
AC 2011-1372: IMPLEMENTING AN EFFECTIVE SUPPORT MODEL FOR INNOVATION IN ENGINEERING EDUCATION AND TECHNOLOGY-ENHANCED LEARNING

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Implementing an Effective Support Model for Innovation in Engineering Education and Technology-Enhanced Learning

Background and Introduction

Through an educational reform initiative at the University of Wisconsin-Madison, faculty and staff are beginning to transform their undergraduate program. This College of Engineering (CoE) initiative, aptly named Engineering Beyond Boundaries (EBB)¹, addresses important shifts in engineering education^{2 3 4}, including the need to “go beyond traditional engineering boundaries” of the classroom and conventional thinking. New technology and multi-media strategies allow faculty to expand their educational approaches. New ways of thinking about engineering education challenge faculty to reconsider their curricula and approaches for a rapidly changing world.

Now in its sixth year, EBB provides flexible funding for faculty-driven projects with a particular emphasis on high-value, transformative change. Through a focused group of stakeholders, this initiative defines a coordinated strategy that places engineering fundamentals within a societal context, thus fostering a passion for life-long learning. Further details, including a comprehensive assessment of successful outcomes, were presented at this venue one year earlier⁵. The 2010 paper illustrates how a well-defined infrastructure at the College level – with leadership provided by a collaborative group of faculty – is used to define objectives, facilitate the development of new ideas and programs, and begin to disseminate those ideas broadly across departmental boundaries. These activities are presented as steps one through three of Massy’s seven implementation steps for reforming education⁶, namely: (1) build awareness and commitment, (2) commission pilot projects, and (3) create venues for ongoing discussion and development.⁷

Experience through EBB and a Technology-Enhanced Learning (TEL) initiative funded from the UW-Madison’s Office of the Provost from 2007-2010 has demonstrated that these educational approaches require innovative service strategies to support faculty and staff for effective development, implementation, and assessment⁸. This aligns with Massy’s fourth implementation step of organizing skill development and consultation services⁹. Faculty input indicates that the incentive programs developed to support these changes alone are not enough. CoE faculty and instructors have throughout both initiatives clearly demonstrated that they benefit from the support of a team of educational professionals, including instructional and information technology specialists. Such support facilitates broader participation and adoption, success and sustainability, and knowledge transfer, all focused on ultimately improving student learning.

In August of 2010, the CoE launched a new service organization, Wendt Commons, which provides a “one-stop-shopping” approach to teaching, learning, information and media services and a new support model for innovation in engineering education. Wendt Commons is the consolidation of the engineering learning center, the engineering media services group, and the CoE’s Library, which is the campus library for engineering and administratively part of the CoE. To maximize the impact and effectiveness of this model, close collaborations with CoE instructional information technology (IIT) and assessment staff are also being formed in order to present an integrated service presence. For example, Wendt Commons’ newly formed Teaching

and Learning Services (TLS) team brings together an instructional design specialist, learning technologists, librarians, media specialists, IT professionals, and assessment and research specialists. This team will collaborate with faculty and instructors to redesign courses, implement new technologies and assess their impact on learning while helping to build a community of practice in engineering education within the CoE. Working within this community of practice¹⁰ will help faculty redefine their roles as partners in designing modern engineering curricula. In support of this, the TLS will provide a bridge to resources available across campus as well as with the broader educational community beyond our university.

Along with the need for assistance in developing new educational approaches, faculty and instructors also expressed a desire for dynamic learning spaces that would support these new ways of teaching. With the Library's increasing emphasis on digital collections, the CoE was presented with an opportunity to rethink the Library's role in supporting learning. The Library already played a key role in student learning in the CoE: providing group and individual study; providing computer labs with engineering software; hosting an increasingly popular supplemental instruction and tutoring program; providing access to and consultation about engineering information; as well as teaching the important life-long learning skills of discovering, evaluating and managing information. Wendt Commons will enhance the learning environment already established by the Library, creating spaces that support innovation in teaching, promoting new ways of learning both formally and informally, and building synergy among teaching and learning support services, faculty, staff and students.

Building on research related to faculty professional development and learning science, this paper will focus on the process for development and implementation of this support model, including guiding principles, desired outcomes, challenges, assessment, and future directions.

Summary of Key Literature

Engineering faculty are apt to evaluate new strategic directions in a research-based context. Encouraging a paradigm shift in classroom education therefore demands an emphasis on sound pedagogical practices derived from the available literature, providing a base of ideas that will resonate with our target audience. Applying a research approach to teaching practice -- sometimes known as "teaching as research", the Wendt Commons staff will draw on key principles that advocate for change in the traditional model for classroom instruction. Rather than providing an exhaustive review of the literature, the following presents a summary of the key concepts on which our service model is based.

