe: the faculty members' flexibility or rigidity in personal and professional expectations. With each factor, they found faculty members' sense of agency in decision-making highly influence by their past. Also women faculty's sense of agency closely tied to gender relationship to the realities of pregnancy in terms of timing, health of child and mother, and the physical nature and immediacy of the experience; and the perceptions of being "mommy tracked" by colleagues. Academic parents also made decisions that were influenced by other factor such as the nature of their research, challenges related to having more than one child, the constraints of a being part of a dual-career couple or having a stay-at-home spouse, and	

other factors specific to their individual work-lives. Gender was a major factor influencing the scaffolding that supported faculty members' sense of agency in balancing work and family in ways that felt satisfying.	
N/A	Price, J. (2010). The effect of instructor race and gender on student persistence in STEM fields. Economics of Education Review, 29(6), 901-910.
Context: Data from public four-year universities in the state of Ohio **Findings:** Results indicate that black students are more likely to persist in a STEM major if they have a STEM course taught by a black instructor. Female students are less likely to persist when more of their STEM courses are taught by female instructors.	
TRS	Rosser, V. J., & Tabata, L. N. (2010). An examination of faculty work: Conceptual and theoretical frameworks in the literature. In Higher education: Handbook of theory and research (pp. 449-475). Springer Netherlands.
Context: This review takes into account various quant and qual studies, as well as conceptual pieces to discuss and inform readers regarding frameworks used to investigate faculty workload and productivity. **Findings:** The authors discussed each aspect of faculty workload including teaching, research, and service. They synthesize research that informs the reader about past findings that should inform current practice or policy. They also present research specific to faculty workload (i.e., time spent on professionally appropriate activities, duties assigned or completed); faculty productivity (i.e., research productivity, number of publications produced in a year or a lifetime); job satisfaction (i.e., emotional reaction to a particular job, combination of various attitudes held by an individual employee at a given time); Morale (i.e., a group's psychological state characterized by confidence, enthusiasm, discipline, willingness to work, and related attributes); Intent to Leave-a good indicator of actual turnover and impacted by individual characteristics reflecting demographic and work factors, contextual variables reflecting individual stature and adjustment to the work environment, and the multiple dimensions of organizational and career satisfaction; Impact of Technology and Distance Education-looked at through diffusion theory; and Faculty Culture-impacted by four contributing subcultures (i.e., culture of the discipline, culture of the academic profession, culture of the academy as an organization, culture of institutional types).	
T	Sattler, B., Turns, J., & Gygi, K. (2009, October). How do engineering educators take student difference into account?. In Frontiers in Education Conference, 2009. FIE'09. 39th IEEE (pp. 1-6). IEEE.
Context: Data were collected from 31 engineering educators at a large public institution in the Northwest. Participants were surveyed and interviews were conducted based on the Critical Decision Method where participants were asked to identify critical incidents. **Findings:** RQ1: Every participant took difference into account. Difference was a small concern, ranging from 3% to 25% in the context of the overall interview. RQ2: Educators took into account a variety of student differences. The most frequent being class standing, level of interest in a subject matter, and behavior. RQ3: Data revealed that there is little evidence of educators differentiating students based on the type of ""educationally relevant differences that seem to populate research literature (e.g., learning styles, approaches to learning and orientations to studying, and intellectual development).	

T	Sunal, D. W., Sunal, C. S., Whitaker, K. W., Freeman, L. M., Odell, M., Hodges, J., Edwards, L., & Johnston, R. A. (2001). Teaching Science in Higher Education: Faculty Professional Development and Barriers to Change. School Science and Mathematics. 101(5), 246-257
Context: The professional development process involved faculty cognitive perceptions of learning, teaching skills, and pedagogical knowledge, as well as faculty culture in teaching undergraduate science courses. 75 faculty from 30 institutions were selected to be involved in this study. **Findings:** Results found that faculty members who described their role of instructor as a facilitator of learning were significantly more likely to plan and implement course change and participate in the course development process. Faculty members with greater knowledge of effective teaching strategies and clearer ideas about planning and carrying out change in college courses were significantly more likely to implement change in their courses. Faculty members with higher personal efficacy during the elicitation phase of the development process were found to be more likely to create change and implement innovative modifications to courses they taught during the reflection and reconstruction process. No differences were found on any of the instruments, with institution variables including size, type, department, team size, or years in the program. Barriers to successful change included: knowledge of pedagogy, innovative course design, and the process of course change in higher education. Factors enhancing successful change included: interaction of faculty members between colleges, collegial and administrative support, administrator presence in some part of the change process, beginning with the goal to be accomplished not with the personal or contextual barriers to be overcome, connections with others having similar goals, building effective interpersonal skills, planning for incremental change, engaging in action research, and joining a network of faculty within or outside an institution who weekly collaborate and disseminate results of change in teaching.	
TR	Connolly, M. (2010). Helping future faculty come out as teachers. Essays on Teaching Excellence: Toward the Best in the Academy, 22(6).
Context: More than 70 doctoral students and postdocs in science, engineering, and math at leading research universities. **Findings:** Study participants learned that admitting an interest in teaching exposes them to career-related risks regardless of their research proficiency and productivity. Participants sometimes overemphasized their genuine interest in research to pass themselves off as the kind of laser-focused doctoral students that advisors tend to factor. When/if participants broached their interest in teaching with their faculty advisor they faced a range of reactions. Most common was that they would be gradually "disowned". Several participants who kept their true career intentions concealed during their doctoral program were disowned once they outed themselves by taking a job at a teaching-focused institution.	
TR	Wergin, J. F. (2001). Beyond Carrots and Sticks: What Really Motivates Faculty. Liberal education, 87(1), 50-53.
Context: Perspective piece about the factors which motivate teachers to choose academic life and institutions can increase these factors' power. **Findings:** He speaks to key motivational factors of Autonomy, Community, Recognition, and Efficacy being important to faculty work. To strengthen these factors, he encourages	

universities to align their institutional mission, roles, and rewards; engage faculty in meaningful work that is intellectually interesting but also take the field somewhere; identify and uncover areas of disequilibrium so as to increase faculty curiosity and research; help faculty develop niches that fit into the overall departmental system; and encourage faculty experimentation, assessment, and reflection.

Thread: Mechanisms/Processes

Sub-thread: Assessment/Evaluation Procedures

TS	Furco, A., & Moely, B. E. (2012). Using learning communities to build faculty support for pedagogical innovation: A multi-campus study. The Journal of Higher Education, 83(1), 128-153.

