# Facilitating Cross-Disciplinary Scholarship of Teaching and Learning at The Citadel

***Kenneth P. Brannan [1], Suzanne T. Mabrouk[2], Alix G. Darden[3], Virginia M. Deroma[4], Russell O. Hilleke[5], Kristy Y. Johnson[3], and Dennis J. Fallon[1]***

## *Abstract*

In April of 2000, a group devoted to the scholarship of teaching and learning was established at The Citadel in response to the Campus Conversations program of The Carnegie Academy for Advancement of Teaching. Faculty involved in The Citadel's campus program represent a variety of disciplines, including Biology, Chemistry, Education, Engineering, English, Health and Physical Education, Math, Physics, Political Science, Psychology, and Special Services. Over the past four years, The Citadel's program has become multi-faceted with many opportunities for interaction across the disciplines. Beginning in 2002, the group added cross-disciplinary classroom research projects to its list of activities. The first project, which compared student performance on immediate and delayed quizzes to student procrastination, will be discussed in this paper. The logistics of establishing the research group and conducting the project will also be presented. Finally, an assessment of the benefits of the first four years of The Citadel's program and its direction for the future will be provided.

## *Introduction*

Challenged by works such as Ernest L. Boyer's classic report, *Scholarship Reconsidered*[1], many schools have considered how to create an environment in which the scholarship of teaching and learning (SoTL) is valued along with discipline-specific research. While a number of academic departments at The Citadel have long taken an active role in the scholarship of teaching, campus conversations between faculty led to an interest in evidence-based documentation of learning that occurred with novel teaching practices. Participation in The Citadel Academy for the Scholarship of Teaching, Learning, and Evaluation (CASTLE) has provided an excellent avenue for faculty to develop ideas about how to measure learning that might occur with novel teaching practices.

CASTLE was established in response to the Campus Conversations program of The Carnegie Academy for Advancement of Teaching. It has afforded opportunities for faculty representing a variety of disciplines to interact and collaborate on projects. Some twenty-five percent of the entire faculty are involved to some extent in CASTLE programs, half of whom are conducting SoTL research. Involved faculty represent a diverse set of disciplines: Biology, Chemistry, Education, Engineering, English, Health and Physical Education, Math, Physics, Political Science, Psychology, and Special Services. CASTLE promotes SoTL through the following activities: regularly scheduled meetings, workshops and conferences, and individual and collaborative research projects. One recent

[1] Dept. of Civil and Environmental Engineering, The Citadel, 171 Moultrie St., Charleston, SC 29409

[2] Dept. of Chemistry, The Citadel, 171 Moultrie St., Charleston, SC 29409

[3] Dept. of Biology, The Citadel, 171 Moultrie St., Charleston, SC 29409

[4] Dept. of Psychology, The Citadel, 171 Moultrie St., Charleston, SC 29409

[5] Dept. of Physics, The Citadel, 171 Moultrie St., Charleston, SC 29409

research project involved faculty and graduate students from five different disciplines (biology, chemistry, civil and environmental engineering, physics, and psychology). The study focused on student procrastination and its correlation with student performance on immediate and delayed quizzes.

The purpose of this paper is to describe how a successful cross-disciplinary program promoting the scholarship of teaching and learning was created and maintained at a small college on a limited budget. The logistics of establishing the above-mentioned cross-disciplinary research group and conducting the research will be presented. The discussion will include typical sponsored activities, the importance of support from the institution, budgetary considerations, challenges encountered, and benefits to engineering faculty involved in the program. Finally, an assessment of the benefits of the first four years of The Citadel's program and its direction for the future will be provided.

## ***Background***

In engineering education, terms such as multidisciplinary or cross-disciplinary may have multiple meanings. For example, Campbell[2] defines education in cross-disciplines as courses extending across several specific areas within a field of engineering; and cross-fields as involving more than one field of engineering. Cross-disciplinary can also refer to integrating non-engineering material into engineering classes[3]. Teams of faculty from various fields (e.g., engineering and business) may cooperate in developing courses[4] and teams of students may work together in courses involving engineering and non-engineering students[5]. New criteria from the Accreditation Board for Engineering and Technology (ABET) promote multidisciplinary aspects in design courses.