Smith, et al., in their review of classroom-based pedagogies of engagement, point out that learning outcomes depend more on students' approach to learning and faculty delivery of material rather than the content itself¹¹. Drawing on research from the past 100+ years, the authors note that active-learning approaches have been developed and injected into engineering classrooms since the 1940's -- yet there has been very little actual change in the basic model for how education is delivered. The traditional lecture format, in which a subject-matter expert conveys knowledge to a largely passive audience, ignores opportunities to immerse the student in the learning process. In the past decade, calls to action for student engagement, student-centered learning, and inquiry-based pedagogy - basic tenets of constructivism - have increasingly taken

hold in engineering education.

In “The Intellectual Development of Science and Engineering Students: Part 1 and Part 2,” Felder and Brent provide a comprehensive overview of expert models for college students’ intellectual development^{12 13}. In summary of several models from Perry, Baxter-Magolda, and others, students ideally progress from “absolute” or “dualistic” attitudes toward knowledge, to more uncertain, multiplistic, “contextualized knowing”. The authors posit that traditional modes of engineering teaching tend to reinforce the (non-expert) student’s natural tendency to view knowledge as absolute, rather than modeling attitudes toward learning that foster true intellectual growth toward contextualized knowledge. Thus, they observe, “most science and engineering students enter college at low levels of intellectual development, and when they are taught traditionally they generally graduate at levels not much higher than those at which they entered.”¹⁴

One approach to innovation taken by Wiggins and McTighe is that of backward design, in which the process of developing instructional materials begins with a solid understanding of the educational goals and objectives¹⁵. Rather than produce novel materials that incorporate a particular technology solely for technology’s sake, this framework encourages the instructor to mold course content, learning activities, and teaching and assessment tools around tangible learning outcomes. In this way, the *inputs* to the educational process are designed to meet the objectives of what the student is to actually learn.

Philpot and Hall have introduced hands-on, visual learning objects, a strategy that some faculty within the CoE believe is particularly effective¹⁶. These rich-media modules were created to demonstrate difficult concepts of mechanics of materials in an interactive way. They were delivered online through a simple web interface, providing students with a self-paced tool for reinforcing their understanding without suffering from the repetitive nature of traditional handwritten homework assignments. The exercises, made freely available by Philpot and collaborators, have been successfully incorporated into mechanics courses by faculty in two different CoE departments, made possible by EBB funding. Another benefit of these modules is the ability of instructors to analyze *how* students are accessing and interacting with the online modules, opening new opportunities for instruction that is custom-tailored to the individual student. Still another benefit of technology is that it can lead to “dialogic” (student driven) pedagogy as opposed to teaching strategies that are “authoritative” (expert teacher centered) in nature¹⁷. Implemented well, technology can increase opportunities for students to orchestrate their own learning, facilitated by a more structured approach by teachers to define learning goals, to respond to learners’ actions, and to provide content.

Other work, particularly from the academic librarianship community, addresses the critical need to foster information literacy in undergraduate programs^{18 19}. As information- and other lifelong-learning literacies become more integrated into the curriculum and gain traction as an institutional priority²⁰, specific skills needed for exploring and discovering new information define a template for real learning²¹. For the past two or three decades, librarians have sought to position information literacy training for students where it will provide them the best leverage both in terms of their inquiry process, and their ability to improve the quality of their research papers and projects. To be effective, this inquiry-based approach requires cooperative effort

between faculty member and librarian.

Research has shown that establishing successful partnerships with faculty to foster information literacy introduces its own challenges. McGuinness presents a detailed study of the barriers to collaboration in post-secondary education, revealing that (perhaps not surprisingly) differences in academic culture between librarians and research faculty provide a basis for lack of cooperation²². Though comprehensive studies on faculty attitudes towards information literacy development are still limited, evidence suggests that faculty want control over how library instruction is implemented rather than handing things over to librarians in separate courses. Yet the prevailing opinion among faculty - that they are already successfully incorporating information literacy into their teaching - is an assertion that McGuinness finds difficult to validate²³. This work summarizes the problem that can be applied to both librarians and instructional support staff, arguing that “understanding the nature and origin of “faculty culture” may help librarians to uncover the common goals, practices and perceptions, on which successful partnerships can be based.”

Faculty, in turn, may need to embrace the idea of teaching as a collaborative activity. Numerous studies have pointed to the development of a community of practice as a key driving force behind classroom innovation²⁴⁻²⁶. Recent results from a large, NSF supported, multi-institution research center provide a model for developing course materials, highlighting the collaboration between learning scientists and domain experts – faculty with expertise in a specific discipline²⁷. In this particular case, the process of connecting pedagogy with practice was refined through peer-to-peer interaction. Rather than explore in isolation new ideas and challenges for classroom innovation, faculty partnered with instructional designers to develop learning modules that could be broadly disseminated across both disciplinary and institutional boundaries. Participants reported that hearing about other peoples’ experiences (successes and failures) was key to adopting and refining specific ideas and principles. The authors emphasize the critical role of intellectual development throughout the process, as well as joint motivation on behalf of all involved to firmly ground their efforts in a scientific approach to teaching and learning²⁸.