Context: Study was conducted at eight diverse higher education institutions over five semesters. Each institution volunteered to join the Learn and Serve America consortium in order to advance service-learning campus-wide. Institutions varied in size, degrees granted, and whether they were public or private, religious-affiliated or secular. Six of the eight institutions were involved for all three years. Data was obtained from 152 of the 221 faculty who took part in the learning community seminars. 6 were instructors, 9 adjuncts, 61 assistant professors, 44 associate professors, 18 full professors, 2 department chairs, 9 other administrators, and 3 faculty members who did not specify rank. Leaders of campuses' service-learning programs were encouraged to create faculty learning community structured as an eight to ten-week seminar. These seminars included discussion of reflection about ways of working in collaboration with community agencies.

Findings: RQ1: Participants showed significant increases$F(1,144 = 31.03, p < 0.001$, partial eta squared = 0.177; by the end of the seminar in their views of service-learning as a practice that enhances student development across a variety of domains, provides benefits to the community, and enriches their own instructional efforts.RQ2:Participants showed significant increases $F(1,135 = 202.36, p < 0.001$, partial eta squared = 0.600; in knowledge of key programmatic components of service learning (e.g., distinctions of service-learning from other forms of experiential education, role of reflection, elements of high quality practice) The participants also indicated their efficacy in managing the various components needed for a successful service-learning experience. Participants also reported a statistically significant change in self-evaluated skill in working with community partners $F(1,131 = 102.00, p < 0.001$, partial eta squared = 0.438.RQ3:Participants began with positive views of support for service-learning at their institutions; however, by the end of the learning community seminar, the participants showed significantly greater awareness of this support $F(1,144 = 22.59, p < 0.001$, partial eta squared = 0.136.RQ4:Pre-test scores were lowest for this scale; however participants came to an increased awareness that service-learning could contribute to their teaching, research, and service at the institution $F(1,133 = 21.98, p < 0.001$, partial eta squared = 0.142.

SL	Tsen, L.C.; Borus, J.F.; Nadelson, C.C.; Seely, E.W.; Haas, A.; Fuhlbrigge, A. (2012). The Development, Implementation, and Assessment of an Innovative Faculty Mentoring Leadership Program. Academic medicine : journal of the Association of American Medical Colleges. 87.12 . 1757–1761
Context: 16 participants: 7 women, 3 from minority backgrounds, 12 with MD degree. Faculty mentoring program took place at Brigham and Women's Hospital (BWH). These individuals were engaged in a 9-month course. They met monthly for an hour and a half during lunchtime. There were two co-facilitators for the course. **Findings:** Participants were asked to complete three self-assessments and two course evaluations. All results shared are statistically significant at $p < .05$. Postcourse ratings were significantly more positive than precourse ratings with the largest change in responses to questions on knowledge of hospital resources for mentoring assistance and the smallest change in questions on serving as a mentor to someone of a different race. The sessions that featured case-based group discussions consistently received higher ratings than the session that were more instructional or didactic in nature. Participants' responses to postcourse self-assessment showed that their mentoring effectiveness and knowledge had improved significantly when compared to precourse responses. Participants also indicated substantial improvement in mentor confidence and ability to accomplish mentoring goals. Participants' response to postcourse self-assessment indicated that the course had an impact on their effectiveness as mentors. There were also achievements (e.g., writing manuscripts, giving presentations) directly attributed to participation in the course.	
Sub-thread: Fidelity of Implementation	
T	Borrego, M., Cutler, S., Prince, M., Henderson, C., & Froyd, J. E. (2013). Fidelity of Implementation of Research-Based Instructional Strategies (RBIS) in Engineering Science Courses. Journal of Engineering Education, 102(3), 394-425.
Context: 387 U.S. faculty teaching engineering scienc courses were surveyed. 99 chemical engineers, 122 electrical or computer engineers, 166 statis faculty. 19% were female and 73% were male (8.2% did not respond). 9.8% were lecturers, 24% assistant professors, 67% were associate professors, 26% were full professors, and 5.9% were other (7.7% did not respond) **Findings:** Overall fidelity of the 11 RBIS ranged from 11% to 80% of users spending time on all required components. Fidelity was highest for RBIS with one required component: case-based teaching, just-in-time teaching, and inquiry learning. Thirteen of 16 critical components discriminated between users and non-users for all RBIS to which they were mapped.	

Thread: Mechanisms/Processes

Sub-thread: Implementation Structures

T	Baker, L. A., Chakraverty, D., Columbus, L., Feig, A. L., Jenks, W. S., Pilarz, M., Stains, M., Waterman, R., & Wesemann, J. L. (2014). Cottrell Scholars Collaborative New Faculty Workshop: Professional Development for New Chemistry Faculty and Initial Assessment of Its Efficacy J. Chem. Educ. 9(11) 1874-1881.

Context: The study occurs in a mid-western state. Participants are STEM faculty at the university. The faculty development program focuses on fostering student-centered teaching and conscious and reflective teaching but also shares information regarding mentoring, cultural competency, work-life balance, and grant writing. The data from the FD reported comes from two years of data (2012-13) and 81 participants. Follow-up after the 3-day workshop occurred via a variety of formats. The first year, participants were paired with a mentor as their follow-up contact. The following year webinars were used.

Findings: Impact on Awareness of EBTMs: The FD significantly increased the number of EBTMs with which the faculty are familiar (from 8.2 pre-survey to 14.6 post-survey)$t(54) = -11.767$. There was a very large effect size eta-squared (0.72).Impact of Implementation of Instructional Practices: t-test shows a statistically significant (3.5 fold increase from 1.9-6.9) in participants who were interested in implementing EBTMs. One-way repeated ANOVA tests showed a statistically significant increase in participants use of lecture with pre-made visuals ($F(2,22) = 5.031, p= 0.016$ and multivariate partial eta squared = 0.314) and group work ($F(2,22) = 7.960$, $p= 0.003$ and multivariate partial eta squared = 0.431). These numbers were calculated from self-report surveys. Impact on Teaching Beliefs: Participants significantly increased on the student-centered scale from pre to post workshop $t(47) = -2.788$, $p=0.008$, eta squared = 0.14 (a large effect size) and decreased on the teacher-centered scale but not significantly. A one-way repeated measure ANOVA show that between the pre-survey and a delayed post-survey there was a statistically significant increase $F(2,46) = 3.818$, $p= 0.029$, multivariate partial eta squared = 0.142 (large). There was a decrease between post-survey and delayed survey but it was not significant. Therefore, the PD does appear to be able to change teacher beliefs in the short term and this change seems to be sustained over time.

