

Clemson Thinks²
Clemson University

ANNUAL REPORT 2015



thinks²
CLEMSON
prepare to engage

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The academic year 2014-15 was a very successful one for Clemson Thinks². We had a large growth in the number and diversity of courses offered, a very well-received Faculty Institute, an improved testing procedure, and the appointment of the first class of CT² Faculty Scholars.

In the academic year 2014-15, 68 classes were conducted under the aegis of CT². Disciplines represented in 2014-15: Agricultural Education, Anthropology, Biosystems Engineering, Bio-Engineering, Biological Sciences, Communications, Construction Science and Management, CU, English, Engineering, Environmental Engineering, Family and Consumer Sciences, Geography, Geology, Health, Honors, Horticulture, Mathematical Sciences, Philosophy, Packaging Sciences, Political Science, Parks, Recreation, and Tourism Management, Psychology, Religion, Sociology, Science and Technology in Society and Theatre. New disciplines for 2014-15 were: Agricultural Education, Biosystems Engineering, Communications, Family and Consumer Sciences, Honors, Packaging Science, Political Science, and Religion.

Thirty-six faculty members attended the 2014 Faculty Institute. Twenty-one different disciplines are represented at the 2014 Institute. The keynote presenter was Dr. Gerald Nosich from the Institute for Critical Thinking in Berkeley, California. Dr. Nosich's presentations and exercises were very well received by the participants. Other notable presenters included: Dr. Linda Nilson who spoke on curriculum, syllabus design, and critical thinking pedagogy, Dr. Kelly Smith who gave a demonstration of the Socratic Method, Dr. Paul Merritt who presented on cognition testing effects, and Dr. David Knox. In response to the survey of the Institute administered to the participants at the end of the June session, 100% of the participants agreed that they would recommend the Faculty Institute to their colleagues.

The transition to 100% California Critical Thinking Skills Test (CCTST) was seamless and a great asset to data collection and analysis. Some faculty expressed a concern that the CAT test was, perhaps, a bit more "user-friendly" to certain types of learners. The option is open to give the CAT test in addition to the CCTST, but the faculty member who chooses to do so is responsible for the grading themselves. From the student standpoint, the CCTST offered the ability to take the test at any time and receive an immediate score. For the CT² Office, the transition to the CCTST freed us from having to package, deliver, pickup, score, and ship off paper tests as well as having immediate access to the scores. In comparing the effectiveness of the CCTST vs the CAT, I would say from our experience, that both tests are equally effective in ascertaining critical thinking skills but the convenience of the CCTST makes it more amenable to our needs.

Also related to critical thinking skills tests, the action plan instituted in 2013-14 to score the CAT tests from that year was completed by the CAT test scoring session in December 2014. On December 15, 16, 17, 2014 the director organized a 3-day scoring session that involved 23 CT² faculty members. One of the virtues of the need to score the CAT test by hand consists in the potential for the scoring session to be a faculty development project. During an engaged scoring session, faculty hone their own critical thinking skills through analysis of the students' answers and their interaction with their fellow scorers. The CAT scoring session was a great success. The lively interaction between the faculty scorers and the intensive engaged atmosphere allowed the reviewers to score twice as many tests in the same amount of time compared to other institutions. Thus, not only were the tests scored but a strong sense of camaraderie was built up among the CT² faculty, an increased awareness of student thought processes, and a sharpening of faculty critical thinking skills were also outcomes. A survey was conducted at the completion of the scoring session. In the survey, participants expressed satisfaction with the activity and the interaction of the participants.

Academic year 2014-15 also marked the inception of the first class of CT² Faculty Scholars. Fourteen faculty members were chosen for this honor that carries with it a \$2500 professional development stipend. All the Scholars are graduates of the Faculty Institute, have taught two or more semesters of successful CT² classes (as indicated by CT test scores and other evidence), have demonstrated their commitment to developing student CT skills, have a coherent philosophy of critical thinking pedagogy, and have submitted up to date credentials reflecting their abilities.

In addition to the above, CT² is also responsible for the administration of the ETS Proficiency Profile to all incoming freshmen and a large sample of seniors (eventually all seniors). By 'bookending' the administration of the test in this manner, the progress of individual students can be tracked. In addition, the critical thinking section of the PP provides another measure of the progress of students in CT skills. In Fall 2015, the CT² office (with the assistance of several of the CT² Faculty Scholars and personnel from Institutional Research) tested 3,495 incoming freshmen. In Spring 2016, 295 seniors were tested. We initially had over 3 times this many seniors scheduled, but, due to school weather closings, many classes had to cancel. The test is mandatory for incoming freshmen. For the senior testing, we rely on the departments and faculty to volunteer their courses. This often poses a scheduling problem in the limited time available. We have traditionally tested seniors in the Spring semester. In the 2015-16 academic year we will expand this to senior testing in Fall and Spring semesters. Hopefully this will increase participation.

