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Strategies for Enhancing the Scholarly Productivity of Engineering Technology Educators

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Abstract

Scholarship is now a requirement for promotion and tenure at most institutions with Engineering Technology (ET) programs. ET faculty that have previously focused only on teaching are now required to demonstrate evidence of scholarly activity on an annual basis. To underscore the importance of the scholarship issue, the Engineering Technology Council (ETC) of ASEE states in its 2003-2006 Strategic Plan's Goal # 5: "The ETC will develop guidelines and promote appropriate scholarship for engineering technology educators." Many ET educators sincerely want to engage in scholarly activities, but lack the experience in this arena because of the non-existence of the scholarship culture within many ET programs. It is, therefore, incumbent on the ET community to develop strategies to facilitate the growth of scholarly activities among ET faculty. Indeed, the mantra for the ET community with regards to scholarship should be: "Scholarship, You can do it, we can help!"

In a recent paper, the author and his collaborators, as members of the ETC Task Force on Scholarship, developed guidelines for scholarship in ET and proposed a faculty workload model. The current paper focuses on strategies that will encourage, facilitate, and provide support for the growth of scholarship in ET. Some of the "ways and means" for increasing scholarly productivity that are currently being implemented in the College of Applied Science and Technology (CAST) at Rochester Institute of Technology (RIT) are discussed. These include: developing a college scholarship website, developing a scholarship mentoring program, developing web-based venues of dissemination and peer review, developing grant proposal and scholarly writing workshops, and identification and cultivation of support resources for scholarship. The early results and experiences from implementing some of these strategies at RIT are discussed and recommendations are offered that would be of help to other ET programs interested in cultivating the scholarship culture within their programs.

Introduction

Since Boyer¹ in his seminal work developed a broadened definition of scholarship to include the scholarship of discovery, integration, application and teaching, many institutions, including those with ET programs, have developed scholarship policies that require their faculty to be productive in at least one of these areas of scholarship, and the ABET Technology Accreditation Commission in its Accreditation Criteria² for the 2004-05 cycle lists scholarly activity in Criterion 5 (Faculty) as one of the factors by which faculty competence is measured. RIT recently (January 2003) adopted a new scholarship policy that requires all faculty to engage in "significant" scholarship. Based on the RIT scholarship policy and the work by the ETC Task

Force on ET Scholarship,⁴ the College of Applied Science and Technology developed the CAST Scholarship Guidelines which was unanimously approved by the college faculty in September 2003. Based on the work by the ETC Scholarship Task Force⁴, the three essential ingredients of scholarship are: Documentation, Public Dissemination, and Peer Review.

Faculty scholarship is essential to support faculty renewal and continuous learning which enhances the student's educational experience and elevates the quality of academic instruction; it also enhances faculty mobility and marketability and enhances the competitiveness, visibility and prestige of the ET program and institution. These factors could play a major role in the institution's fund raising efforts.^{3, 7, 9} Anecdotal evidence points to a relatively few number of ET full professors when compared to engineering and other programs; engaging in scholarship will enhance the chances of ET faculty achieving full professorship status since many institutions now view scholarship, in addition to excellence in teaching, as a requirement for promotion to this level.

Barriers to Scholarly Productivity in ET and How to Overcome Them

There are several barriers to scholarly productivity in ET, one of which is the heavy teaching workload in ET programs where the average teaching load⁴ is 13 contact hours. Another barrier is the perception that excellence in teaching and scholarship are somehow incompatible. There's also the fear that if ET faculty were to embrace the scholarship culture, ET programs will be assimilated into the engineering/science paradigm where theory and depth predominates over breadth and application, and the "publish-or-perish" culture thrives. The author believes that these concerns are minimized by the broad definition of scholarship by Boyer¹ in his seminal work, in which scholarship is cast in four dimensions: the scholarship of discovery, integration, application, and teaching/pedagogy. As discussed in a recent paper by the ETC Task Force on Scholarship⁴, the scholarship of application and teaching are a good fit for ET programs, while the engineering/science paradigm stresses the scholarship of discovery. ET faculty can produce scholarly work from their current teaching and consulting activities by extending these activities to include public dissemination and peer-review. It is also possible, and should be one of the goals of ET scholarship, to maintain student-centeredness in scholarship by ensuring that ET scholarship involves students, enhances student learning, enhances our teaching, and enhances the critical thinking, life-long learning, creative and innovative skills of our students; employers seek after students who possess such skills. Therefore, the author believes that there is a place for ET within the scholarship spectrum while maintaining the student-focus and the applications orientation that is the hallmark of ET programs, and without becoming indistinguishable from engineering and science programs. As stated by Ransdel¹⁰, "perhaps the important question to ask is not whether scholarly productivity is important in today's climate of higher education – but whether faculty members can increase their current level of scholarly productivity."