T	Brent, R., & Felder, R. M. (2003). A model for engineering faculty development. International Journal of Engineering Education, 19(2), 234-240.
Context: SUCCEED is a coalition of 8 institutions with a combined engineering faculty of over 1,500. **Findings:** The SUCCEED faculty development program is composed of 6 components. Three of them involve instructional development and support: 1) programs open to all faculty; 2) programs specifically for new faculty members; 3) programs for graduate students. The other three involve campus infrastructure and climate: 4) a faculty or staff member within engineering whose principal responsibility is coordinating faculty development efforts; 5) links to campus-wide faculty development programs; 6) provisions in the faculty incentive and reward system that support improvements in teaching and educational scholarship. Learning communities play an important role in the SUCCEED FD model. Assessment components: 1) ascertaining participant satisfaction with FD programs; 2) judging the impact of FD programs on the teaching of the participants; 3) discovering whether the programs had an impact on students' learning.	
T	Brent, R., Felder, R., Regan, T., Walser, A., Carlson-Dakes, C., Evans, D., ... & McGourty, J. (2000). Engineering Faculty Development: A Multicoalition Perspective.
Context: SUCCEED is a coalition of 8 institutions with a combined engineering faculty of over 1,500. **Findings:** Components: Faculty development coordinator, linkages to campus-wide faculty development programs, learning and networking opportunities, programs for new faculty, programs for graduate students, institutional incentives for improving teaching. They discuss the ECSEL Coalition, FOUNDATION Coalition, GATEWAY Coalition, SUCCEED Coalition.	
T	Felder, R. M., & Brent, R. (2010). The National Effective Teaching Institute: Assessment of impact and implications for faculty development. Journal of Engineering Education 99(2) 121-134.
Context: The article uses literature on the design, implementation, and evaluation of instructional development program is reviewed and summarized. The intended audience is faculty developers and teaching leaders who wish to effectively address the instructional development needs of engineering faculty, and engineering administrators who wish to understand those needs and build and nurture programs that address them. **Findings:** Wlodkowski's five-factor theory of adult learner motivation provides a good framework for the design of engineering instructional development programs. The criteria are compatible with the cognitive science-based How People Learn instructional model and also with the recommendations of faculty development authorities. Making engineering instructional development effective at an institution will require applying the criteria to program design and delivery and creating an institutional expectation of faculty participation in the programs.	
T	Finelli, C. J., Daly, S. R., & Richardson, K. M. (2014). Bridging the Research-to-Practice Gap: Designing an Institutional Change Plan Using Local Evidence. Journal of Engineering Education, 103(2), 331-361.

Context: Evidence from the College of Engineering at the University of Michigan was used as evidence for this institutional change plan. All full-time faculty were used. 26 faculty members participated in the focus groups (qualitative). 15% were females, 27% were full professors, 35% were assistant professors, 15% were associate professors, and 23% were lecturers. For the observation portion of the study, 26 faculty members agreed to have their classes observed. 2 were women and the other 24 were men. 11 were full professors, 6 were associate professors, 3 were assistant professors, and 6 were lecturers. For the student feedback data (survey) they had 386 undergraduate engineering students. 64.2% were male and 35.8% were female. 27.7% were Sophomores, 36.3% were Juniors, 34.5% were Seniors, and 1.6% were classified as other. There was a mix of ethnicities with the majority being white (74.9%). **Findings:** The institutional change plan for accelerating the adoption of effective teaching practices comprises a faculty action plan and an administrative change plan. Analyzing their focus group data they found seven categories of factors that influence faculty members' decision to adopt effective teaching practices. 26 individual themes make up the 7 categories. The 7 categories are: infrastructure and culture; knowledge and skills of effective teaching practices; student experience; time; classroom and curriculum; personal disposition; networking and community. Analyzing their observation data they found that: 1) the amount of questioning used by professors varied with some using none and others using this 94% of the time; 2) there was limited active learning observed. Findings from the student surveys: Students noted that their most supportive professor was engaging while lecturing and explained concepts in easy to understand ways.	
T	Fowler, D., Kaihatu, J., Macik, M., & Bakenhus, C. (2016). Impact of curriculum transformation committee experience on faculty perspectives in teaching and learning. Paper submitted to the conference proceedings of the American Society for Engineering Education. New Orleans.
Context: The target institution is a large research university with an enrollment of about 56,500 students and about 3,000 faculty members. Total research expenditures exceeded $854 million in the fiscal year of 2014, demonstrating the university's strong emphasis on research. **Findings:** CRPC encompasses nine major steps and a toolkit of templates that assist in completing each step. 1) orientation and team formation - change readiness questionnaire; 2) internal data gathering - survey templates for gathering data; 3) external data gathering - survey templates for gathering data and peer institution templates; 4) program level learning outcomes development and performance criteria designed in the form of rubrics - rubric template; 5) curriculum map development - curriculum matrix template; 6) supplementary curriculum materials creation; 7) implementation plan creation - consideration documents; 8) assessment plan creation - assessment plan template and implementation plan template including professional development needs and communication plans; 9) updated curriculum implementation.	
T	Henderson, C., Beach, A., & Finkelstein, N. (2011). Facilitating change in undergraduate STEM instructional practices: An analytic review of the literature. Journal of research in science teaching, 48(8), 952-984.
Context: Review is based on 191 conceptual and empirical articles published between 1995 and 2008. **Findings:** The authors came up with four broad categories of change strategies based on the literature: disseminating curriculum and pedagogy, developing reflective teachers, enacting	