As mentioned above, a very successful year for CT². The excitement and energy level is still building. We look forward to 2015-16.

CAT Scoring Session: December 2014

The design of Clemson Thinks² included the testing of two separate instruments for pre and post-testing in the CT² seminars: The Critical Thinking Assessment Test (CAT) and the California Critical Thinking Skills Test (CCTST) from Insight Assessment. Both instruments are widely used to measure critical thinking skills in education and industry. Although both instruments have concurrent validity, they are very different in their structure and method of scoring.

The CAT exam consists of short scenarios to which the test-taker responds to through several questions. The CAT is administered in class. The test is scored manually by a (minimum) team of two with a third evaluator to adjudicate when there is a disparity between the scores given by the two primary evaluators. The CCTST is taken on-line and may be administered in class or as homework. The CCTST is similar in format to the verbal reasoning section of the GRE or the critical reading section of the SAT. The test is scored automatically when it is completed.

While both instruments have their virtues as measures of critical thinking skills it became apparent that it would be impossible to score every CAT test – a necessary part of the design of CT². Although Tennessee Tech recommends a sample of 15-20% matched pairs of tests, this does not fit in with the design of CT² that requires that all students be tracked individually. So, at the end of year one of CT² there were approximately 500 unscored CAT tests. The CCTST scores were available immediately, so the program had 50% of the scores for the 2013-14 year. Due to logistical issues, the new director who began in June 2014 decided that, henceforth, only the CCTST would be used.

However, the problem remained of having to score the CAT tests. In December 2014 the director organized a 3-day scoring session that involved 23 CT² faculty members. One of the virtues of the need to score the CAT test by hand consists in the potential for the scoring session to be a faculty development project. During an engaged scoring session, faculty hone their own critical thinking skills through analysis of the students' answers and their interaction with their fellow scorers. The CAT scoring session was a great success. The lively interaction between the faculty scorers and the intensive engaged atmosphere allowed the reviewers to score twice as many tests in the same amount of time compared to

other institutions. Thus, not only were the tests scored but strong sense of camaraderie was built up among the CT² faculty, an increased awareness of student thought processes, and a sharpening of faculty critical thinking skills were also outcomes. A survey was conducted at the completion of the scoring session.

MISSION & GOALS

MISSION

Clemson Thinks², the University's Quality Enhancement Plan, is an ambitious experiment in critical thinking that will transform learning and teaching through second-year Critical Thinking (CT) Seminars, a cohort of CT faculty scholars, faculty development, rigorous assessment and scholarly research.

GOALS

1: Student Critical Thinking Skills

To increase the critical thinking skills of Clemson University students.

2: Faculty Critical Thinking Skills

To increase the critical thinking pedagogical skills of faculty.



OUTCOMES

California Critical Thinking Skills Test (CCTST) Results

<i>Fall 2014</i>	Overall Score	Percentile	Analysis	Inference	Evaluation	Induction	Deduction
Pretest (n=913)	17.53	53.27	3.84	9.07	4.62	9.38	8.15
Post- Test (n=772)	18.20	56.82	3.97	9.36	4.86	9.64	8.56

<i>Spring 2015</i>	Overall Score	Percentile	Analysis	Inference	Evaluation	Induction	Deduction
Pretest (n=913)	17.31	53.43	3.85	9.05	4.41	9.26	8.05
Post- Test (n=772)	18.17	57.89	3.96	9.32	4.89	9.57	8.60

OUTCOMES

CALIFORNIA CRITICAL THINKING SKILLS TEST (CCTST) RESULTS ANALYSIS

FALL 2014

PAIRED SAMPLES STATISTICS					
	Mean	N	Std. Deviation	Std. Error Mean	
Pair 1	Post_F14	19.4690	31	2.85756	.51323
	Pre_F14	18.4700	31	2.54858	.45774

PAIRED SAMPLES TEST									
	Paired Differences	t	df	Sig. (2-tailed)					
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference						
Lower	Upper								
Pair 1	Post_F14 - Pre_F14	.99896	1.15022	.20659	.57705	1.42086	4.836	30	.000