Many engineering technology programs have not required scholarship of their faculty until recently, and as a result many ET educators do not have the needed experience in this area of faculty endeavor. The greatest challenge is how to motivate ET faculty to become incrementally engaged in scholarly activities, especially those who for many years have not had any scholarly

output; for a great number of these faculty, consulting has been their only non-instructional focus for many years. To foster the growth of the scholarship culture in ET, “liberal and consistent motivation, reward, and recognition” of faculty are essential in addition to fostering an environment conducive and supportive of faculty scholarship.⁶ Towards this end, the CAST at RIT is developing and implementing several strategies; the goal is to encourage peer collaboration and networking in scholarship and to achieve a scholarly productivity of at least one scholarly product per faculty per year within the first five years of implementation of these strategies. We believe this level of scholarly productivity is a reasonable target for ET faculty given the current average teaching workload of these faculty⁴ and in the absence of any benchmark data. The Washington State University has published similar goals for its faculty with the expected level of scholarly productivity varying from college to college¹¹. To help accomplish our stated goals, we are devising several strategies in CAST and some of the strategies currently being developed and implemented include:

- Scholarship website for collaboration, dissemination and peer review of works and ideas-in-progress
- Scholarship mentoring for faculty
- Web-based venues for dissemination of scholarship (Digital Media Library)
- Grant proposal and scholarly writing workshops; identification of funding sources
- Creating College Summer Mini-Grants for Scholarship
- College Scholarship Symposia or Colloquia for Ideas and Work-in-progress

These ideas will be discussed in this paper with the hope that early results and lessons learned from implementing these strategies will be helpful to other ET programs intent on increasing the level of ET faculty scholarship within their program.

Faculty Associate for Scholarship (FAS)

To lead the effort towards increasing the scholarly productivity of CAST faculty, the Dean of the College appointed an ET faculty member with experience in scholarly activities to the position of Faculty Associate for Scholarship (FAS). The FAS was first presented to the department chairs at the Dean/Chairs meeting at the beginning of the academic year; at this meeting the FAS was introduced as a resource to help the Chairs move their faculty along in the scholarship arena and the proposed plan of work for 2003-2004 was presented to them for their comments. The concept was well received by the department Chairs and they have been supportive of the FAS program. In fact, some ideas that became part of the strategies discussed later in this paper were actually suggested by the Chairs. The FAS also arranged meetings with each department Chair to glean from them what the scholarship needs of their faculty were. Several of the faculty that subsequently met one-on-one with the FAS were referred to the FAS by their department Chairs.

The FAS was next introduced to the CAST faculty at the September faculty meeting where the Dean encouraged the faculty to view the FAS as their scholarship resource. To increase awareness of scholarship and to answer questions and concerns that faculty may have, the FAS

attended departmental faculty meetings at the beginning of the 2003-04 academic year; this was helpful in breaking down barriers to scholarship and making new faculty aware of the scholarship resource in CAST. The FAS gives regular updates and presentations on the State-of-Scholarship-in-CAST at college faculty meetings, and through e-mail. CAST faculty have been receptive to the program and their level of co-operation and willingness to adapt has been remarkable, even for those faculty who have not been active in scholarship for a long time. With prodding and encouragement and a better understanding of scholarship, even reluctant faculty are gradually coming around to embracing scholarship rather than fearing it as a new burden or job requirement.

The FAS, as the College point-person for scholarship, is responsible, in consultation with the Dean, for developing and implementing strategies for enhancing scholarly productivity, and has been granted a one-third course release-time for this position. It is anticipated that the FAS position will be for two or three-year duration. The FAS is also responsible for creating an annual college-wide inventory of scholarly activities. This inventory will be helpful in measuring the success of the strategies by comparing the faculty scholarly output from year to year. Some of the strategies currently being implemented by the FAS to enhance scholarly productivity are now discussed.

Scholarship Website

With the help of web-based course management software currently used at RIT for all courses, the FAS developed a scholarship website and acts as the moderator and facilitator for the website. All faculty in CAST have access to the website and can post works or ideas-in-progress and can participate in discussions and peer review on the website. The point of entry to the website is the “Syllabus” page shown in Figure 1 where some “ways and means” (see Appendix 1) for increasing faculty scholarly productivity are posted. Faculty are encouraged through regular e-mail communication from the FAS to post scholarly works on the website and to participate in peer review of posted works; though peer review in and of itself does not qualify as scholarship, it can be a legitimate precursor activity to scholarship. The experience gained by faculty from reviewing other people’s work can be useful in producing their own scholarly product.

The Discussions area of the website contains several folders as shown in Figure 2. Calls for abstracts received from various sources such as the ETD listserv are also posted on the website to expose CAST faculty to potential venues for dissemination and peer-review of scholarship. The “Scholarship Collaborative” folder is a venue for soliciting collaboration among the faculty in the College. It is important to celebrate scholarly achievement in order to encourage productive faculty, and to motivate the non-productive faculty to get on the scholarship bandwagon; the “Scholarship in Review” folder shown in Figure 3 and “Scholarship in Press” folder are used to highlight faculty who have submitted scholarly products for review and those whose scholarly products have been reviewed and accepted for publication. Practice-oriented journals and conferences that encourage scholarship of a practical nature are listed in the “Potential Venues for Dissemination of Scholarship” folder and faculty can also add to this list.