In this paper, the term cross-disciplinary will refer to faculty from different disciplines investigating and promoting more effective ways of teaching and learning. Cross-disciplinary efforts of this nature are believed to be invaluable in promoting the scholarship of teaching and learning in all of the participating disciplines in that such cooperative enterprises help faculty to focus on learning across the curriculum. In the sections below a brief history of the establishment of a group that fosters cross-disciplinary collaborations on The Citadel campus is presented.

Building upon the work of Ernest Boyer's *Scholarship Reconsidered*[1] and Glassick, Huber, and Maeroff's *Scholarship Assessed*[6], the Carnegie Teaching Academy initiated a three-part, multi-year program[7]. Coordinated by the American Association for Higher Education (AAHE), the second part of the Carnegie Teaching Academy's program was called the Teaching Academy Campus Program. From the outset of the program, plans were made to involve some 80 institutions in the Academy's Campus Program. Member institutions were encouraged to share their SoTL experiences through publications and conferences. Remarkably, the number of member institutions had grown to 200 by Fall 2002[8].

After learning about the Campus Conversations Program, two of the authors (Drs. Darden and Mabrouk) organized a meeting in April, 2000 for faculty interested in the scholarship of teaching and learning. High enthusiasm among those in attendance led to regular, biweekly meetings. Activities in the first few months included the following:

- the development of a campus definition of SoTL and mission,
- discussion and assessment of SoTL literature read by group members prior to the meeting; presentation and critique by group members of SoTL papers in their respective fields,
- a workshop on Classroom Research and Assessment conducted by Dr. Mimi Harris Steadman, coauthor of the book *Classroom Research: Implementing the Scholarship of Teaching*[9].

The two-day workshop, attended by 20 percent of the entire faculty, was a pivotal event for the group for two reasons. First, focus on Classroom Assessment Techniques, or CATs, was sharpened. Prior to the workshop, CATs as discussed by Angelo and Cross[10] had been used in CASTLE meetings to initiate discussion and assess understanding of topics explored. Hands-on activities during the first part of the workshop provided a greater level

of expertise with CATs. Second, the workshop provided details on the implementation of classroom research on campus.

In preparation for Fall 2000, the group became a formal entity on campus now known as CASTLE. The group began discussing ideas for classroom research projects that would commence in the fall. After the fall semester began, biweekly meetings were scheduled and primarily devoted to refining research ideas to incorporate strategies for assessing learning. Individual CASTLE members presented research plans, while members offered feedback. The cross-disciplinary nature of the feedback enhanced the efforts of participating faculty members.

Another workshop held Spring 2001 helped direct attention to the many facets of scholarly work. Headlining the event was Dr. Charles Glassick, former president of the Carnegie foundation. Dr. Glassick's presentation was entitled "Looking to The Next Century: Scholarship in Higher Education." Sessions on the Learning and Study Strategies Inventory (LASSI), the Motivated Strategies for Learning Questionnaire (MSLQ), and leading an effective classroom discussion added to the research tools and techniques of campus faculty members.

By the end of the academic year, members were prepared to present the results of the research fostered by CASTLE activities. Several members presented their research at a Communication across the Curriculum (CAC) meeting, a well-attended gathering of Citadel faculty, many of whom were not involved in CASTLE. A second opportunity was provided in June 2001 through the support of an AAHE "Going Public" grant. A number of members presented their work at The First Annual Charleston Connections: Innovations In Higher Education Conference attended by faculty from five colleges and universities in the Charleston, South Carolina area. The Charleston Connections Conference, which was started by CASTLE, has continued as an annual area event.

For the first two years, cross-disciplinary activities were primarily oriented towards support and exchange of ideas at the meetings. Research projects were conducted either by individuals or by co-workers in the same field. During Spring 2002, the group decided to conduct a pilot project involving faculty members from multiple disciplines. The project focused on student procrastination and its correlation with student performance on immediate and delayed quizzes. This project will be discussed in the next section. A second cross-disciplinary project on critical thinking was scheduled to begin upon completion of the first project. The critical thinking project is currently in progress.