policy, and developing shared vision. Disseminating curriculum and pedagogy is the strategy most written about by STEM researchers. Faculty development researchers mostly write about developing reflective teachers. Higher ed. researchers mostly write about enacting policy. Much of the research presented regarding the impactfulness of these strategies is weak. However, effective change strategies are typically aligned with or seek to change the beliefs of the individuals involved, involve long-term interventions, last at least one semester, and require understanding a college or university as a complex system and designing a strategy that is compatible within that system.	
T	KEZAR, A., & GEHRKE, S. (2015). Communities of transformation and their work scaling STEM reform. Pullias Center for Higher Education.
Context: Three different groups of participants. Observations and document analysis: observed signature events for each community, visited each community's main office, joined their listservs, visited their websites on an on-going basis, and attended other key events; Interviews: 112 people between 26 and 30 people within each community. 75% faculty members [60.7% were professors, 29.8% were associate professors], 25% were either former faculty, current admins, or staff members of the four reform communities. Survey: 2,503 participants. Distributed amongst 997 institutions and 4 communities. 36.7% full professors, 27.9% associate professors, 9.2% assistant professors, 20.2% non-tenure track, 5.9% with no academic rank, 54.3% female, 82.4% White, average age 49.9 years. **Findings:** Key findings: 1) Study identified a novel approach to improving STEM education, which they called communities of transformation; 2) communities of transformation address both individual faculty and broader systemic change; 3) benefits of these communities accrue to both individual faculty and to their institutions; 4) communities of transformation provide significant benefits for women faculty and for faculty of color; 5) positive outcomes follow from an engaging philosophy that is lived in programmatic activities and fostered through a supportive and mentoring community; 6) communities of transformation follow similar trajectories as they evolve from an idea to a community; 7) communities of transformation face common challenges and must develop particular strategies to navigate them; 8) communities of transformation rely on a specific set of avenues for expanding impact; 9) future communities of transformation can draw on the sustainability model identified and developed through this study; 10) there are further ways that communities of transformation can extend their impact.	
TRS	Macdonald, R.H., Beane, R.J., Allen-King, R.M., Iverson, E.R., Manduca, C.A., Mogk, D.W., Ormand, C., RIchardson, R.M., Tewksbury, B.J. & Yuretich, R.F. (2013). On the Cutting Edge Workshops and Web Resources for Early Career Geoscience Faculty. 46-55. The Role of Scientific Societies in STEM Faculty Workshops: A Report of the May 3, 2012 Meeting of the Council of Scientific Society Presidents, Washington D.C.
Context: ~1400 geoscience faculty from more than 450 geoscience departments have participated in On the Cutting Edge (OCE) workshops. Participants from research universities, comprehensive universities, liberal arts colleges, and 2-year colleges are selected on the basis of scientific and educational expertise, as well as to provide a diverse array of viewpoints. **Findings:** Describes in detail the four day workshops offered by OCE. Workshops have goals that participants will: learning a goals-based approached to course design that incorporates active learning and assessment strategies; share ideas and approaches for teaching geoscience	

courses; consider successful strategies for maintaining and active research program and for working with research students; discuss life as an early-career faculty member and explore ways to balance teaching, research, and service responsibilities; leave with examples of assignments and activities. Participants have access to a website resource that supplies much of what was covered in the workshop as well as participant created products for future use. Workshops have been shown to be successful by structure evaluation methods and less formal measures.	
T	Manduca, C. A., Mogk, D. W., Tewksbury, B., Macdonald, R. H., Fox, S. P., Iverson, E. R., ... & Bruckner, M. (2010). On the cutting edge: teaching help for geoscience faculty. Science, 327(5969), 1095-1096.
Context: ~1400 geoscience faculty from more than 450 geoscience departments have participated in On the Cutting Edge (OCE) workshops. Participants from research universities, comprehensive universities, liberal arts colleges, and 2-year colleges are selected on the basis of scientific and educational expertise, as well as to provide a diverse array of viewpoints. **Findings:** One of the key features of the workshop is the website for workshop participants as they prepare for their workshop experience; it provides tools for interaction, sharing, and collaboration during the workshop and records insights gained at the workshop. Following the workshop, the OCE project team reviews materials generated by the workshop and creates a topical site designed to present this information to geoscience faculty who did not attend the workshop. This website can be used after the workshop to refresh participants' memories of things learned. The workshops encourage discussions about teaching, whereas the website allows faculty to quickly discover what others are doing.	
T	Nelson, J.K., Hjalmarson, M.A., Bland, L.C., & Samaras, A.P. (2016). SIMPLE Design Framework for Teaching Development Across STEM. Proceedings of the ASEE Annual Conference and Exposition. ASEE. ASEE Annual Conference and Exposition. New Orleans, LA.
Context: Two participant sets: One from the SIMPLE Engineering project and the other from SIMPLE STEM. SIMPLE data collected from group leaders about his/her group at the end of the project. SIMPLE STEM data obtained from 24 of the participants. **Findings:** Share themes: people-driven principle can be enacted in a few different ways, formation of community, value of sharing both evidence-based strategies and personal experiences using these strategies. Variation across projects and groups: Variation driven by the needs of the groups and their collective and individual goals, role of participants, and role of graduate students.	
R	Pfund, C., Spencer, K. C., Asquith, P., House, S. C., Miller, S., & Sorkness, C. A. (2015). Building national capacity for research mentor training: an evidence-based approach to training the trainers. CBE-Life Sciences Education, 14(2), ar24.
Context: Engages in Research Mentor Training (RMT) train the trainer workshops that was originally based on the Facilitator Training (FT) develop for National Academies Summer Institute (SI) on Undergraduate Education in Biology. By the end of the third phase, 88 institutions and 195 attendees. **Findings:** Phase 1: 1.5d FT with specific goals towards FT collaboration, discussion, implementation, and evaluation. Table 2 on p.4 provides specifics regarding the FT agenda. Self-reports were used to determine effectiveness of the FT (effectiveness measured based on if attendees skills and knowledge was increased and whether they were able to effectively train	