Scholarship Mentoring for Faculty

Mentoring is an important “ways and means” to encourage faculty to become engaged in scholarly activities.^{3, 8, 9} To help faculty package their current activities into scholarship, the FAS meets with faculty one-on-one or electronically on an as needed basis to review their draft scholarship plans to ensure that it contains the three essential ingredients of scholarship namely: Documentation, Dissemination and Peer review.

The FAS also meets with the ET department chairs to glean from them what they perceive the greatest needs of their faculty to be with regards to scholarship. Based on the information gleaned from these meetings, the FAS contacts several faculty either by phone, by e-mail or through one-on-one meetings to encourage them to consider submitting abstracts/papers or to make suggestions for possible collaboration on scholarship. The mentoring program is especially important to help dispel the fears and concerns that faculty may have regarding scholarship. In just a few months, through the mentoring program, many CAST faculty have discovered that much of their current teaching or consulting activities can be converted to scholarship by reflecting on these activities and writing or presenting a paper to tell others about it; the feedback received leads to renewal and continuous improvement of the faculty which leads to enhanced student learning.

ET faculty are encouraged to explore pedagogical and engineering practice-based or applied scholarship since these are more naturally fitting to ET^{4, 5, 6} and because they enhance classroom instruction, which is one of the hallmarks of good ET programs. The plan for the future is to develop specific scholarship mentoring program for new faculty by pairing them up with experienced faculty-scholars.

Web-Based Venues for Dissemination of Scholarship

To help build the confidence of faculty, a Digital Media Library (DML) was recently launched at RIT to be used as an archive for published and unpublished scholarly works. The URL for the RIT DML is <http://ritdml.rit.edu> and a screen shot is shown in Figure 4. The DML is an RIT brand of a product called D-Space which has an open source code and was created by a partnership between MIT and Hewlett Packard; the URL for D-Space is <http://dspace.org>. RIT, MIT and several other universities including the University of Rochester are participating in this pioneering effort of making scholarly works readily available and creating more web-based avenues for the dissemination of scholarship. The DML consists of “3- sub-libraries: theses and dissertation, video/audio/images, and e-prints (journal articles, research, lab reports, conference proceedings, books, etc.)” The FAS currently acts as the DML Administrator for CAST and is responsible for approval of scholarly works that are submitted to the DML by CAST faculty. Published works, except abstracts and citations, must have copyright clearance from the original publishers in order for the work to be posted on the DML

The DML is accessible to the general public while the CAST scholarship website is accessible only to CAST faculty, and there is a link to the RIT DML from the CAST scholarship website.

The DML can also be used to document and disseminate student theses and other forms of student scholarship. Currently peer review cannot take place within the DML website; all peer review of abstracts, thesis or papers posted within the DML website takes place only on the CAST scholarship website. It is expected that as faculty gain confidence from the feedback received for their posted scholarly works on the DML and/or the CAST scholarship website, they will be further motivated to disseminate their scholarship to a wider audience through journal publications or conference presentations. Thus, the DML is one way of encouraging and motivating faculty to incrementally become engaged in scholarship.

Some strategies that are currently under development and will be implemented in the near future include the following:

CAST Scholars Group

To identify faculty scholars within the College, we are establishing a Faculty Scholars Group within the College that would meet on a monthly basis to brainstorm ideas on opportunities for cross-disciplinary scholarship within the College, grant opportunities, peer-review of scholarship in CAST, barriers to scholarship, how to involve students in scholarship, how to ensure that ET scholarship enhances faculty teaching, how to embed scholarship in student learning experiences, metrics for measuring quality of scholarship, and how to move scholarship further ahead within the College. The hope is that these scholars, through their scholarly and other activities in their spheres of influence, will help influence and encourage other ET faculty to become incrementally engaged in scholarship, thus helping to spread and nurture the scholarship culture within the College. The Scholars Group will also provide a pool of potential mentors for the proposed new faculty scholarship mentoring program, and the Scholarship Editorial Board (SEB) that will be responsible for the peer-review of scholarship in the CAST DML and on the CAST website.

The CAST Scholars Group will offer opportunity for faculty from the constituent departments within the college to network on scholarship, thus creating fertile ground for nurturing cross-disciplinary scholarship. The meeting format will be informal and the Dean's Office will provide food and refreshments as an added incentive for faculty to attend. An e-mail invitation to the first meeting which has fixed for mid-March has been sent out to all CAST faculty and so far, thirteen faculty members have already expressed interest in joining the group and attending the meetings.

Grant Proposal and Scholarly Writing Workshops

As the next logical step on the scholarship journey, the future plan is to organize grant proposal and scholarly writing workshops once faculty have become comfortable with writing abstracts and papers for conferences and journals. These workshops will be organized on a department level, as opposed to the College level, to maximize participation and results, and will be scheduled to fit within the regular departmental faculty meetings. The intention is to use the CAST liaison in the Sponsored Research Office (SRO) at RIT to present these seminars, given

their expertise in this area. The goal is to increase faculty awareness of the various grant agencies and sources of external funding, and to increase the number of grant proposals, and thus funded proposals by CAST faculty. It is crucial that external sources of scholarship funding, both large and small, be sought in order to keep the scholarship culture growing, after the initial start-up investment by CAST and RIT; external funding is the life-blood of all scholarship, especially in these times of budget restraints within the academy.