Pedagogical theories aside, Wendt Commons’ practical message to faculty is that we support their teaching efforts by supplying infrastructure, triage of services, and expertise that will save them time and foster innovation on their part. The Wendt Commons support model of aligning resources and expertise “to support faculty” will foster more collaborative, team-based attitudes to teaching that result in more student-centered approaches to instructional design.

Developing and Implementing an Effective Support Model

Like many higher educational institutions today, resources at our university are limited, and the CoE would need to look to existing resources to create this new support model. The initial step was identifying what were considered core partners – our engineering learning center and the library – to lead the development of this new support model. The Engineering Learning Center (ELC) – a small unit dedicated to fostering effective student-centered teaching and learning – was an obvious choice and had already been involved in supporting innovation in teaching and learning. The Library, one of the larger academic support units in the CoE, was chosen because they had a dedicated team of librarian-instructors who demonstrated a capacity and enthusiasm

for teaching through their information literacy program, and who had a history of involvement in pedagogical initiatives on campus. These librarians possessed a transferable set of skills that would allow them to actively participate in this support model, creating a “new” set of resources for this initiative. The evolution towards a “digital library” also made the Library a good choice, because as space and staff are less tied to supporting print, the potential exists to reallocate these resources towards teaching and learning in a broader context. The direct reporting relationship between Wendt Library and the College of Engineering at UW-Madison presents unique opportunities to draw the library closely into this initiative.

Existing Models

In collaboration with the CoE’s Associate Dean for Academic Affairs, the Directors of the ELC and the Library began to explore models for this initiative. An early challenge encountered was that a similar model incorporating teaching and learning services with libraries, especially in a STEM context, does not exist. The closest model, perhaps, was in UW-Madison’s School of Education, where they had recently consolidated instructional support services, which had included the library for some time, with information technology. Two relevant models, however were identified: the “teaching and learning center”, whose focus is on providing instructional support to faculty; and the “learning commons”²⁹, which focuses more on the student, bringing together academic support services, IT and library services usually within a library setting. Most of the “teaching and learning centers” served the entire institution as opposed to a specific College and included a team of educational and learning technology professionals (e.g. Georgia Tech’s Center for the Enhancement of Teaching and Learning (CETL) and the Stanford Center for Teaching and Learning (CTL)). Some, like CETL, were more formal organizations within the institution, while others, like the Dartmouth Center for the Advancement of Learning (DCAL) and the MIT Teaching and Learning Laboratory (TLL), were similar to research centers. The research model couples dedicated staff with representatives from other departments within the institution, drawing from the faculty, the library, and academic computing. Both models provided good examples of staffing structures and service profiles.

The “learning commons” model that brings together academic support services served as an inspiration for our emphasis on “one-stop-shopping” since that resonated with a challenge that CoE faculty had expressed – too many sources for obtaining help both within the CoE and across campus, some of which they were not even aware existed. With this as a central theme, additional units within the CoE were pulled in as key partners including our college’s assessment specialist, instructional IT group, media services group, and the supplemental instruction and tutoring program. The initial focus would be developing new support services for faculty and instructors.

Development Milestones

A timeline of the significant milestones in the development process is summarized in Figure 1.

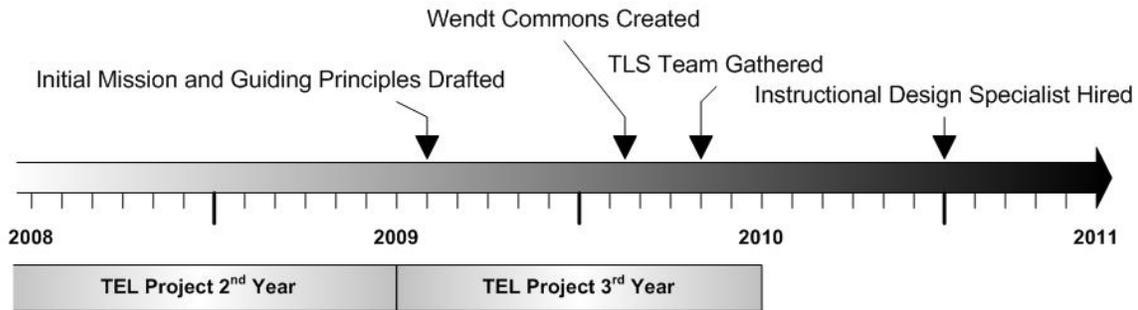


Figure 1: Development Timeline with milestones

In August 2009, prior to engaging all of the partners in depth, an early version of a mission and guiding principles for the development of this support model were drafted as the basis upon which to share our ideas with and get feedback from staff, faculty governance committees, and students. While aspects of the mission evolved, the guiding principles, shown below in Table 1, proved to be invaluable in building a shared vision. The guiding principles helped with our decision-making and communications during the development process. They remain drivers for our thinking today.

