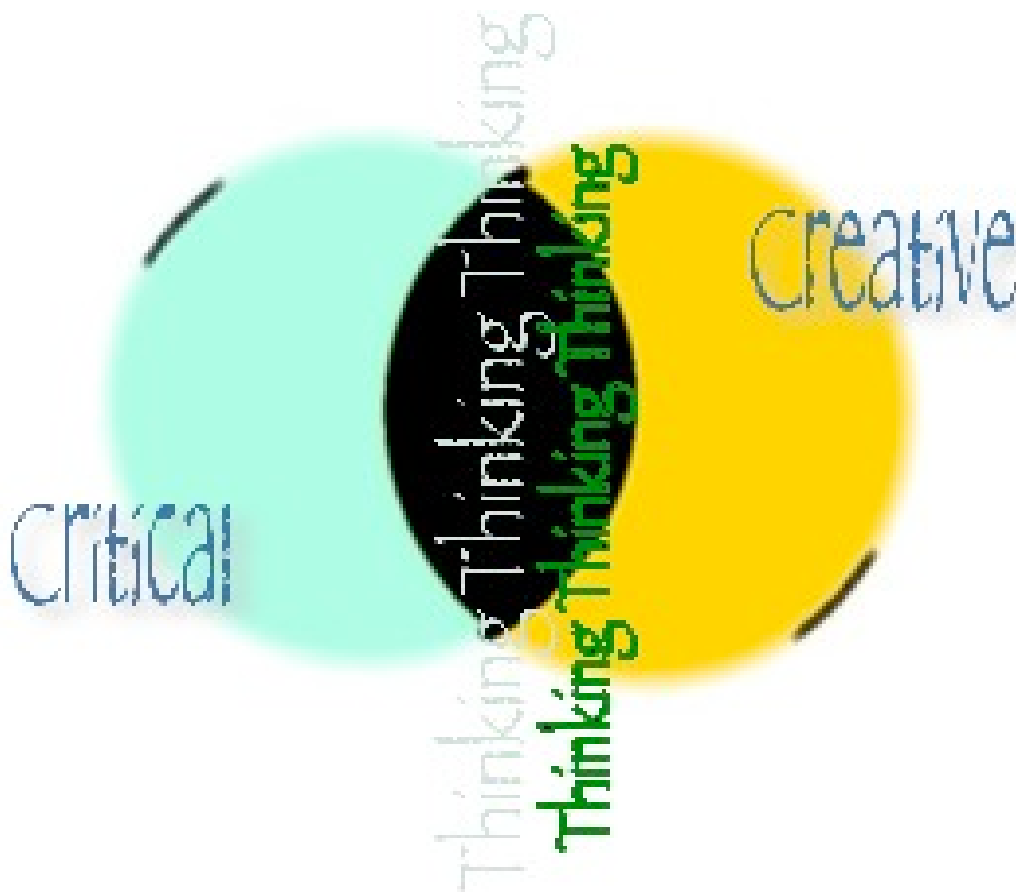**The Five Colleges of Ohio**
The Teagle Foundation

"Creative and Critical Thinking: Assessing the Foundations of a Liberal Arts Education"

3-Year Comprehensive Report

The College of Wooster
August 15, 2009

"Creative and Critical Thinking: Assessing the Foundations of a Liberal Arts Education"

3-Year Comprehensive Report

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EXECUTIVE SUMMARY

This report presents the history and findings of the Five Colleges of Ohio Teagle-funded project to assess critical and creative thinking on our campuses.

The project has been extremely stimulating for many of our participating faculty, who have found that the collaboration with colleagues across the Five Colleges of Ohio has helped them re-imagine the classroom as a more effective creative environment for student growth.

We are also pleased to have found that indeed our campuses remain sites that both faculty and students recognize as centers for the fostering of creative and critical thinking. This point is extremely important since one of the working hypotheses of our research was the belief that creative thinking, in particular, can be and/or is squelched by an undergraduate education. Our research indicates that that is clearly not the case with respect to the liberal arts education that we provide.

Project History

Iain Crawford, former vice president for academic affairs at The College of Wooster, initiated the project, working with Susan Palmer, executive director of the Five Colleges of Ohio, in 2005-06.

Several key questions guided our research:
(1) What tools might we develop to assess fundamental and related outcomes of a liberal arts education?
(2) Can we effectively assess development of critical and creative thinking in the classroom?
(3) What are faculty and student perceptions of creative thinking and critical thinking?
(4) how do student perceptions of these change during their college years?