After initiating the cross-disciplinary research project, it was necessary to make a change in the meeting format. For the first two years, programs focused on SoTL research in the literature or on campus. In order to accommodate cross-disciplinary research, a meeting format was eventually adopted that alternated presentations of effective classroom techniques and their effect on learning with research meetings. Thus, over the years, CASTLE leadership has carefully guided the program format to promote the scholarship of teaching and learning on campus, to expand the expertise of members in effective teaching and research techniques, and to encourage collaboration of SoTL research projects that ultimately benefit students.

## ***A Cross-Disciplinary Pilot Project***

In August 2001, CASTLE established an executive committee to help coordinate activities promoting the scholarship of teaching and learning. Members of the new executive committee were solicited by e-mail among the active participants. During the next few months, the executive committee formulated plans for the initial cross-disciplinary project, which was formally announced in March 2002. Although the project had been discussed in meetings, all faculty involved with CASTLE were contacted by e-mail to ensure that anyone interested in participating would have an opportunity. The original stated goal of the proposed research project was "to evaluate if attention/retention is increased when students know they are immediately accountable after material is introduced or after a specified period of time."[11]

## ***Project Coordination***

Five faculty members ultimately responded to the proposal and participated in the project. With coordination details being handled primarily by a graduate assistant working 10 - 20 hours per week in the CASTLE office, a request was made to participants in May 2002 for information needed to complete the project. Project responsibilities, including coordinating the project, conducting the literature review, coordinating the data analysis, compiling the data, writing the first draft of the manuscript to be submitted to a journal, performing the study activities, and editing were divided among participants.

Overall, the project involved five faculty members and two graduate assistants from five different academic departments and five different classes, administration of quizzes and questionnaires for each class, interaction with the college review board for human subjects testing, and obtaining written permission from participating students. Nevertheless, from project conception to project completion, most details were handled efficiently through coordination by a graduate assistant. In addition, other data were collected during the second phase of the project that could be potentially useful in subsequent studies.

## ***Project Design***

Complete details of this project have been published elsewhere[12], but will be summarized here as an example of a SoTL project possible through cross-disciplinary collaboration. One objective of the study was to determine if the timing of quizzes affects student attentiveness during lectures and performance on the quizzes. Another objective was to explore potential relationships between procrastination and quiz performance.

The objectives were accomplished by giving two different-timed quizzes in each class. One quiz was given immediately following a lecture. The second quiz was administered at the beginning of the next class period following a lecture. In both cases, students were forewarned about the quiz before the lecture commenced. Quizzes were composed of five to seven questions and balanced with regard to the degree of higher-order thinking required, question type, and length. Quizzes were also administered in close time proximity in order to reduce the confound of quiz difficulty across conditions given that content areas of a course typically become progressively more difficult as the semester progresses.

Quizzes were administered to 183 undergraduate students taking classes in the following disciplines: Biology (64 students), Chemistry (47 students), Civil Engineering (13 students), Physics (44 students), and Statistics (15 students). Freshman and Sophomore classes were specifically targeted for the study to limit the need for prior knowledge of subject material.

In addition to administering quizzes, observations of student attentiveness were made during the lectures associated with each quiz. Trained graduate students observed three randomly selected students to monitor during the lecture. Actions such as taking notes, nodding at a lecture point, or looking at the textbook were identified as on-task behaviors. Staring out the window, sleeping, or talking with another student were considered examples of off-task behaviors. Sampling was performed at 10-second intervals, with cues provided by a tone on a tape. Reliability checks were performed to ensure consistent quality of data collection. Baseline conditions were established through observations made during a lecture not followed by a quiz.

To limit the impact of increasing complexity of subject material, quizzes and observations were made early in the semester. In two courses the immediate quiz was given first, while the delayed quiz was given first in the other courses.