others at their home institutes). 97% reported they felt adequately prepared. > 88% of mentors who were trained by those who went through FT found the training valuable and would recommend the training to a colleague. Phase 2: FT shortened to not exceed 6 hours for a 1-day training. In this phase activities were added to help facilitators navigate the logistics of implementing RMT at their home institutions. Also added was a mini mentor training session. All attendees rated FT as either good, very good, or excellent. 80% reported they felt adequately prepared. Self-reports also showed gains in their confidence. Mentors trained by attendees back at home institutes reported the effectiveness of their facilitators as high. Phase 3 (national scale up): 1-day workshop done one day before or after national conferences around the country. Attendees reported that their confidence of facilitating mentor training had increased. They wanted more time for the workshop and more time practicing facilitation.	
T	Pulford, S., Ruzycki, N., Finelli, C.J., Hahn, L.D., Thorsen, D. (2015) Making Value for Faculty: Learning Communities in Engineering Faculty Development. ASEE. 2015 ASEE ANnual Conference & Exposition, Seattle.
Context: 5 universities that utilized faculty learning communities (FLCs) as models for changing faculty teaching practice. the universities included: University of Alaska (Cohort Size: 8-10 per community/year); University of Florida (Cohort size: 4); University of Illinois (Cohort size: 25-30/year); University of Michigan (Cohort size: 7-8/term); University of Washington (Chort size: 7) **Findings:** Discovered a number of themes connecting the disparate school models of FLCs. They illuminated some of the aspects of how and why learning communities provide a breadth of benefits to faculty. Themes: 1) learning communities supported translating education research into practice; 2) learning communities mitigated risk for faculty; 3) learning communities fostered constructive group problem solving among faculty; 4) learning communities provided a gateway to other faculty enrichment experiences; 5) the presence of community of peers helped to build trust in learning communities.	
TRSL	Sorcinelli, M. D., A. E. Austin, P. L. Eddy, & Beach, A. L. (2006). Creating the future of faculty development: Learning from the past, understanding the present.Jossey-Bass San Francisco.
Context: Based on a study of nearly 500 faculty developers from all institution types **Findings:** In recent years, new expectations of higher education from parents, employers, trustees, and government leaders have contributed to broad institutional changes. Recognizing that the quality of a university or college is closely related to that of its faculty members, many institutions have increased their efforts to support and enrich faculty work. Creating the Future of Faculty Development addresses this growing need for faculty development by exploring how faculty development has evolved and envisioning its future. Based on a study of nearly 500 faculty developers from all institution types, the book examines core issues such as the structural variations among faculty development programs; the goals, purposes, and models that guide and influence faculty program developments; and the top challenges facing faculty members, institutions, and their programs. Several key questions are addressed, including: What are the structural variations among faculty development programs?; What goals, purposes, and models guide and influence program development?; What are the top challenges facing faculty members, institutions, and faculty development programs?; What are potential new directions and visions for the field of faculty development? Creating the Future of Faculty Development summarizes the challenges and pressures now facing developers and higher education as a whole. In this book, readers will find reason to rethink how they approach,	

organize, and support faculty development as they engage in institutional planning for the future.	
T	Spiegel, S., Claussen, S.A., Falconer, R., & Caster, A.G. (2016). Insights into Systemically Transforming Teaching & Learning at the Colorado School of Mines American Society for Engineering Education New Orleans, LA.
Context: This study looks at the early efforts of a new center established to systematically advance STEM teaching and learning at the Colorado School of Mines. **Findings:** Their theory of action focuses on four settings and three lenses. The four settings are faculty, class/students, administrators, and the university. The three lenses are cognitive, symbolic, and organization. The cognitive lens is concerned with consciousness, thinking and behavior, which is essential to the work of teaching. The symbolic lens considers the meaning and interpretations that occur within and across the human interactions, which is essential for motivating educators to change some of their practices. The organizational lens helps us keep in mind what is necessary to manage change throughout the system. The study presented focuses on the faculty and class/student settings. Preliminary data indicates that changes made to classes to make them more actively engaging have resulted in improved student learning in common lecture and the laboratory course.	
T	Utschig, T. T., Schaefer, D., & Visco Jr., D. P. (2012). A Proposed Teaching and Learning Curriculum for COMPLEETE Based on Current National Trend Frontiers in Education Seattle, Washington.
Context: COMPLEETE is an initiative for a national program to build and recognize educator excellence in engineering and engineering technology in three levels: building quality teaching and learning environments, strengthening teaching skills and systematically investigating learning in the classroom, and reflecting and giving back to the engineering and engineering technology community. **Findings:** The first level of the COMPLEETE curriculum aims to: provide an overview of teaching and learning practice and theory in Engineering and Engineering Technology Education; and begin to establish in participants a culture of reflective practice and evaluation of their own teaching practice and of the learning of thier students. When compared to other national programs. the authors did so at 7 predetermined levels: learning theory, student development, instructional design, instrutional facilitation methods, assessing and providing feedback, instrucitonal technology, reflective practice. Results show that reflective practice and instructional technology have the lowest level of agreement with COMPLEETE. Instructional design and instructional facilitation and methods have the highest agreement.	
TR	Vergara, Prevost, Campa, Urban-Lurain, Salk. (2016). Implementing high-engagement teaching professional development for STEM doctoral students, POD Network Conference, Louisville, KY.
Context: 9-month program (August - May) for doctoral students and postdocs. They have a learning community. In the fall, they work on planning Teaching as Research (TAR) projects & teaching/learning literature. In the spring, they work on project implementation, data analysis, completion, and professional development for academic careers. **Findings:** They advocate for small cohort models. They acknowledged that the participants like diversity of the cohort and Steering Committee. They were able to see participants'	

learning gains in assessing teaching and learning. They also were able to see gains in participants' knowledge of expectations of early-career STEM faculty.	
TRS	Wenger, E. (1998). Communities of practice: Learning, meaning, and identity. Cambridge university press.
Context: Learning is becoming an urgent topic. Nations worry about the learning of their citizens, companies about the learning of their workers, schools about the learning of their students. But it is not always easy to think about how to foster learning in innovative ways. This book presents a framework for doing that, with a social theory of learning that is ground-breaking yet accessible, with profound implications not only for research, but also for all those who have to foster learning as part of their responsibilities at work, at home, at school. **Findings:** Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. Three crucial characteristics are: 1. The Domain - The community has an identity defined by a shared domain of interest. Membership therefore implies a commitment to the domain and therefore a shared competence that distinguishes members from other people.; 2. The Community - Members engage in joint activities and discussions, help each other, and share information. They build relationships that enable them to learn from each other.; 3. The Practice - Members of a community of practice are practitioners. They develop a shared compilation of resources: experiences, stories, tools, ways of addressing recurring problems. This takes time and sustained interaction.	
TRS	Whittaker, J. A., & Montgomery, B. L. (2014). Cultivating institutional transformation and sustainable STEM diversity in higher education through integrative faculty development. Innovative Higher Education, 39(4), 263-275.
Context: STEM workforce is decreasing and there is still a need to increase the number of females and underrepresented minorities in the field. This article argues for a integrated faculty development model than can assist in increasing the number females and underrepresented minorities in STEM fields. **Findings:** The authors explain an integrative FD model that combines Research and Teaching (scholarship of teaching and learning that promotes the success of a diverse student and faculty community or uses diversity to promote learning; scholarly efforts to understand successful evidence-based initiatives for teaching a diverse student population); Teaching and Service (teaching in collaboration with an institution serving underrepresented individuals in STEM; service-learning with diverse local communities to build institution-community bridges); Research and Service (scholarly efforts or collaboration to understand successful methods or evidence-based outreach and service initiatives for promoting the success of a diverse student population or faculty community; research in collaboration with a faculty colleague at an institution serving individual underrepresented in STEM.	
TRS	Beane, R.J., Hill, T.M., Macdonald, H., Tewksbury, B., Allen-King, R. & Yuretich, R. (2015). Workshop for Early Career Geoscience Faculty: Strategic Planning and Support at the Beginning of Academic Careers. Geological Society of America Abstracts with Programs. 47(7), 686. Geological Society of America. Geological Society of America Annual Meeting. Baltimore.