OUTCOMES

SPRING 2015

PAIRED SAMPLES STATISTICS					
	Mean	N	Std. Deviation	Std. Error Mean	
Pair 1	Post_S15	19.2516	31	2.55250	.45844
	Pre_S15	18.3613	31	2.33362	.41913

PAIRED SAMPLES TEST									
	Paired Differences	t	df	Sig. (2-tailed)					
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference						
Lower	Upper								
Pair 1	Post_S15 - Pre_S15	.89032	1.50385	.27010	.33871	1.44194	3.296	30	.003

The testing went smoothly for both the pre and post and validated the decision to phase out the CAT test. The unscored CAT tests from the 2013-14 academic year were scored over 3 days by 23 CT² Faculty Members.

OUTCOMES

FALL 2014

<i>COURSE PREFIX</i>	<i>COURSE NUMBER</i>	<i>SECTION</i>	<i>COURSE TITLE</i>
ANTH	4660	001	Evolution of Human Behavior
B E	3200	001	Principles and Practices of Geomatics
BIOE	3700	002	Bioinstrumentation and Bioimaging
BIOE	4120	001	Orthopedic Engineering and Pathology
BIOL	4660	001	Evolution of Human Behavior
BIOL	2000	002	Biology in the News
COMM	2010	001	Introduction to Communication Studies
ENGL	2150	004	Literature in 20th- and 21st-Century Contexts
ENGL	2150	012	Literature in 20th- and 21st-Century Contexts
ENGL	2150	017	Literature in 20th- and 21st-Century Contexts
ENGL	2120	006	World Literature
ENGL	2120	007	World Literature
ENGL	2150	100	20th - 21st Century Lit

ENGR	1900	004	Special Projects in Engineering I
ENGR	1900	005	Special Projects in Engineering I
ENSP	2000	001	Introduction to Environmental Science and Policy
FCS	8300	001	Community Development
GEOL	2700	001	Experiences in Sustainable Development: Water
HLTH	2020	001	Intro to Public Health
HLTH	2020	002	Intro to Public Health
HLTH	2020	003	Intro to Public Health
HORT	3080	001	Sustainable Landscape Garden Design
MATH	1010	113	Essential Mathematics for the Informed Society
MATH	3190	001	Introduction to Proof
MATH	3190	002	Introduction to Proof
PHIL	1020	001	Logic
PHIL	1020	002	Logic
PKSC	4990	015	Packaging Science CI
PRTM	2290	001	EDGE

OUTCOMES

<i>PRTM</i>	3450	001	Tourism Management
<i>PSYC</i>	3100	600	Advanced Experimental Psychology
<i>SOC</i>	4140	001	Policy and Social Change
<i>SOC</i>	3970	001	Substance Abuse: Social Causes, Consequences and Treatment
<i>SOC</i>	4600	001	Race and Ethnicity
<i>STS</i>	2150	001	A Critical Approach to the Global Challenge of Technological Revolutions
<i>THEA</i>	2100	003	Theatre Appreciation

OUTCOMES

SPRING 2015

Course Prefix (ARCH, PHIL, MATH, AVS etc.): Course Number: Section Number: Course Title

Course Prefix (ARCH, PHIL, MATH, AVS etc.):	Course Number:	Section Number:	Course Title
AGED	4160	001	Ethics and Issues in Agriculture and the Food and Fiber System
ANTH and BIOL (cross-listed)	3510	001	Biological Anthropology
BIOL	2000	002	Biology in the News
BIOL	2000	004	Biology in the News
COMM	2010	001	Introduction to Communication Studies
CSM	1500	001	Construction Problem Solving and Critical Thinking
CSM	1500	002	Construction Problem Solving and Critical Thinking
CSM	1500	003	Construction Problem Solving and Critical Thinking
CU	2010	001	Sustainability
ENGL	2120	009	It's a Wonderful World?: Utopia/Dystopia

ENGL	2120	010	It's a Wonderful World?: Utopia/Dystopia
ENGL	2120	017	It's a Wonderful World?: Utopia/Dystopia
ENGL	2120	011	World Literature
ENGL	2120	012	World Literature
ENGR	1900	005	Special Projects in Engineering
ENGR	2080	001	Evaluating Innovations: Fixtures, Fads, and Flops
ENSP	2000	001	Introduction to Environmental Science and Policy
GEOG	1030	001	World Regional Geography
HON	2060	001	Introduction to Nanotechnology
MATH	1010	001	Essential Mathematics for the Informed Society
MATH	3190	002	Introduction to Proof
PHIL	1020	006	Logic
POSC	3890	001	Religious Liberty and the Constitution
PRTM	3450	001	Tourism Management