The second phase of the project examined the procrastination tendencies of students involved in the study. This information was obtained via a procrastination questionnaire developed by Tuckman[13]. Due to the use of human subjects, it was necessary to acquire appropriate approval from the college review board for human subjects testing and to obtain written permission from each student. Following approval of the college, two graduate students again visited each participating class and administered the questionnaire.

## ***Results***

The principal results from the study include the following:

- The average percentage of time that students were exhibiting on-task behavior was higher for lectures preceding an immediate quiz than for lectures preceding a delayed quiz. Baseline conditions represented the lowest percentage of on-task behavior. However, the differences between the three conditions were not significant.

- Scores on the immediate quizzes were significantly higher than scores on delayed quizzes.

- No significant relationship was found between immediate quiz scores and procrastination scores. However, comparison of procrastination scores and delayed quiz scores resulted in a significant, negative relationship.

## ***Applications***

A standard practice in many college classrooms is to use some type of delayed testing as the primary form of assessment. It is assumed that students will be appropriately motivated to learn through the application of delayed testing. Results from this study indicate that administering immediate quizzes may be more effective in facilitating student learning and suggest that students do not maximally utilize time in between classes to prepare for quizzes.

Procrastination appeared to be related in some way to the lower scores on the delayed quizzes. Judicious selection of times for classroom testing may be beneficial for students identified as procrastination-prone.

# ***Lessons Learned from SoTL Activities and Cross-Disciplinary Collaboration***

Experience in CASTLE demonstrates how much can be accomplished by a small nucleus of members representing a variety of disciplines. However, there are several areas critical to the success of SoTL activities on a college campus, including administrative support, membership, and leadership. The significance of these areas in creating opportunities beneficial to a variety of disciplines is discussed below.

## ***Administrative Support***

Administrative support can be valuable in creating and supporting opportunities for collaboration among faculty from different disciplines. As noted previously, support has been provided for workshops and conferences on campus, where faculty members from all disciplines interact. The Charleston Connections Conference has been particularly helpful in this regard. Another potential opportunity for cross-disciplinary interaction is for teams of faculty members to participate in national and regional conferences. Since CASTLE was established, funds have been made available for this purpose.

Having space for meetings, storage of literature, and files can provide a central base of operations that promotes effectiveness and group identity. After two years, the administration gave CASTLE a spacious room for its activities. Further, funding for a part-time graduate assistant to record minutes at meetings, maintain the website, update information, and make arrangements for workshops and conferences has helped keep faculty free for accomplishing other tasks.

Shortly after the organization of CASTLE, a natural link was forged between the Office of Planning and Assessment and CASTLE. It was realized that results from SoTL research could be used in assessing programs at the departmental and institutional levels. In addition, effective classroom research can lead to continuous improvement of teaching and learning, a goal of outcome assessment.

Making sure that faculty members have ample time to pursue activities related to the scholarship of teaching and learning can encourage faculty involvement. In 2001 – 2002, one faculty member selected as a Carnegie Scholar was subsequently granted a teaching load reduction. Recently, a one-course reduction per semester for a faculty member to facilitate CASTLE programs was approved. Perhaps more importantly, this type of support makes it clear to the rest of the campus that SoTL will be considered a viable form of scholarship. Moreover, administrative support in tenure and promotion decisions can communicate the high importance of SoTL to faculty throughout the institution.

## ***Participation***

During the first year, some 25% of the faculty attended CASTLE meetings regularly, although the attendance at any given meeting might be less. However, experience over the past four years has shown that numbers at any specific meeting rarely exceeds 10% of the faculty and that participation tends to decrease as the year proceeds. Low participation may be a result of several factors:

- a belief that they have little to learn or gain from attending meetings
- limited time combined with heavy demands
- perception that work associated with SoTL's focus on documentation of learning has little influence in the promotion and tenure process.

While low numbers do not necessarily prevent collaboration among the disciplines, it is desirable to have sufficient participation to provide flexibility and appropriate expertise for cross-disciplinary projects. One of the ways membership has been promoted is to have core members make presentations at new faculty orientations and at CAC meetings. Periodic announcements over e-mail and the maintenance of a web site are also potentially beneficial.