Table 1: Guiding principles for Wendt Commons

1. *Provide one common entry point in the CoE for teaching, learning, information and media services*
2. *Develop services driven by the needs of the CoE community*
3. *Improve the student learning experience*
4. *Improve the teaching experience by partnering with CoE faculty/instructors to...*
 - *Foster innovation in the "classroom"*
 - *Develop sustainable and scalable solutions for the instructional environment*
 - *Build bridges between established pedagogical practices and emerging trends in technology enhanced learning*
5. *Leverage support and resources in the CoE to increase faculty impact and student success.*
6. *Partner locally and globally*

During the early Fall of 2009, the CoE’s faculty governance groups, the EBB task force, and the engineering student leadership group were consulted, and there was general consensus that this was a positive direction in which to move. The partners then began to engage in the planning process, fine-tuning the guiding principles and developing near and long-term plans for this new support-model. It was at this point that two challenges were encountered: 1) lack of clarity about leadership and accountability; and 2) key personnel changes at the Engineering Learning Center and Engineering Media Services. The latter caused a slight shift in course and resulted in the decision in February of 2010 to consolidate the Engineering Learning Center, Engineering Media Services and the Library into what is now Wendt Commons under the leadership of the Director of the Library, as depicted below in Figure 2. With this decision came a new set of opportunities and challenges, while also addressing most of the earlier issues around leadership and accountability.

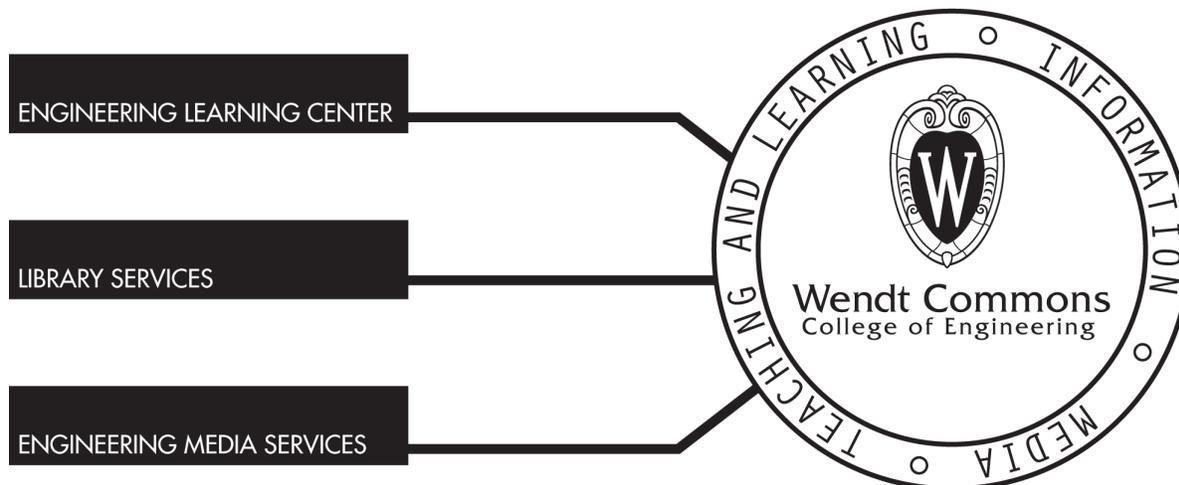


Figure 2: Consolidation of services within Wendt Commons

Principles three through six of Michael Cusumano’s approach to “managing strategy and innovation in an uncertain world”³⁰ are applicable to the desired development of Engineering Commons and its TLS services. They are particularly noteworthy as they relate to creating agility within an organization, a characteristic that is critical in today’s rapidly changing world. These principles suggest organizations should:

- focus on “building distinctive organizational *capabilities*”;
- embrace *pull-systems* that “generate real-time information and are much more responsive to change than push-systems”;
- maximize “*economies of scope*, which involve sharing a common base of knowledge, information, product inputs, and technology across different departments, projects and activities; and
- “pursue *flexibility* in most, if not all if not all areas of operations and decision making, and organizational evolution.”³¹

If Wendt Commons is successful in creating agility through these principles, Cusumano indicates that the CoE will have an organization that can not only adapt to change but that will be able to innovate in partnership with faculty and instructors³².