Two types of grants are generally available to ET faculty: Equipment or laboratory improvement grants and Research grants. Limited experience gained so far from the few successful grant proposals in CAST indicates that equipment or laboratory improvement grant proposals must be tied or connected strongly to students, curriculum, faculty and/or industry in order to be able to secure operating funds for the lab, otherwise, it becomes very difficult to make the grant work.

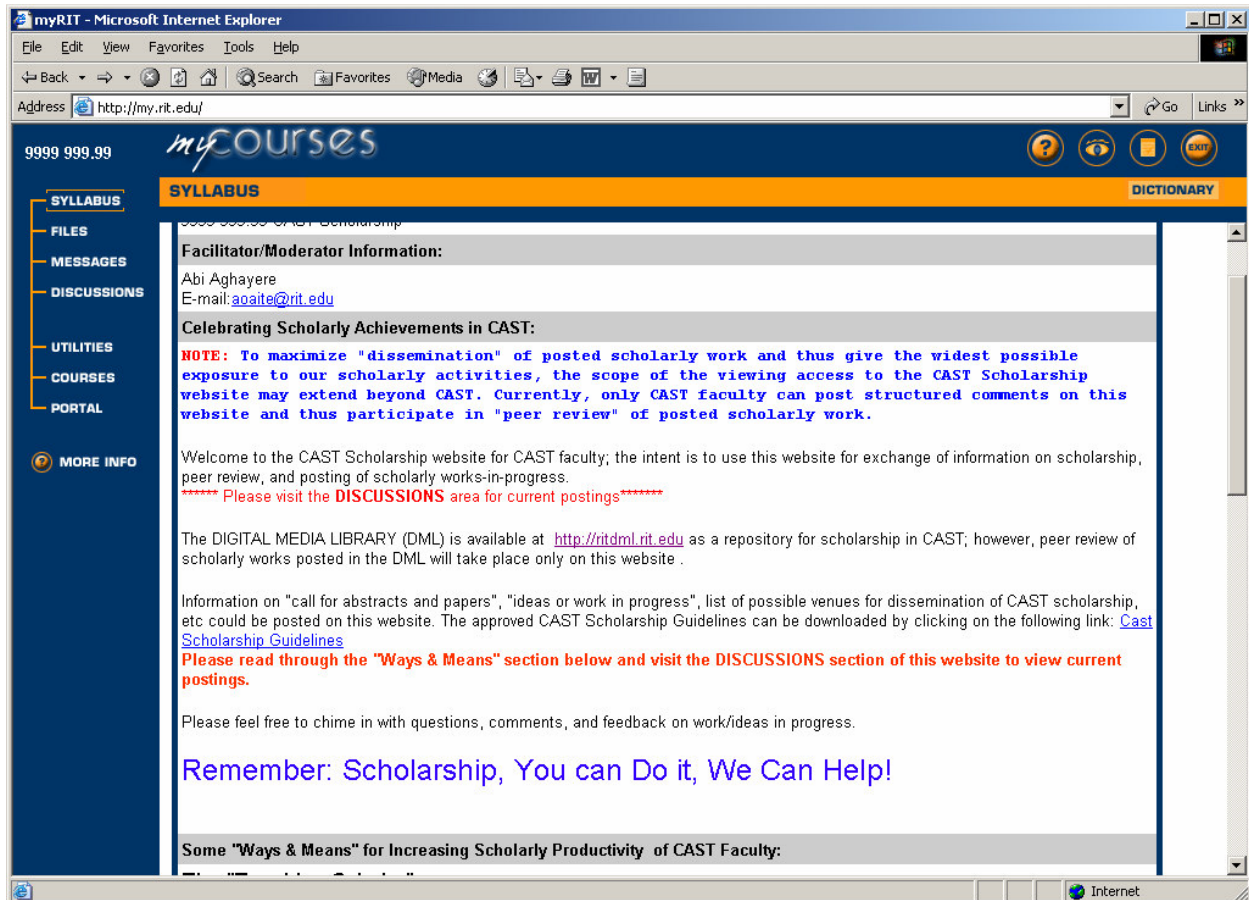


Figure 1. Entry Page to the CAST Scholarship Website

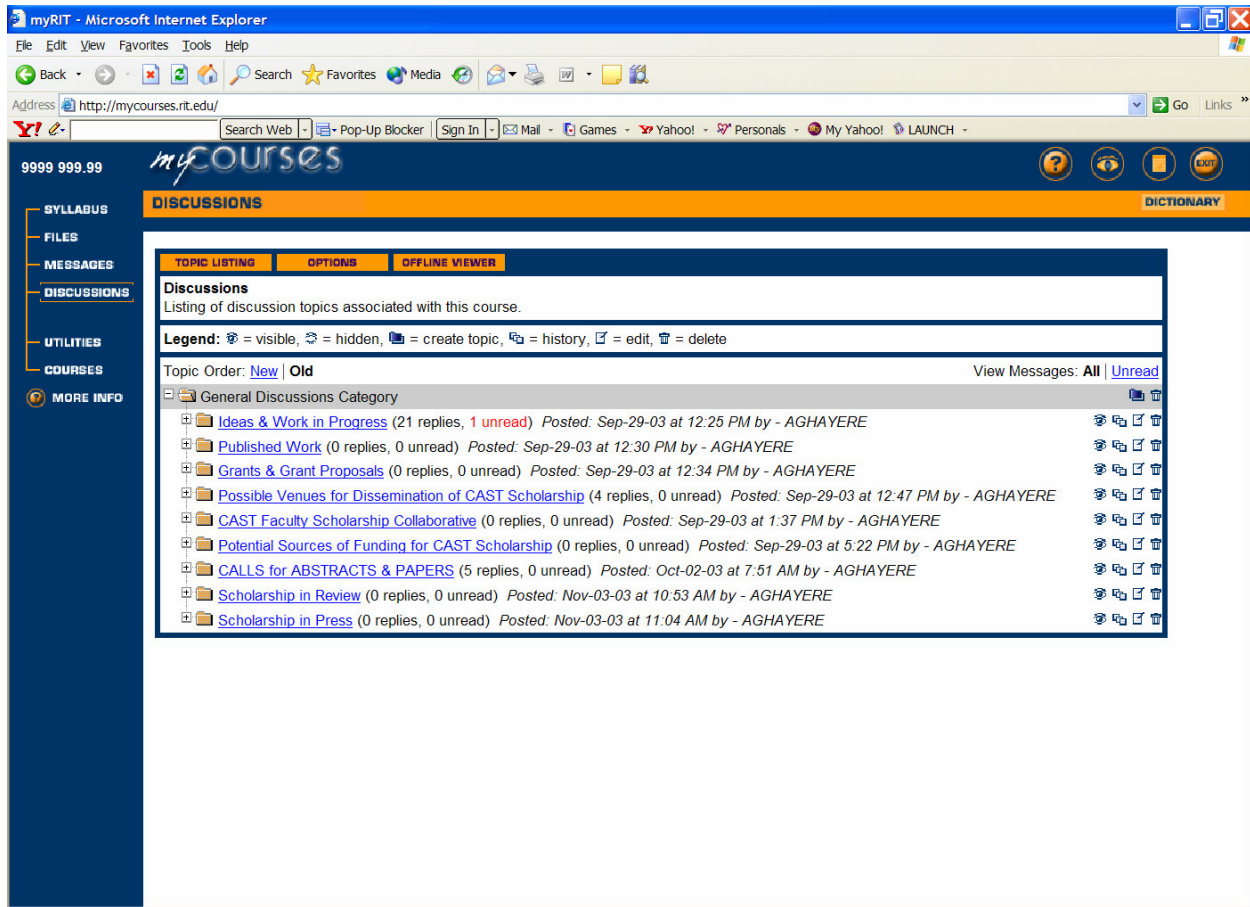


Figure 2. Discussions Page of the CAST Scholarship Website

College Scholarship Symposia or Colloquia

As part of the future of plan of work, the FAS plans to organize scholarship symposia or colloquia within the College. The purpose of the symposia which will consist of abstracts, papers and posters will be to promote collaboration among the faculty in the College, to share ideas and work in progress, to acknowledge scholarly achievements, and to share faculty scholarship with students. We also plan to explore the creation of excellence-in-scholarship awards, similar to excellence-in-teaching awards, to provide some incentive for faculty to engage in scholarly activities.

Creating College Summer Mini-Grants for Scholarship

The FAS plans to make the case to the Dean of the College to create several summer scholarship mini-grants for faculty; amounts of up to \$2000 will be proposed, though tight budget considerations at this time may limit the number and amount of grant awards that can be made.

Typically, most ET faculty do not teach during the summer months and many do only consulting work during this period. With a grant incentive, faculty can devote some of their time during the summer months to scholarly activities. The advantage of the mini-grant program is that the experience and confidence that faculty acquire from writing the mini-grant proposals will be helpful to them in the future when writing grant proposals to external agencies like the National Science Foundation (NSF).