In the first year of the project, we assembled two working groups of faculty from our institutions. Each group studied the concepts of creative thinking and critical thinking in order to develop rubrics, based on Primary Trait Analysis, to assess both kinds of thinking in the classroom. Rubrics were piloted and reviewed for refinement. Simultaneously, we developed and tested surveys of faculty and student perceptions of creative and critical thinking.

In the second year, we administered the surveys to first-year students, seniors, and faculty. We also conducted focus groups with faculty and seniors, in addition to testing additional rubrics created by 60 faculty representing all four divisions across our campuses. These faculty completed an online survey regarding their perceptions of the impact of the use of the rubric on their teaching. Based on data collected from the rubrics, we constructed a generic creative/critical thinking rubric. Many traits govern critical and creative thinking, but based on our review of the literature and our assessment of our own faculty's determination of which traits they consider most relevant to the classroom, we selected the following for our generic rubric: *Elements of Argumentation – Explanation, Analysis, Evaluation, Interpretation, and Logic; Domain and Disciplinary Knowledge; Synthesis and Connections; Abstract Thinking; Complexity of Thought; Idea Generation – Fluency and Flexibility; Completeness/Coherence; Elegance; Divergent Thinking; Novelty – Germinal, Original, and Transformational; Engagement; and Risk Taking* (descriptions included in Appendix A).

In the third year, we used the generic rubric in longitudinal and cross-sectional studies by 24 faculty members representing the fine arts, humanities, natural sciences, and social sciences on our project campuses. We collected additional data through (1) the administration of critical and creative thinking surveys to first-year students and sophomores on our campuses, (2) the online survey of participating faculty, and (3) long interviews conducted with the participating faculty to learn more about the relationship between creative/critical thinking and pedagogy.

Key Findings

(1) What tools might we develop to assess fundamental and related outcomes of a liberal arts education?
We developed surveys as well as focus group and individual interview protocols to determine faculty and student perceptions of critical and creative thinking. We developed a generic rubric.

(2) Can we effectively assess development of critical and creative thinking in the classroom?
Creative and critical thinking can be assessed in students, and we found improvement of performance on many creative and critical thinking traits among the students we studied (N = 444 students across 31 courses).

Faculty who participated in the project could choose to assess students on a variety of creative and critical thinking traits. The traits measured most frequently across all disciplines were *original* and *complete* measured in 89 and 87% of students, respectively, followed by *knowledge* measured in 85% of students. The traits least likely to be measured included *abstract, logic,* and *germinal.* There were some differences across disciplines in the traits that were emphasized; for example, faculty teaching in interdisciplinary courses were more likely to examine *complexity,* and they shared with fine arts faculty a greater concern for *engagement* and *risk.*

In the longitudinal data measuring change in student performance across a semester, the traits where the most change was evident included *complete, elegant, knowledge,* and *engaged;* and the most change occurred among students in interdisciplinary courses. In the cross-sectional data comparing less expert students to more expert, the most reliable differences were for *analyze, logic, knowledge,* and *explain.* There was no significant difference between the groups' performance on *abstract, fluent, flexible, elegant, divergent, germinal,* and *risk.*

(3) What are faculty and student perceptions of creative thinking and critical thinking?
Students most frequently associated creativity with extracurricular activity and then with the arts. Unlike critical thinking, creativity was *not* closely associated with the classroom. Students rated "class projects" as important in facilitating both creative and critical thinking.
Faculty identified assessment of arguments and understanding others' perspectives to distinguish growth in students' critical thinking. To distinguish growth in creative they identified novelty, risk, and curiosity. Synthesis and complexity of thought characterized growth in both critical and creative thinking.

In student and faculty ratings of the prevalence of creative environment characteristics on the four campuses, the highest ratings were given for *challenge* and *freedom,* and the lowest for *conflict* and *risk taking.* Of these four, *conflict* is the one that most discourages creativity; the other three

promote creativity. Generally, faculty rated most of these characteristics as less prevalent than did the students.

Women students reported more experience with both creative and critical thinking and more positive attitudes about creativity compared to men students.

Regarding barriers to critical thinking on campus, about one-third of students and faculty wrote about "student issues" including students' lack of preparation or concerns about being evaluated negatively. Regarding barriers to creative thinking, the most common response of senior students was that class pedagogy was a barrier (40% of students mentioned this), while faculty most often wrote about time as a barrier (18% of faculty).