Context: Data from 2003-2015. 410 participants. 51% from PhD institutions, 29% from BA/BS institutions, 14% from MS institutions, 6% 2-year colleges. Data from 2002 - 2014. 632 participants. Disciplines: 75% in Geoscience, 10% in Marine Science, 9% in Atmospheric Science, 6% Other. Data from 2002 - 2014. 685 participants. 51% female, 49% male. **Findings:** PD/Workshop promotes evidence-based teaching practices, strategic planning, supports faculty by developing rapport and community, and builds confidence.	
T	Borrego, M., & Henderson, C. (2014). Increasing the use of evidence-based teaching in STEM higher education: A comparison of eight change strategies. Journal of Engineering Education, 103(2), 220-252.
Context: They review literature regarding organizational change strategies **Findings:** Change agents are guided, often implicitly, by a single change strategy. There are eight change strategies: Disseminating- curriculum and pedagogy (Diffusion and Implementation); Developing – Reflective Teachers (Scholarly Teaching and Faculty Learning Communities); Enacting – Policy (Quality Assurance and Organizational Development); Developing – Shared Vision (Learning Organizations and Complexity Leadership). These eight strategies will expand the repertoire of change agents by helping individuals consider change from a greater diversity of perspectives.	

Thread: Outputs	
Sub-thread: Faculty Identity and Wellbeing	
T	Banasik, M. D., & Dean, J. L. (2016). Non-Tenure Track Faculty and Learning Communities: Bridging the Divide to Enhance Teaching Quality. Innovative Higher Education, 41(4), 333-342.
Context: Reviewed literature regarding faculty learning communities (FLC) **Findings:** FLC researchers have documented a link between FLC participation and student learning, performance, and enthusiasm. Participating faculty have also reported an increased sense of community, greater understanding of the institution of which they were a part, and new or increased familiarity with and ability to use a variety of teaching styles.	
TRSL	Parker, D. C., & Scott, R. M. (2010). From mentorship to tenureship: A storied inquiry of two academic careers in education. Mentoring & Tutoring: Partnership in Learning, 18(4), 405-425.
Context: Two faculty: a novice pretenured professor and an experienced tenured professor. **Findings:** "Mentors can assist their protégés in areas seldom covered by university orientation sessions. They can guide new hires through the labyrinth of committee work, suggesting service opportunities that may best fit their interests without being overly time consuming. If new faculty need help in establishing a research focus, experienced faculty can link them with others in the field, guide them to research support services within the institution, and, when appropriate, involve them in their research. Both the pretenured and the tenured faculty stand to gain from a mentorship relationship. It provides a tool for reflection of tenured faculty and they become re-energized.	
T	Simmons N. (2011). Caught with their constructs down? Teaching development in the pre-tenure years. International Journal for Academic Development. 16(3), 229-241.
Context: 7 participants: 6 females and 1 male; 2 social sciences, 1 humanitites, 2 professional faculty, 2 sciences; teaching experience ranged from 0-5**.** **Findings:** Throughout the first five years, faculty members integrate their roles differently. In the first years, their teaching, service, and research roles are isolated from each other. As they progress these three roles integrate until at years 4-5 these roles are well integrated. Participants seemed to move way from isolation in their early years. She also saw a subtle shift in early faculty members' desire for external affirmation towards more internal validation of teaching. She also described a hierarchy of development phase: survival, safety, belonging, self-esteem, self-actualizing.	
TRSL	West, E.L. (2012). What are you doing for the rest of your life? Strategies for fostering faculty vitality and development mid-career Journal of Learning in Higher Education. 8(1), 59-66.
Context: Faculty in mid-career can often express feeling fatigue, exhaustion, low self-esteem, and need for renewal. This article explores the impacts of what is called Appreciative Workshop on mid-career faculty. The workshop was provided at two conferences (one a state conference for women in higher education) and one university. **Findings:** The appreciative workshop is based on the foundation that creativity can be taught, that all people are creative, and that everyone has the capacity to become more creative. The workshop uses reflection and journaling, viewing film, listening to music, reading and writing	

poetry, and experiencing a variety of art forms. The goal is to get participants to focus on the possible rather than analyzing what is not possible. It consists of four phases: discovery, dreaming, designing, and delivering. Results suggest that participants finished the workshop being able to focus on the positive; connect with other faculty with similar struggles; experience a non-pedagogical interlude; allow the staleness to go away; talk with colleagues about teaching and positive focus; and reflect.

Thread: Outputs

Sub-thread: Productivity and Metrics

R	Aithal, P. S., & Kumar, P. M. (2016). ABC Model of Research Productivity and Higher Educational Institutional Ranking.

Context: To test their developed model, they looked at the faculty members from four universities: Wharton Business School at the University of Pennsylvania (266 faculty members); Harvard Business school (979 faculty members); IIM (143 faculty members); Indian School of Business (45 faculty members).
Findings: They developed a model of measuring research productivity for higher educational institutions based on calculating institutional research index and weighted research index. The institutional research productivity is calculated using a metric which consists of three institutional variables and one parameter. The three variables identified are the following: 1) Number of articles published in peer reviewed journals: a) number of books published; b) number of case studies and/or book chapters; c) published during a given time of observation.

T	Baiduc, R. R., Linsenmeier, R. A., & Ruggeri, N. (2016). Mentored Discussions of Teaching: An Introductory Teaching Development Program for Future STEM Faculty. Innovative Higher Education, 41(3), 237-254.

Context: 76 participants from four cohorts over the past two years. 46.1% males, 52.6% females, 71.1% graduate students, 28.9% postdoctoral fellow. Included biological sciences, engineering and mathematics, and physical sciences.
Findings: MDT is comprised of three group meetings, classroom observations (mentees observing mentors), and meetings with faculty mentors. Classroom observation were reported (on post-survey) as being a valuable component of the MDT. Many mentees also reported that the meetings with faculty mentors were also very valuable.