With an agile organization in mind, the Spring of 2010 brought initial decisions about staffing. The need for groups of staff to continue to focus on library and media services would continue, and to date, much of that initial structure remains in place. The focus was placed on developing a new unit within Wendt Commons, Teaching and Learning Services (TLS), which would be the intersection of teaching, learning, information, and media services (also see Figure 2). The success of a support model piloted during the last year of the TEL project helped establish the core of our TLS team³³. The pilot had made clear the need to hire an instructional design specialist to fill a capabilities gap that existed; this position would lead the TLS team. Feedback obtained via an EBB Roundtable task force focusing on the TEL needs of faculty provided direction for this position description; faculty were interested in someone they could connect with as a peer, who preferably had taught and would continue to teach engineering, and someone with the ability to help them connect best practices in teaching and learning with emerging

technologies. While learning technology support had been provided by instructional IT (IIT) up until this time, it was decided that it would be more effective to transfer the learning technologist who worked most directly with faculty to Wendt Commons in order to achieve greater emphasis on this type of support; IIT would continue to collaborate with Wendt Commons, provide programming and infrastructure support and have a representative on the TLS team, as well. The TLS team would be rounded out by two media specialists, two library instruction specialists, the CoE assessment specialist, a part-time research intern, and a team of undergraduate technology consultants who provide faculty assistance with implementing learning technologies. In addition to the transfer of the learning technologist, the greatest shift in resources to date has come with a librarian assuming responsibility for coordinating an existing professional development program for teaching assistants, as well as the library shifting 50% of a research intern's time towards teaching and learning support activities. As this model and organization continue their development it is expected that staff will continue to see a shift in their roles and responsibilities.

During the Summer/Fall of 2010 TLS began to develop as a team, gaining a deeper knowledge about the various services offered by their new colleagues, identifying ways to work together and recruiting for the instructional designer. Communication was clearly going to be a key to our success. Tools were identified to help support the team members in their work, including a wiki and customer relations management tool. The “one-stop-shopping” model has already demonstrated a benefit to faculty with several instances in which they have received two or more services with just having to make one contact. While there was a CoE-wide announcement about this new support model, a proactive approach was taken to contacting faculty and instructors to identify ways in which TLS could help them with current courses or EBB projects. TLS staff also took this opportunity to promote our new services and to get input on ways we could improve or expand TLS services. Early feedback from the EBB task force on TEL needs of faculty, had demonstrated a clear need for a support team, but support from faculty was all over the map when it came to other service ideas (e.g. providing a “sand-box” for learning technologies, check-out of or shared software/hardware, etc.) With this input in mind, TLS staff began to develop desired outcomes and their initial service profile. For services to be successful, they needed to be driven by the needs of faculty and instructors, so these conversations were and will continue to be very important to ongoing service development.

Vision, Communication, Participation

This development process has been successful for three reasons. As noted earlier, the guiding principles have been drivers for building a shared vision of our new support model and the way its development has been, and will continue to be, approached. In retrospect, our shared vision and the overall process would have been strengthened by involving all of the partners earlier in the development of these principles. Second, and more important, is that from the beginning communication – *two-way communication* – was recognized as being important for success. Faculty, staff and students were given opportunities to provide feedback at key points throughout the process, developing buy-in and, ultimately, improving the end result. Faculty input received through the EBB task force thus far has proved vital to the process and has demonstrated that this will need to be a central piece of our ongoing model. For staff who are involved or affected, more timely and frequent communication, including general discussions for staff to share ideas, may have reduced the lack of clarity and feelings of angst that can often come with

organizational change. Last, this process has been successful due to the willingness of dedicated and enthusiastic staff members to embrace change.

Desired Outcomes

The unique, integrated approach to providing outstanding teaching and learning services to faculty and instructors demands well defined outcomes in order to adequately engage the target audience. Prior to the development phase of the newly formed Wendt Commons, a thorough assessment was conducted to solicit feedback from faculty and students. An overview of the types of services to be offered emerged, leveraging existing consultation and support services developed under a previous technology-enhanced learning (TEL) initiative within the CoE. Wendt Commons' TLS team identified specific goals and outcomes in the areas of faculty engagement, knowledge transfer, and improving the quality of teaching and learning services in the CoE, namely:

- Increase faculty engagement by providing valued and high quality services
- Facilitate knowledge transfer of best practices and support peer to peer interaction
- Support application of sound pedagogical practices informed by engineering education research
- Foster a community of practice around exceptional and innovative approaches to teaching and learning by helping faculty to build connections, both internally and externally
- Adopt evidence-based quality measures to guide course design and delivery
- Sustain and scale initiatives to impact as broad a cross-section of the College as possible

Faculty Engagement

Numerous studies have recognized the utility of classifying faculty and instructors into distinct groups based on their level of interest in researching and adopting new educational strategies^{34 35 36}, namely:

1. “Entrepreneurs” or “early adopters” have confidence in their own expertise. Incentives are internal. They will share their positive and negative experiences with other faculty.
2. “Second wave” or “risk averse” fear that using new technologies will take too much time and that a failed attempt will hurt students. They demand “user friendly” systems.
3. “Careerists” or “reward seekers” will be most interested if there is a positive impact on tenure, promotion or salary.
4. “Reluctants” believe that old models of learning are superior or are unwilling to change.³⁷