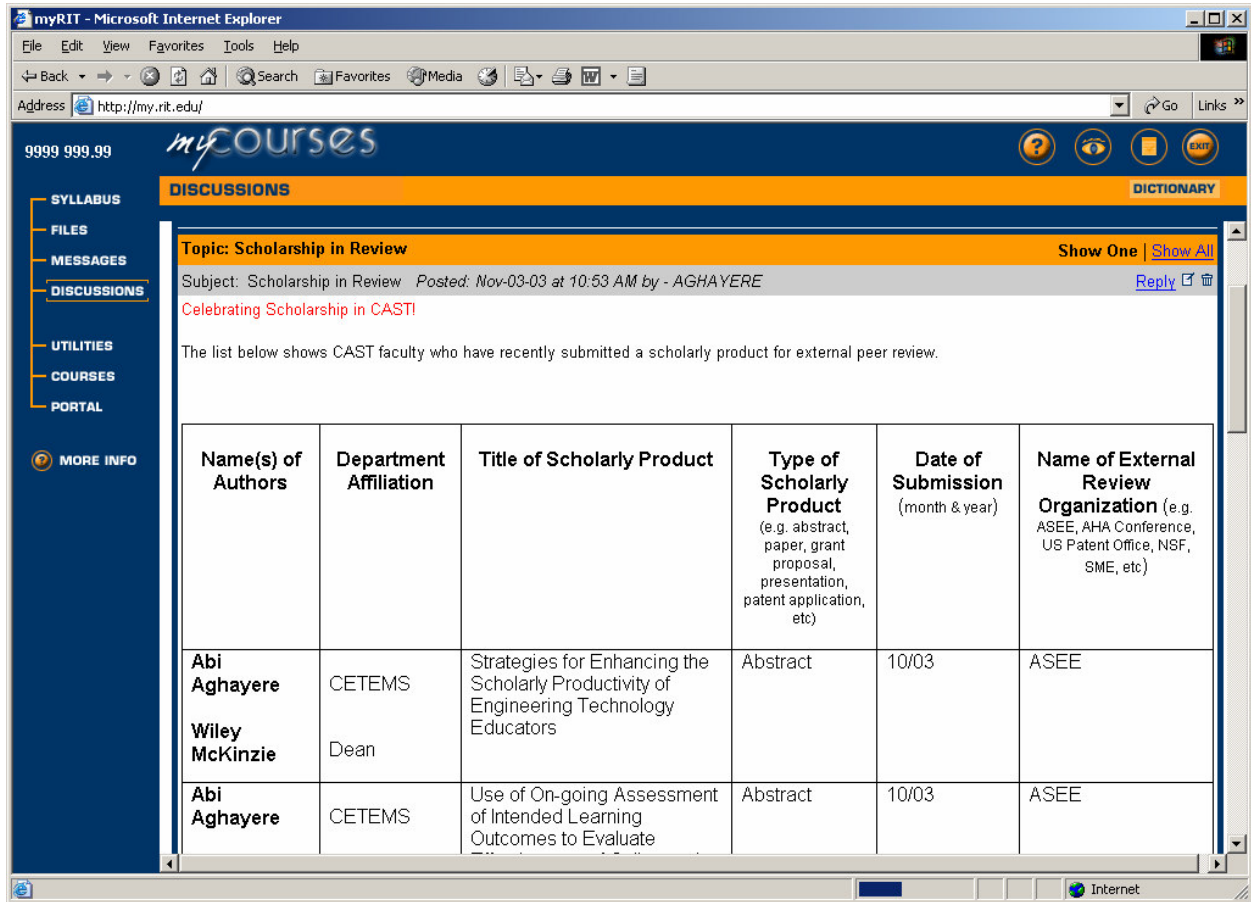


Figure 3. “Scholarship in Review” Folder on the CAST Scholarship Website

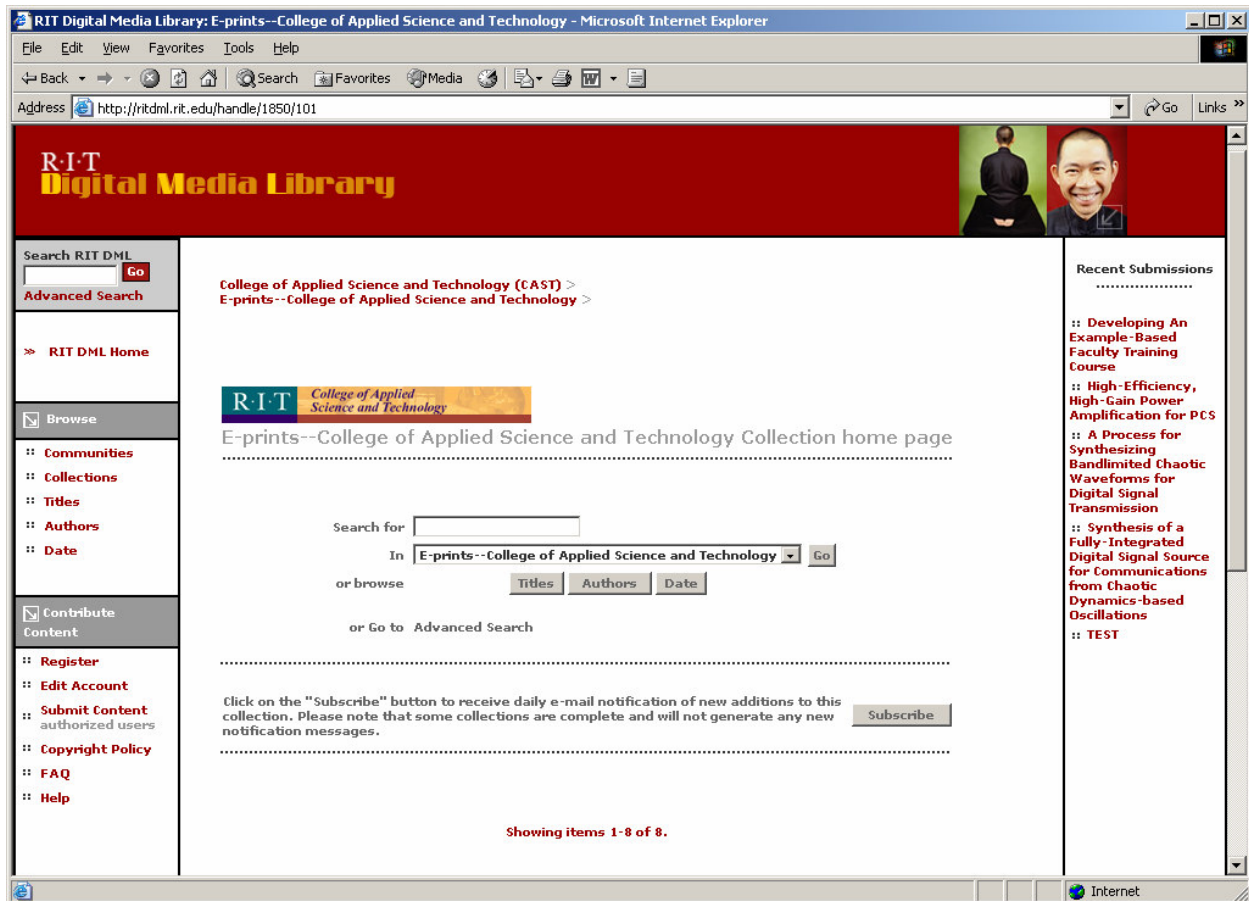


Figure 4. RIT Digital Media Library

Other Scholarship Support Programs in the Works

The FAS plans to suggest to the Dean of CAST to invest in faculty scholars through a competitive course release program for scholarship. Special consideration would be given to new faculty to enable them establish their scholarship portfolio, while also maintaining adequate teaching load required for tenure in ET programs. New or novice faculty scholars will be eligible to apply annually for up to one-third course release for up to a maximum of two years. Experienced faculty scholars who have already attained tenure would also be eligible to apply for up to a one-third course release for one quarter per academic year when working on scholarship that involves grant or contract proposal writing. Faculty with successful grant proposals will be allowed a buy-out of teaching time up to a maximum of one-third course release using the departmental/college overhead funds from the grant award.

The suggested maximum one-third course release is to ensure that ET faculty-scholars continue to remain engaged with their students in the classroom. The number of course release awards given annually will be determined by the Dean based on available resources. The scholarship

performance of faculty who has been granted course release will be reviewed annually by a Scholarship Review Committee (SRC) to be set up by the Dean; this committee could be made up of faculty from the CAST Scholars Group.

Faculty will also be encouraged to make use of available resources for scholarship such as the internet and the world-wide web, and the sabbatical leave program, which can be used for instance, by faculty who wish to focus their time on writing a text-book in their discipline. From the author's experience at RIT, the sabbatical leave program is grossly under-utilized by ET faculty.

Preliminary Observations, Evaluations and Conclusions

Using the tracking features on the scholarship website, approximately 50% of the 75 faculty in CAST have already logged on to the website as of December 2003. These numbers are encouraging given the fact that the CAST scholarship website was created in September 2003. It is our hope that faculty activity on the scholarship website and the DML will increase as faculty prepare their plans of work and scholarship deliverables for 2004.