Participation is an ongoing concern for any SoTL group that wishes to improve its credibility among faculty and administration. While communication is essential, one of the most effective ways to stimulate and maintain participation is through effective leadership.

## ***Leadership***

CASTLE leadership is made up of two volunteer coordinators and a core group of members. Enthusiastic leadership is key to broadly promoting participation among faculty from various disciplines. Among the potential responsibilities of leaders are the following: organizing activities that promote SoTL, coordinating or guiding cross-disciplinary projects, and recruiting other faculty. Over the four years of operation, it has not been difficult to maintain loyal participation among a core group. The group has also been fortunate to have outstanding coordinators, considering the competing demands for faculty time from many other directions.

As noted above, the administration has assisted in attracting coordinators by offering release time for coordinators. In addition, other core members have been willing to share the burden of responsibilities by accepting well-defined tasks. Nevertheless, sustaining a SoTL group for the long term is a challenge that is highly dependent on locating willing and able coordinators, especially considering that even among loyal core members it may be difficult to find members who would take on the additional responsibilities associated with group leadership.

## ***Benefits to Engineering Education***

There are a number of benefits for engineering educators that participate in cross-disciplinary SoTL groups. These benefits, of course, are generic and also apply to faculty members of any discipline. By working with faculty from other disciplines in a variety of contexts, an individual faculty member is exposed to a much wider range of models and viewpoints. This can add considerable dimension to that faculty member's individual research methods. Further, group members working on classroom research have an opportunity to expand their expertise through

collaboration. For example, an engineering educator may learn a great deal about human subject research from a psychology professor who excels in this type research.

In a small school with a limited number of students, the sample size is often a concern for statistical analysis. By assembling a team composed of several disciplines, the sample size may be increased. The sample will be a more diverse sample, composed of various disciplines, but this can be advantageous in contributing to the body of knowledge in a given area. Research based on a number of disciplines may appeal to a broader audience. Also, it may be possible to draw comparisons between the engineering population and other populations.

Finally, another obvious but important point should be made. Considering the relatively low percentage of engineering faculty actively involved in the scholarship of teaching and learning, collaboration with faculty members of other disciplines increases contact with individuals with similar interests. This expands resources for research, creates more opportunities for feedback, and perhaps most importantly, benefits the students in the process.

## ***References***


1. Boyer, E.L.(1990) *Scholarship Reconsidered: Priorities of the Professoriate*, Jossey-Bass, San Francisco, CA.

2. Campbell, M. E. (October 1999) "Oh, Now I Get It!" *Journal of Engineering Education*, American Society for Engineering Education, Washington, D.C.

3. Raju, P. K. and Sankar, C. S. (October 1999) "Teaching Real-World Issues through Case Studies," *Journal of Engineering Education*, American Society for Engineering Education, Washington, D.C.

4. Bhavnani, S. H. and Aldridge, M. D. (January 2000) "Teamwork across Disciplinary Boundaries: A Bridge between College and the Workplace," *Journal of Engineering Education*, American Society for Engineering Education, Washington, D.C.

5. Dannels, D. P., Berardinelli, P., Anson, C. M., Bullard, L., Kleid, N., Kmiec, D., Peretti, S. (2003) "Instruction and Assessment of Multidisciplinary Teaming Skills in Senior Design," 2003 Annual Conference and Exposition Proceedings, Nashville, Tennessee.

6. Glassick, C., Huber, M., and Maeroff, G. (1997). *Scholarship Assessed: Evaluation of the Professoriate*, Jossey-Bass, San Francisco, CA.

7. Carnegie Foundation for the Advancement of Teaching (Summer 1998) *News*, http://www.aahe.org/teaching/Carnegie/news1.htm.

8. The Carnegie Foundation for the Advancement of Teaching, "Campus Program," http://www.carnegiefoundation.org/CASTL/highered/campus_program.htm.

9. Cross, K. P. and Steadman, M. H. (1996) *Classroom Research: Implementing the Scholarship of Teaching*, San Francisco, CA.: Jossey-Bass.