TRS	Boyle, B. & Boice, B. (1998). Systematic Mentoring for New Faculty Teachers and Graduate Teaching Assistants. Innovative Higher Education. 22(3) 157-179

Context: Two campuses: Campus one - large, public, comprehensive university. 25 pairs completed the year-long program over the course of two consecutive years. Campus two - large public research 1 university. 18 graduate students participated, ten in the pilot project, eight more joined for the semester-long formal mentoring program.
Findings: Data from the first program (campus one) suggested the centrality of factors such as sustained, involving relationships for best outcomes of new faculty. Data from the second program (campus two) demonstrated that a simpler program focusing on involvement within the mentoring pair and group meetings produces promising results. From both of these projects, they developed a replicable model of systematic mentoring; and they obtained a clear picture of the styles and skills of exemplary mentors**.**

T	Brawner, C. E., Felder, R. M., Allen, R., & Brent, R. (2002). A survey of faculty teaching practices and involvement in faculty development activities. Journal of Engineering education, 91(4), 393.

Context: SUCCEED is a coalition of 8 institutions with a combined engineering faculty of over 1,500. **Findings:** RQ1: Number of respondents who reported usually or always writing instructional objectives was 65%. Assistant professors were significantly more likely to do so than associate professors. The more teaching seminars respondents had attended, the more likely they were to write instructional objectives in the style encourage by the SUCCEED program. 60% reported assigning small group exercises for brief intervals in their classes, with 22% doing so once a week or more and 37% reported using active learning for most of a class period. 8% reported doing so once a week or more. Assistant professors were more likely than full professors to use active learning and the use of this method correlated positively with attendance at teaching seminars. RQ2: 59% of respondents reported that they began or increased their use of active learning, 43% wrote instructional objectives, and 43% used team-based learning as a result of being engaged in the program.	
T	Chen, H. L., Lattuca, L., & Hamilton, E. (2008). Conceptualizing Engagement: Contributions of Faculty to Student Engagement in Engineering. Journal of Engineering Education.97(3)339-353.
Context: Authors drew examples and data from the Engineering Change study, the Academic Pathways Study of the Center for the Advancement of Engineering Education, and the United States Air Force Academy. **Findings:** Data suggest that student interactions with faculty contribute positively to student confidence in their problem-solving and professional and interpersonal skills. These interactions also help students understand the importance of developing these professional and interpersonal skills. Student engagement in undergraduate research, which involves greater exposure to faculty, also contributes to the development of personal and professional skills. Lastly, satisfaction with one's instructors is negatively related to academic disengagement from engineering courses.	
T	Ebert-May, D., Derting, T. L., Hodder, J., Momsen, J. L., Long, T. M., & Jardeleza, S. E. (2011). What we say is not what we do: effective evaluation of faculty professional
Context: Faculty in two national PD programs (Faculty Institutes for Reforming Science Teaching and National Academies Summer Institute on Undergraduate Education in Biology). This study had 77 participants. Teaching experience ranged from 2 - 41 years. 64% of participants came from doctoral/research universities, 36% came from associate's colleges, baccalaureate colleges, and master's colleges and universities. **Findings:** Following PD, 89% of the respondents stated they made changes in their course that included active, learning-centered instruction. In contrast, observational data showed that participation in PD did not result in learner-centered teaching. The majority of faculty (75%) used lecture-based, teacher-centered pedagogy, showing a clear disconnect between faculty's perceptions of their teaching and their actual practices.	
T	Fowler, D., Macik, M., Turner, J., & Hohenstein, J. (2015). Facilitating program, faculty, and student transformation: A framework for curriculum redesign. Journal of Transformative Learning. 3(1) 59-73.
Context: The sample participants for this study consisted of thirteen civil engineering (CVEN) faculty participating on the Curriculum Transformation Team (CTT). Eight faculty members: 6 (associate professors); 2(full professors). Two had been on the CTT since the	

project began in 2013. All participants taught at least one undergraduate course and function as the head coordinator for a multisection undergraduate course. **Findings:** Faculty inidcated that their experiences were positive and that they felt the project had been highly valuable. Faculty members who more readily participated in the process were more self-reflective and had more interest in the long-term impacts of the revision process on the entire CVEN program. Other faculty focused more closely on the short-term or course-level impacts of the revision process and engaged less in post-process reflection. As participants reported their increased engagement, they also discussed how they started approaching their teaching differently. Faculty also identified several factors that helped produce shifts in engagement and pedagogical understanding: including students in the process of PRD was helpful; discussing and embedding standards (BOK2 and ABET) was helpful. Participants also began to critically evaluate how they could influence the achievement of the program learning outcomes by incorporating components at the course level.	
T	Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences, 111(23), 8410-8415.
Context: 225 studies were metaanalyzed for this article. Each study reported on examination scores or failure rates when comparing student performance in undergraduate STEM courses under traditional lecturing versus active learning. **Findings:** RQ1: The overall mean effect size for performance on identical or equivalent examinations, concept inventories, and other assessments was a weighted standardized mean difference of 0.47 ($z = 9.781$, $p << 0.001$). This means that on average, student performance increased by just under half a SD with active learning compared with lecturing. RQ2: The overall mean effect size for failure rate was an odds ratio of 1.95 ($z = 10.4$, $p << 0.001$). This is equivalent to a risk ration of 1.5, meaning that on average, students in traditional lecture courses are 1.5 times more likely to fail than students in courses with active learning. Average failure rates were 21.8% for active learning but 33.8% for traditional lecture.	
T	Light, G., Calkins, S., Luna, M., & Drane, D. (2009). Assessing the Impact of a Year-Long Faculty Development Program on Faculty Approaches to Teaching International Journal of Teaching and Learning in Higher Education. 20(2), 168-181.
Context: 49 faculty who participated in the FDP. 29 were from sciences, medicine and engineering disciplines, and 20 were from the social sciences and humanities; 48 of 49 participants attended at least 70% of planned activities, and 40 attended 90-100% of these activities. There were 29 faculty in the control group drawn from the same pool of faculty as the program participants. The control consisted of new junior tenure line faculty at approximately the same point in their careers as those in the FDP. Pre- and post-data were collected from 16. 4 were from the sciences, medicine, and engineering, and 12 were from the social sciences and humanities. **Findings:** Found evidence of positive change in the approaches to teaching of junior faculty participants in the FDP. All three methods of data elicited evidence indicating that participating faculty moved towards more conceptual change/student focused approaches to teaching, and that a significant part of that change could be attributed to their participation in the program.	