Early indications from the strategies implemented so far have been very positive and point to the success of the FAS program. A total of 16 CAST faculty participated in the recent abstract submissions to the ASEE 2004 conference with a total of 11 abstracts submitted. This is a significant improvement over previous years, and based on anecdotal evidence, the efforts of the FAS in motivating faculty, and the presence of the CAST scholarship website have been instrumental in achieving this increased rate of faculty participation in scholarly activities. One e-mail correspondence from a CAST faculty - whose abstract was accepted - to the FAS sums it up: "Thanks for 'building a fire' under us and reminding us of the deadline; your encouragement really helped."

With the 2004 ASEE Annual Conference paper submission process now completed, the author can report that 9 papers written by CAST faculty were accepted in the ETD Division; this compares to a total of 4 papers written by CAST faculty for the 2003 conference by 4 participating faculty members. In addition to the 9 papers above, 4 papers written by CAST faculty were also accepted in other ASEE divisions. This brings the total of papers accepted from CAST faculty for the 2004 ASEE Annual Conference to 13 papers with 17 participating faculty members. Additionally, 5 recent papers written by CAST faculty have been accepted for publication/presentation in other mediums. Table 1 presents the inventory of scholarship in CAST for the past three years; in the past 6 months, about 30% of CAST faculty have participated in producing more than 20 scholarly products. These increases in scholarly productivity and in the number of participating faculty can be attributed to the success of the FAS program and the strategies discussed in this paper. A recent correspondence to the FAS from a CAST department Chair that further attests to the success of the FAS program states, "your work as the CAST Faculty Associate for Scholarship has really helped faculty embrace the concept [of scholarship], rather than fear it as a new job responsibility. You lead by example, and interact well with faculty, even those who are reluctant." Preliminary indications point to an