10. Angelo, T. A. and Cross, K. P. (1993) *Classroom Assessment Techniques: A Handbook for College Teachers*, San Francisco, CA.: Jossey-Bass.

11. Personal communication from A. Young (2002) on behalf of the Citadel Academy for the Scholarship of Teaching, Learning and Evaluation Executive Committee.

12. DeRoma, V. M., Young, A., Mabrouk, S. T., Brannan, K. P., Hilleke, R. O., and Johnson, K. Y. (2003) "Procrastination and Student Performance On Immediate and Delayed Quizzes," *Education*, Vol 124, Issue 1, p.40.

13. Tuckman, B. W. (1991) "The Development and Concurrent Validity of the Procrastination Scale," *Educational and Psychological Measurement*, Sage Publications.

## ***Kenneth P. Brannan***

Kenneth P. Brannan is Professor and Head of Civil and Environmental Engineering at The Citadel. He was President of the Southeastern Section of ASEE during 1998-1999. He was co-recipient of the Thomas C. Evans Instructional Paper Award for 1990. He earned B.C.E. and M.S. degrees from Auburn University and the Ph.D. from Virginia Tech. A registered professional engineer, Dr. Brannan has interests in freshman engineering education, computers in engineering education, water supply, and wastewater treatment system.

## ***Suzanne T. Mabrouk***

Suzanne T. Mabrouk is Associate Professor of Chemistry at The Citadel. She is one of the co-founders of CASTLE. She earned an A.B. from Wheaton College (MA) and a Ph.D. from the University of Massachusetts at Amherst. She is actively involved in the development of introductory and organic chemistry experiments, techniques to enhance student learning, and the chemistry of essential oils and alternative photography.

## ***Alix G. Darden***

Alix G. Darden is Associate Professor of Biology at The Citadel and one of the cofounders of CASTLE. She earned her BS in Biology at Brooklyn College, Brooklyn, NY and a Ph.D. from Southwestern Graduate School, Dallas, TX. Dr. Darden has interests in the development of abstract thinking in traditional and non-traditional college students and the molecular biology of amphibian photoreception.

## ***Virginia M. DeRoma***

Virginia DeRoma, Ph.D., ABPP, is an assistant professor in the Department of Psychology. She earned her Ph.D. from West Virginia University in Clinical Psychology and has taught at University of Southern Mississippi and William Carey College before becoming faculty at The Citadel. Dr. DeRoma has recently published articles that relate to student affinity for course structure, procrastination, and tolerance for ambiguity.

## ***Russell O. Hilleke***

Russell O. Hilleke is Associate Professor of Physics at The Citadel. He earned a B.S. degree in Physics from the Georgia Institute of Technology and a M.S. and Ph.D. from the University of Illinois at Champaign-Urbana. His interests are in developing advanced laboratory exercises for Physics students and condensed matter physics.

## ***Kristy Y. Johnson***

Kristy Y. Johnson is an Assistant Professor in the Department of Biology at The Citadel. She earned her B.S. degree from Gardner-Webb University and her Ph.D. from the Medical University of South Carolina. Dr. Johnson has assisted in the recent development of a Teaching Internship at The Citadel for graduate students and post-doctoral fellows from the Medical University. Her research interests include determining the effects of sphingolipid molecules on tumor development.

## ***Dennis J. Fallon***

Dennis J. Fallon is the Dean of Engineering and the Louis S. LeTellier Chair at The Citadel in Charleston, South Carolina. He is presently the President of the Southeastern Section of ASEE. He also held this position during the academic year 1996 to 1997. He was the co-recipient of the Thomas C. Evans Instructional Paper Award for 1990. His teaching awards included the Cumberland Gap Chi Epsilon Award for teaching excellence in 1985 and the James Grimsley Teaching Award in 1995. He earned a BSCE from Old Dominion University. He received his MSCE and Ph.D. in structural engineering from North Carolina State University. Dr. Fallon's primary interest besides the teaching of structural and geotechnical engineering is in the scholarship of teaching, curriculum assessment and program evaluation.