PSYC	3100	500	Advanced Experimental Psychology
REL	3000	001	Studying Religion: Theories and Methods
SOC	2020	001	Social Problems
SOC	2020	002	Social Problems
SOC	2010	004	Introduction to Sociology
SOC	4600	001	Race and Ethnicity
STS	2150	001	A Critical Approach to the Global Challenge of Technological Revolutions
THEA	2100	006	Theatre Appreciation

OUTCOMES

Disciplines 2014-15:

Agricultural Education
 Anthropology
 Biosystems Engineering
 Bio-Engineering
 Biological Sciences
 Communications
 Construction Science and
 Management
 CU
 English
 Engineering
 Environmental Engineering
 Family and Consumer Sciences
 Geography
 Geology
 Health
 Honors
 Horticulture
 Mathematical Sciences
 Philosophy
 Packaging Sciences
 Political Science
 Parks, Recreation, and Tourism
 Management
 Psychology
 Religion
 Sociology
 Science and Technology in Society
 Theatre

New disciplines for
 2014-15 are: Agricultural
 Education, Biosystems
 Engineering,
 Communications, Family
 and Consumer Sciences,
 Honors, Packaging
 Science, Political
 Science, and Religion.

OUTCOMES

STUDENT EVALUATIONS

TERM	QUESTION	Average of Score	Count of Answers
Fall 2014			
1408	I have gained skills in interpreting data and information from one source and applying it to make informed decisions.	4.34	483
1408	I had the opportunity to develop creative solutions to complex issues presented during the course.	4.34	479
1408	I received feedback on my written and verbal communication assignments throughout the course.	4.22	483
1408	This course provided me with the opportunity to analyze multi-dimensional problems.	4.43	478
1408	This course helped me expand my knowledge and application of critical thinking skills.	4.39	484
Spring 2015			
1501	This course provided me with the opportunity to explore possible solutions and outcomes to specific problems or issues.	4.27	73
1501	I have gained skills in interpreting data and information from one source and applying it to make informed decisions.	4.38	72
1501	I had the opportunity to develop creative solutions to complex issues presented during the course.	4.32	73

1501	I received feedback on my written and verbal communication assignments throughout the course.	4.63	73
1501	This course provided me with the opportunity to analyze multi-dimensional problems.	4.32	72
1501	This course helped me expand my knowledge and application of critical thinking skills.	4.47	73

USE OF RESULTS

Critical Thinking Pre and Post Tests

The assessment model for the CT^2 seminars is based on multiple sources of data collection. One of the most important data collection methods is the pre- and post-testing of students enrolled in the CT^2 seminars. The students are tested during the first week of class and again before or in the final week of class. Based on our research, we determined that two instruments: The Critical Thinking Assessment Test (CAT) developed by Tennessee Technical University and the California Critical Thinking Skills Test (CCTST) developed by Insight Assessment were best suited to our needs.

Clemson University administered the CAT test to half the pilot courses in the fall semester of 2012 and the CCTST to the other half. We followed this same procedure for the pilot courses during the spring 2013 semester. During Fall 2013, we compared our results in: ease of administration, ease of scoring, quality of data, amenability to students, faculty buy-in, and other factors to determine a final assessment instrument for the program. Although the CAT was an effective instrument for measuring critical thinking skills it had two major drawbacks in the context of CT^2 : it is a paper and pencil test to which the instructor must devote two class periods (pre and post-test) and it must be scored manually by faculty members. One of the core principles of CT^2 is that the progress of individual students must be tracked. Thus, scoring a sample of the CAT tests would not be acceptable. Further, the time and effort needed to score the tests manually would be prohibitive and would only increase as the program expanded. The CCTST, on the other hand, is automatically scored when the student completes the test. The student receives a report showing their performance in various aspects of critical thinking. The CCTST may be done in the classroom environment or as a homework assignment. It was decided by the new director in Summer 2014 that all CT^2 classes would employ only the CCTST as the pre and post-test instruments. This has been very successful in Fall and Spring 2014-15 and we now have accumulated a great deal of useful data.

“I thought there was much knowledge and good science about teaching and learning presented. It sparked many new ideas about how I could teach material and aid students to better learn new concepts.”