T	Reeves, T. D., Marbach-Ad, G., Miller, K. R., Ridgway, J., Gardner, G. E., Schussler, E. E., & Wischusen, E. W. (2016). A Conceptual Framework for Graduate Teaching Assistant Professional Development Evaluation and Research. CBE-Life Sciences Education, 15(2), es2.
Context: The empirical research regarding how to best prepare biology graduate teaching assistants (GTAs) is lacking. This essay proposes a conceptual framework for biology GTA teaching professional development (TPD). This framework serves as both a guide for conducting GTA TPD evaluation at single institutions and as a means to coordinate research across institutions at a national level. **Findings:** The proposed conceptual framework acknowledges: 1. contextual variables of the institution (i.e., University type, size, student body characteristics, policy training requirements); GTA training design variables (i.e., content, structure, activities); GTA characteristic variables (i.e., teaching experience and training, career aspirations, attitudes toward teaching); 2. moderating variables that impact implementation (i.e., adherence, exposure, participant responsiveness); and 3. outcome variables of GTA Cognition (i.e., knowledge/skills, attitudes toward teaching, beliefs about teaching); GTA Teaching Practice Variables (i.e., planning, instruction, assessment); and Undergraduate Student Variables (i.e., knowledge/skills, retention/attainment, interest).	
T	Stes, A., Min-Leliveld, M., Gijbels, D., & Van Petegem, P. (2010). The impact of instructional development in higher education: The state-of-the-art of the research. Educational research review, 5(1), 25-49.
Context: This manuscript reviews 36 articles (qualitative, quantitative, and mixed-methods) to determine the nature and design of earlier research into the impact of instructional development in higher education. **Findings:** In order to analyze studies, they were separated in how outcomes of development initiatives were measured. Levels were: Change within teachers (i.e., change in attitudes, conceptions, knowledge, skills, behavior); Institutional Impact; Change within students (i.e., change in perceptions, study approaches, learning outcomes). RQ1: Review indicates that instructional development interventions over time have more positive behavioral outcomes than one-time events. RQ2: Review indicates that collective course-like, instructional development initiatives have fewer behavioral outcomes but more outcomes at the level of the students than initiatives with an alternative or hybrid format. RQ3: Not enough studies to answer this question. RQ4: Review indicates that discipline-specific and discipline-general interventions have comparable impacts to each other.	
T	Theall, M., Abrami, P. C., Arreola, R., Franklin, J., Nuhfer, E., & Scriven, M. (2005). Valid faculty evaluation data: Are there any. In AERA Annual Meetings Program Interactive Panel Presentation, American Educational Research Association Symposium, Montreal (Vol. 4, No. 14, p. 240).
Context: This presentation focused on reviewing the issues regarding evaluation data for faculty and whether assessment strategies were valid. **Findings:** Research has shown that in general the gender of the teacher or the students does not have a consistent or significant effect on ratings. However, when divided by academic discipline, gender bias was found in certain departments. This could be due to women teaching lower-level or introductory courses which are expected to receive reduced ratings. Another factor regarding validity of evaluation is the fact that many old evaluation methods are being used even though current courses have undergone significant changes due to emerging	

technologies and instructional practices. Some have suggested portfolios as another method of ratings or standardized content-specific tests.	
T	Tofel-Grehl, C & Callahan, C.M. (2016). STEM School Discourse Patterns. Journal of STEM Education. 17(2), 34-41.
Context: The article is grounded in theory about classroom discourse (i.e., authoritative vs. dialogic). It involved 6 STEM high schools. Schools were selected based on school model type (e.g., fulltime non-residential, part-time pull-out, etc...); geographic region; enrollment size; and admission criteria. A total of 86 discrete class were observed and 6 science classes were selected for detailed discourse analysis. **Findings:** RQ1: Three common features were observed in more authoritative discourse classes: 1. teachers rigidly adhered to a traditional lecture format; 2. teachers spent less time answering student questions; 3. students spoke far less often and for far less time than students in dialogic environments. In dialogic classrooms two common features were observed: 1. more time given to students to work in groups; 2. more value placed on student opinions and ideas. RQ2: In general teachers used a variety of questions (e.g., opening questions, Follow-up questions, analytic and justification questions) to accomplish their goals. RQ3: In dialogic classrooms students were observed introducing topics of personal interest related to the area of the class. Students also consistently reported that they felt heard more in these classes.	
T	Wieman, C., Perkins, K., & Gilbert, S. (2010). Transforming Science Education at Large Research Universities: A Case Study in Progress. Change: The Magazine of Higher Learning, 42(2), 6-14.
Context: This is a discussion about current PD intervention underway at the University of Colorado and at the University of British Columbia. Their approach uses "Science Education Specialists" to partner with science departments and faculty and provide support (e.g., curriculum resources, collection and analysis of student data, facilitate communication) to transform traditional-style teaching. **Findings:** Departments hired Science Education Specialists (SES) and have made substantial changes to core undergraduate science courses with plans to make changes to more. Faculty are able to transform course now without the help of the SES. They are also sharing their transformed courses with other faculty who may not be actively using the SES. AT UBC, they are instituting a TA-training program and they designed a pre-post survey of students' perceptions about the earth sciences.	

Thread: Outputs

Sub-thread: STEM Culture

R	McGovern, V., Kramarik, J., & Wilkins, G. (2013). Career benchmarks from the Burroughs Wellcome Fund's early faculty career development awards. Academic Medicine, 88(11), 1732-1739.

Context: 196 basic scientists who have been supported by the Burroughs Wellcome Fund's early faculty career development programs from 1982-2010.
Findings: The group moved into jobs and gained first R01s faster than average. Surprisingly, those who train the most students and fellows do not publish the most. Women and men trained different numbers of undergraduate, PhDs, and postdocs. Women awardees had fewer publications on average than men.

Thread: N/A

Sub-thread: N/A

T	Havice, W. L. (Guest Editor). (2013). Integrative STEM Education—Developing Innovators, Educating Creative Learners STEM Education, National Dropout Prevention Center/Network Newsletter. 24(1). National Dropout Prevention Center/Network Clemson University

Findings: William Dugger makes a case for how STEM can better educate students and help motivate them to stay in school through graduation. Barbara Nesbitt presents how teachers in SC are finding success with at-risk students by engaging those students in STEM challenges. Melida Reevers shares how the elementary school in which she teachers has created an engineering/STEM lab where all students can become creative learners and problem solvers. Mark Sanders presents a definition for integrative STEM education. Pat Forrester shares his experiences this past year working with students, teachers, administrators, and business/industry leaders in promoting integrative STEM education. Finally, Steven Barbato shares his view that the key to retaining students is to engage them early and often.