Efficient allocation of resources requires a sound understanding of how individual faculty and instructors map to these categories, so as to set realistic expectations for what may be achieved within a given set of constraints. From there the strategy for engaging members of each group can be tailored to magnify the successes and increase overall faculty and

instructor participation. For example, targeting only the early adopters may yield more rapid results that make a significant impact, but that success will be limited to the total number of students in direct contact with the affected courses. At the same time, focusing the majority of the effort on convincing reluctants to embrace new approaches is also likely to fail, as this audience will require significant resources in order to affect meaningful change. This approach may also be viewed from a different vantage point by noting the inherent trade-off between quality of service and the ability to reach as many faculty and instructors as possible. The best strategy will balance available resources with expected impact in a way that resonates with each group. Recognizing that the majority of faculty will fall in the middle two categories, for example, suggests the need for tools that can be implemented quickly, can be easily deployed to many users, and provide tangible and measurable improvements in learning outcomes that also lead to increased student satisfaction.

As discussed earlier, the new Wendt Commons model builds on existing opportunities for faculty engagement through the EBB initiative. While tangible improvements in undergraduate education have directly resulted from EBB, project funds were allocated to a limited number of participants spread among all ten academic departments and associated programs. This yielded a lack of coordination among projects and limited knowledge transfer of best practices. Though the program offered obvious benefits (flexible funding to seed new ideas, visibility within the CoE), incentives for documenting and communicating successes were low. This is particularly true for the middle two categories of faculty (“risk averse” and “careerists”), for whom the numerous other demands of securing and running a research program often take precedence. Wendt Commons’ new model for engagement is specifically tailored to complement the existing EBB model. The principal goal is to merge the efforts of library and instructional support staff to significantly augment instructional design and professional development resources available to faculty. Partnerships with instructional IT and the CoE assessment specialist will continue to be critical to success. The whole model for faculty engagement, including the relationships between the newly formed Wendt Commons and these other existing units within the CoE, is shown below in Figure 3.



Figure 3: Wendt Commons' model for faculty engagement centered around teaching and learning

Wendt Commons staff is working with faculty to develop EBB proposals, highlighting the services offered and providing coordination on how they may be leveraged most effectively. Recognizing that electronic and web-based communication (being principally asynchronous) is not ideal for coordinating feedback, TLS staff continues to directly engage faculty through face-to-face communication. Partnerships with trend-setters (early-adopters) are being established to assist in the development of innovative course materials based on pedagogies for engagement. Individual faculty with demonstrated interest in improving teaching and learning are being targeted and offered assistance with their current and future initiatives. Once a relationship has been formed, the essential elements of the successful learning activity is being captured to generate a snapshot for broad dissemination among other faculty and instructional personnel. Because faculty members are hard-wired to stay current with the latest research and emerging trends, the marketing approach will capitalize

on this inherent nature to encourage faculty both to participate in research-based teaching and learning best practices and to take full advantage of the services offered. The focus established during earlier phases of TEL development will remain, providing user-friendly resources, help desk support, and training in the use of the most promising technologies so as to reduce barriers to adoption in the classroom.

Knowledge Transfer

Another mechanism for faculty engagement is to facilitate peer to peer interaction and knowledge transfer of best practices. By creating opportunities for faculty to share ideas, stories (of both successes and challenges), and specific tools, TLS fosters a vibrant community of practice dedicated to improving the undergraduate educational experience. Though limited opportunities currently exist, mainly in the form of periodic formal and informal workshops and cross-College faculty meetings, participation requires extra effort on behalf of faculty. TLS reaches out to faculty in existing forums, including department meetings, EBB Roundtable sessions, and College-wide newsletters/publications, to catalyze discussion and “create a buzz” around the services offered. Though the main message is the resources provided by TLS, this direct marketing approach also provides the opportunity to solicit and collect feedback in a kind of ad-hoc focus group. Meeting faculty where they are already likely to be increases the likelihood of capturing a plurality opinion rather than isolated comments. Other more focused approaches include brownbag discussions of successful partnerships between faculty and TLS staff and periodic reviews of the pedagogical literature. A popular forum currently being considered for continuation is a monthly “conversations and coffee” event, specifically targeting newer tenure-track faculty at the Assistant Professor level. This event has in the past yielded fruitful discussions with instructors who are particularly passionate about teaching (by virtue of being “new”) but whose many other commitments do not permit the devotion of time and other resources to innovative classroom approaches.

The desired outcome from these efforts to foster faculty sharing is an increase in faculty participation at all levels – from planning and identifying new focus areas for further study to injection of best practices into the classroom. This suggests a two-pronged approach to innovation: driven by faculty but augmented with exploration by the TLS staff. As a central clearinghouse for teaching and learning innovations, the TLS staff stay current in the latest and greatest trends and resources. They also work with faculty to explore, pilot, and scale new ideas that would otherwise take a lower priority role when viewed alongside more immediate research needs. By summarizing information on best practices for instructional design – firmly grounded in the latest literature – and highlighting tools from other campus units, TLS leverages existing models for success that resonate with faculty and instructors. These approaches help transfer knowledge, skills, and attitudes about teaching and learning among engineering faculty.