Please rate your satisfaction with the following aspects of the CAT Test scoring process:

#	Question	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	Total Responses	Mean
1	Facilities (e.g., room size, location, physical comfort)	0	10	4	4	2	20	2.90
2	Overall duration of three (3) consecutive days	0	1	1	10	8	20	4.25
3	Number and frequency of formal breaks	0	3	2	5	10	20	4.10
4	Variety and amount of food (i.e., snacks, drinks, and lunches)	0	2	2	7	9	20	4.15

USE OF RESULTS

5	Atmosphere of sessions (e.g., level of formality, sense of collegiality)	0	0	0	2	18	20	4.90
6	Structure of sessions (e.g., size of groups, number of tests per round)	0	0	1	3	16	20	4.75
7	Interaction with session leader(s)	0	0	1	3	16	20	4.75
8	Interaction with fellow participants	0	0	0	3	17	20	4.85

As for dissatisfaction, the only complaints centered around the small size of the room. In future activities of this sort, more spacious accommodations will be arranged. All considered though, a very productive and enjoyable experience for the participants.

SUMMARY & CONCLUSION

CONTRIBUTIONS TO THE INSTITUTION

1. Trained 36 faculty members in effective critical thinking pedagogy at the 2014 Clemson Thinks² Faculty Institute.
2. 2130 students participated in CT² courses.

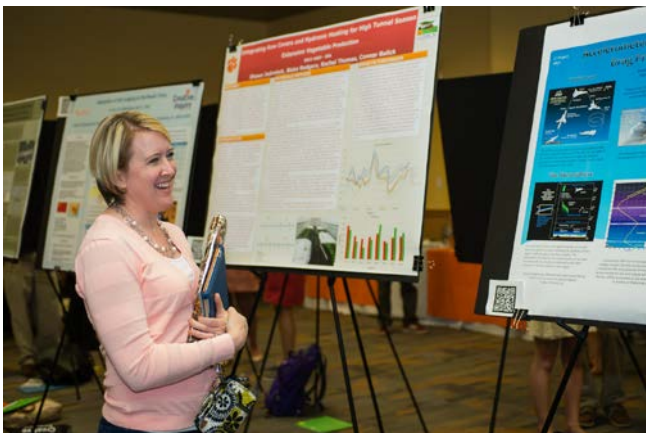
HIGHLIGHTS

1. 2014 CT² Faculty Institute: Gerald Nosich, keynote presenter.
2. Appointment of first class of CT² Faculty Scholars.
3. Growth of program.

TEACHING ACTIVITIES

1. 36 faculty members participated in the 2014 CT² Faculty Institute.
2. 68 CT² classes were offered 2014-14 academic year.

Students in CT² classes get an extra set of 6 questions in the Student Evaluation of Instructors. These questions pertain to their perception of their growth in CT skills. The average of students responding to each question was 4 (out of 5) or better.



“I LIKED THE KEYNOTE PRESENTATION AND JUST HAVING THE OPPORTUNITY TO MEET OTHER FACULTY MEMBERS AND BOUNCE IDEAS OFF OF THEM. THERE WERE LOTS OF GREAT CHANCES FOR FACULTY FELLOWSHIP.”

SUMMARY & CONCLUSION

CHALLENGES

The greatest challenge facing CT² is the budget. According to the plan, the budget was to have been substantially increased in 2014-15 from its 2013-14 level. Due to financial challenges the University faced, that increase was not forthcoming. Thus our budget remains static at the 2013-14 level even though there are multiple expenditures that have increased since the program's inception. Among these expenditures are: more student enrollment=more money being spent on critical thinking tests, the appointment of the Faculty Scholars and the attendant stipend=\$35,000, the CAT test Scoring Session cost \$30,000 in professional development funds and catering. As mentioned elsewhere, the Faculty Institute including speakers, professional development stipends, facilities, personnel, supplies, and catering exceeds \$100,000. Also due to funding challenges, the full time administrative assistant and Associate Director have not been hired since their salaries would also have to come out of a static budget that is increasingly inadequate as the program grows. I am not hopeful that we shall see a budget increase in 2015-16 so I think we will have to get used to doing a lot more with less.



“I learned much about critical thinking, including its conceptualization and operationalization. The institute was interactive, informative, and well-done overall. I liked the break on Wednesday. I’m much more excited and informed about deliberately emphasizing critical thinking in my classes.”



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