increased awareness of scholarship among CAST faculty and increased faculty participation in scholarly activities. The consistent motivation of the faculty by the FAS and the availability of the CAST scholarship website and the DML, where scholarly works can be posted, peer reviewed, and celebrated, are helping to cultivate the culture of scholarship in CAST and in the ET programs. We have set an initial target goal of one scholarly product per faculty per year within the first five years, in the absence of a benchmark survey of the scholarly productivity in ET programs. We believe this goal is reasonable for ET faculty given the current average ET faculty teaching workload of 13 contact hours⁴ which limits the time that can be spent on scholarly activities. The National Center for Education Statistics, in 1987 and 1992, conducted surveys¹² of the scholarly productivity of faculty in US colleges and universities, and tabulated the results based on the type of institution per the Carnegie classification, and the program area. The 1992 survey indicated that the average scholarly productivity for all institutions was about 4.6 scholarly products per faculty per year, and more than fifty percent of these were in the form of presentations and exhibits. The survey also revealed that the corresponding average teaching load for faculty was 9.4 contact hours for 4-year institutions and 11 contact hours for all institutions. The ET community should conduct a similar survey which ET programs could use as a benchmark to set their scholarly productivity goals.

We have discussed various strategies and ideas in this paper for enhancing the scholarly productivity of ET faculty and some of these strategies are currently being implemented in CAST at RIT. These strategies are not unique to RIT or CAST and could therefore be replicated in other ET programs. A preliminary evaluation of the processes that have been implemented and the impact of these processes point to positive changes in how CAST faculty view scholarship. This paradigm shift with regards to scholarship can be seen in the increase in the number of faculty that have engaged in scholarly writing within the past 6 months. It is the hope of the author that other ET programs would replicate some of these strategies at their institutions in order to provide the necessary support mechanism for ET faculty scholarship and thus motivate their faculty to become engaged in scholarship. As much as possible, ET scholarship should be student-centered, involve students, and enhance student learning and classroom instruction. As ET faculty begin to reflect on their teaching, consulting and other activities on a continuous basis, and writing or presenting on their findings to a broader audience, and receiving feedback, classroom instruction will be enhanced; however, for this to happen and for the scholarship culture to become ingrained in ET, adequate support and enablers for faculty scholarship and an adequate reward system are needed; such support could be in the form of course release time and a travel fund program for faculty to attend conferences, as well as other scholarship support ideas proposed in this paper.

The author hopes that this paper will start an ET Community-wide discussion about the “ways and means” to enhance the scholarly productivity of ET educators. ET faculty should be encouraged to embrace scholarship in order for ET to continue to thrive and maintain respectability within the academy. In so doing, ET will become known and distinguished not only for its applications-oriented and student-focused teaching, but also for its student-centered and curriculum-enhancing scholarship. This will enable many more ET educators to achieve full professorship status and prestige at their institutions. Indeed, the mantra of the ET community with regards to scholarship must be: “Scholarship, You can do it! We can help!”

Table 1. CAST Scholarship Inventory * (as of 9/7/2004)**

Time Period	Refereed Articles in Conference Proceedings	Refereed Journal Articles	Books & Book Chapters	Grants, Patents, and Software	Others (please describe)	Total Number of Scholarly Products	Total Number of CAST Faculty Members Participating in the Scholarly Output
Sept 2003 – Present	18*	1**		3		22	21
Sept 2002 – August 2003	9			2		11	11
Sept 2001 – August 2002	7			1		8	2

* 13 of the 18 papers will be presented at the ASEE 2004 Annual Conference in June 04

** Paper accepted for publication in Journal

*** Scholarship listed herein contain the three essential ingredients: documentation, dissemination, and peer-review

Acknowledgements

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Some "Ways & Means" for Increasing Scholarly Productivity of ET Faculty:

The "Teaching Scholar"

1. Just like teaching, schedule regular blocks of time for writing and documenting your scholarly work; write in 30-minute blocks of time at least 4 days a week. Set realistic scholarship goals and prioritize activities.
2. Publish or present on ABET assessment experiences and procedures.
3. Publish or present on new course and curriculum developments, experiences in the classroom: what works, what doesn't, innovative methods for enhancing student learning, assessment of pedagogical methods, etc
4. Publish or present on online teaching experiences; comparison of online versus face-to-face or hybrid courses as it relates to student learning
5. In the absence of laboratories, consider scholarship in the areas of computer modeling and simulation, and pedagogy
6. Consider writing and publishing a textbook in your field.
7. Turning Consulting Activities into Scholarship⁴:

Present or publish in a practice-based publication or at a conference on the following:

- something useful and/or new and innovative in your consulting practice
 - consulting case studies
 - consulting applications
 - monitoring of existing or developing technologies
 - integration of practice into the classroom: documenting how technical aspects of consulting practice are integrated or incorporated into the curriculum
 - documenting how professional issues facing industry and the profession are incorporated into the curriculum
8. Publish or present on Independent study projects with students
 9. Publish or present on your leadership and service experiences with professional societies.
 10. Description of continuing education seminars, workshops and short courses developed and presented to professionals, faculty or K-12 teachers
 11. Publish and present reports to clients on consulting activities detailing new applications or new ideas developed, leading to advancement in professional practice or education
 12. Collaborate with other CAST faculty and if possible, faculty from other institutions. Avail yourself of the resources in the Discussions section of this website to view "ideas and work in progress," to share your own ideas, and to give and receive feedback.