Improving Quality of Teaching and Learning

A key goal of Wendt Commons’ re-organization is to improve the quality of instruction across all departments and programs. This process is expected to be continuous and

dynamic, reflecting the shifting technological and pedagogical landscape, as well as the ever-evolving needs of faculty as they embrace new and innovative methods.

An essential starting point was to define quality as it relates to the teaching and learning experience for faculty and students. Programs encouraging the use of technology enhanced learning approaches and funding from the campus level led to the adoption of specific performance outcomes and tools in order to gauge progress. The CoE TEL project utilized the Quality Matters framework³⁸, including eight standards that evaluate the design of online and hybrid courses, namely:

1. Course Overview and Introduction
2. Learning Objectives
3. Assessment and Measurement
4. Resources and Materials
5. Learner Engagement
6. Course Technology
7. Learner Support
8. Accessibility

Early discussions concerning how these principles could be applied to course design in a tangible way centered around the need to streamline the communication process, both internally and externally. It was determined that coordinating and tracking faculty could best be accomplished through a customer relations management (CRM) system adapted from industry. This system will assemble details on specific contacts and interactions with faculty and instructors, current tasks and projects, and additional suggestions for resources of interest to a given individual. Thus the CRM will be used to support the model of a “one-stop- shopping” approach for teaching and learning services while simultaneously alerting TLS staff to further opportunities for engagement. An appropriate CRM is currently being selected on the basis of these functions. This system will also provide a mechanism for quality control, ensuring that initial contact is followed up with meaningful actions and, as appropriate, sustained interaction from semester to semester. The importance of measuring the satisfaction and engagement levels of customers relative to their need for instructional services and support cannot be underestimated.

Defining quality services and measurable success relative to supporting pedagogical practices and principles of good teaching³⁹ should be determined by what faculty consider to be important rather than what is convenient to measure. Drawing upon relevant engineering education, research and best practices will guide the development and delivery of services to ensure outcomes are met in the areas of effective course design, teaching strategies, and learning experiences.

Recently, Bernold suggested use of a total-quality-improvement approach to enhance engineering education⁴⁰. This dynamic model facilitates constant improvement of classroom instruction, based on self- and peer-assessment of teaching and the degree to which desired learning outcomes are achieved. At the heart of this is the idea of benchmarking, a process by which the teaching methods that are deemed superior are evaluated on an on-going basis and used to replace less successful practices. Formative evaluation of teaching excellence is

used to provide valuable and actionable feedback, with an eye towards improving instruction between two successive periodic reviews. Thus, in addition to responding to peer reviews, the instructor is continuously learning new ideas and best practices.

Challenges

Through the development and implementation of the Wendt Commons support model a variety of challenges have become apparent. These challenges fall into two broad categories:

New organization, new roles, new responsibilities... no new funding

- Blending organizational cultures and models for communicating and working together.
- Reallocating resources to provide a new support model and an organizational structure that supports agility
- Balancing new and shifting roles, responsibilities, and services without adverse effects on core services
- Developing a new service model in an uncertain budgetary environment

Faculty and instructor perception, adoption and ongoing engagement

- Establishing a new identity for Wendt Commons that resonates with faculty and instructors
- Marketing the new suite of services and demonstrating their value to faculty and instructors
- Engaging faculty and instructors as collaborators in the development of engineering curricula
- Developing an effective feedback mechanism for faculty and instructors to provide input to Wendt Commons so that the suite of services remains valued and relevant

Every organization has a distinct organizational culture and way of working. While the units consolidated into Wendt Commons and its additional partners in the TLS all work under the auspices of the CoE's Academic Affairs, each unit has their own culture. They do, however, all value collaboration and dedication to providing outstanding service to CoE students, faculty, and staff. While the implementation process is still in the early stages, these two important shared values provide a solid foundation upon which to build a new organizational culture for Wendt Commons. Each unit also brings to the table their own methods of communicating and preferred productivity tools. Early work with the TLS team has begun to address some of these issues. A wiki has been developed to support collaborative work among the TLS team. Also, as mentioned before, there are plans to implement a CRM that will track staff interactions with faculty and instructors and will help to minimize confusion for both. As this model continues to evolve, a new meeting structure that effectively supports our work will also need to be explored.

This new organization and support model required that many staff take on new roles and responsibilities. Personnel changes provided the CoE with the opportunity to reallocate a position and create the instructional designer position. The team's learning technologist has been transferred from IIT to Wendt Commons and asked to re-focus the responsibilities of

this position. Librarians have been asked to play an expanded role in educational support and development, beyond that related to information. In some cases, this has required a significant time commitment and forces us to review job descriptions. With no additional resources, this has also caused a domino effect of shifting job responsibilities both among Wendt Commons staff and at IIT. In the case of IIT, this has been met with unexpected challenges. In order to maximize our organizational agility, the reallocation of responsibilities and resources will likely continue. For instance, Wendt Commons and IIT will explore how to effectively integrate their help desks to expand and improve service, while creating efficiencies. This shifting of resources, however, will need to be balanced with support for core services. Launching this new support model in an uncertain budgetary environment poses challenges as well and will require careful navigation to be successful.

In addition to the challenges that come with organizational change, faculty engagement, while a highly desired outcome, will also be one of the biggest challenges Wendt Commons will face. In a diverse and multidisciplinary academic environment, one of the greatest challenges is establishing consensus on *specific* directions and initiatives that will serve the greatest number of stakeholders. At the same time, faculty and instructors must retain the freedom to explore their own pedagogical goals and instructional interests in the classroom independent of the strategic plan at the college level. Pooling resources and providing services in a uniform, coordinated way streamlines efforts, reduces the time required by faculty to design and successfully implement innovative classroom experiences, and fosters a uniform approach to model effective practices. On the other hand, the perception of this approach as top-down rather than faculty driven may lead to a lack of cooperation in the redesign of undergraduate education within the CoE. Our university maintains a long-standing tradition of faculty governance, and such perceptions are likely to negatively impact the ability of Wendt Commons to establish meaningful and long-term partnerships with faculty. Rather than embrace the significant multiplying effect of staff dedicated to teaching and learning, faculty may view Wendt Commons as a “one size fits all approach”, whereby *courses* and *instructional styles* are molded to fit the available resources.

It is expected that debunking this myth will require a unified approach to faculty engagement, beginning with a continuous assessment of faculty needs and extending all the way through the implementation phase. Facilitating peer-to-peer interaction and knowledge transfer, while a challenge itself, may also be a key element in effectively engaging faculty and shifting their perceptions about the role instructional support staff and librarians can play in developing the curriculum.

Plans for assessment

Having measurable outcomes and supporting metrics in place will allow TLS to assess the quality of instructional strategies, course design and learning effectiveness, and to evaluate and improve upon TLS services. Drawing from educational research and practice from professional associations and NSF funded projects provides relevant case studies and service models to learn and build from. These associations and projects include the American Society for Engineering education (ASEE) the National Academy of Engineering (NAE), EDUCAUSE, The Sloan Consortium, and other centers for engineering education.

Continuing to assess faculty satisfaction and engagement relative to the TLS resources and support will be an integral evaluation approach to guide the services offered to faculty and instructors. Measures of student satisfaction and learning effectiveness with the various instructional tools and pedagogical practices will continue to guide the course design, development, delivery and evaluation processes.

The assessment methods used to gather information from faculty during the TEL project in 2009-10 included surveys and focus groups to gather feedback on their motivations for engaging in innovative teaching practices and the effectiveness of the approach used to support and develop faculty's use of TEL. Similarly students were surveyed while enrolled in a TEL project course to measure their satisfaction with the TEL course features, use of instructional strategies, and their perception of how the course content and delivery addressed the stated course learning objectives.⁴¹

Other assessment strategies within the CoE will provide relevant information to determine the degree of success in achieving the desired outcomes for Wendt Commons. The annual Engineering Benchmarking, Inc. (EBI) survey provides data relevant to student satisfaction with faculty and instructor teaching and interaction⁴², as well as satisfaction with technology enhanced learning. Other data includes faculty teaching reviews, the EDUCAUSE Center for Applied Research Study of Undergraduate Students and Information Technology results specific to engineering students at UW-Madison, and faculty peer-to-peer assessment on teaching effectiveness.

As opportunities to work with faculty in course development and re-design increases within the CoE it has been increasingly important to have a vetted framework to guide the development and evaluation process that aligns with the literature from the educational learning sciences.

Summary and future work

By providing quality services in an integrated manner, the Wendt Commons support model hopes to reduce the barriers to change, enable wider participation among engineering faculty and instructors, and facilitate innovation in engineering education and technology-enhanced learning. Wendt Commons staff has taken a proactive approach to faculty engagement, which will continue to play a central role in this support model. Early collaborations have already generated success stories upon which to begin marketing these services more broadly within the CoE and have demonstrated this model's potential for catalyzing change. While further development and implementation of the service profile continues, addressing the challenges will be crucial to the success of this initiative and to staff morale. Wendt Commons is a new organization that requires staff to take new roles and responsibilities with no new resources. We believe the CoE's ability to leverage existing resources to provide a "one-stop-shopping" support model for teaching and learning services has the potential to accelerate the pace of transforming engineering education in the CoE and is a model for other universities.

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