All groups studied indicated that they thought their environments promoted creative and critical thinking, and all groups showed positive attitudes towards creative and critical thinking. When the groups differed in responses it was generally the faculty, and sometimes the senior students, whose responses were more tempered or negative.

Faculty, compared to students, indicated more agreement with the idea that they consider themselves people who think critically, that faculty can create conditions to promote critical thinking, that they value critical thinking, that it is possible to assess critical thinking, and that a liberal arts education is conductive to promoting critical thinking.

Faculty most often consider their own research to be the site of their most creative experiences.

Faculty were the group least likely to agree that the college provides time and space for creativity, that there is a "creative vibe" on campus, and that the higher education system facilitates creative thinking. For a few questions senior students provided the lowest ratings including agreement that courses encourage creativity, that there are opportunities for no right or wrong answers, that extracurricular activities encourage creativity, that creativity is valued in the major, and that the college values efforts to be creative.

Students had fairly stereotypical views of the disciplines in that they rated critical thinking to be most involved in the natural sciences, followed by social sciences, humanities, and fine arts; and creative thinking to be most prevalent in fine arts, followed by humanities, social sciences, and natural sciences. Faculty in these disciplines rated both creative and critical thinking as very important to their disciplines.

(4) How do student perceptions of critical and creative thinking change during their college years?
First-year students tended to see more possibilities for creative thinking campus-wide than did seniors.

Students generally did not perceive reading assignments for class to involve creative thinking, with seniors rating this lower than did sophomore and first-year students.

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As students progress through the curriculum, their belief that creativity can be taught increases.

Seniors perceived interacting with students and faculty both in and out of class as activities involving more critical thinking than did sophomores and first-year students.

Seniors, in contrast to sophomores and first-year students, were more likely to report (1) writing papers that required integration and (2) putting together ideas across courses, and they were least likely to report using brainstorming.

Seniors rated characteristics of a creative campus environment somewhat lower than did sophomores and first-year students. The ratings for "freedom" were lowest for the seniors.

Faculty Findings Regarding Pedagogy

Participating faculty who completed an on-line survey indicated that they had discussed the use of the rubric with colleagues and that the rubric helped them learn more about creative and critical thinking among their students

Participating faculty believe that teaching practices most likely to stimulate creative thinking include "active learning" techniques that facilitate student engagement with course material, connecting material inside the classroom with the "real world" outside of the classroom, and engaging students in interdisciplinary work.

Future Plans

We have already presented partial findings at the AACU and HLC conferences and will be presenting final results to the AAC&U this year. We have also initialed a project to compile and publish a collection of essays on creative/critical thinking and pedagogy, written by our faculty participants and consultants. The project will take at least a year and a half before it is completed, but we are excited about its potential to help a much larger group of faculty think productively about the place of creative and critical thinking in their classrooms.

Report Prepared by:

Nancy Grace, Professor of English, The College of Wooster

Sarah Murnen, Professor of Psychology, Kenyon College

Creative and Critical Thinking:
Project Participants (2006 – 2009)

Project Initiator: Iain Crawford -- V.P. of Academic Affairs, The College of Wooster (COW)

Project Director: Lori Bettison-Varga -- Associate Dean of Research, COW (Year 1)

Grant Administrator: Nancy Grace -- COW (Years 2 & 3)

Assessment Consultant: Theresa Ford -- COW (Year 1)

Data Analyst: Sarah Murnen -- Kenyon College (KC) (Years 2 & 3)

Survey Administrator: Theresa Ford -- COW (Years 2 & 3)

Administrative Associates: Sarah Sidor (Years 1 & 2) & Cynthia Harris (Year 3) -- COW

Transcribers: Nancy Grace, Cynthia Harris, & Sarah Sidor -- COW

Brenda Howard – OH5 & Erin McIlvain – KC

Consortial Representative: Susan Palmer – OH5

Consultants: Doug Eder -- Southern Illinois University - Edwardsville
Paul Kleiman – Deputy Director, Palatine, the Higher Education Academy; United Kingdom
Barbara J. Millis – Director, Teaching and Learning Center; University of Texas at San Antonio
Steven Tepper -- Curb Center for Art, Enterprise, and Public Policy; Vanderbilt University
Joe Trimmer -- Virginia Ball Center for Creative Inquiry; Ball State University
Barbara Walvoord -- The University of Notre Dame

Year 1 Faculty Participants

Denison University:

Gary Baker, German
Nestor Matthews, Psychology
Gill Miller, Dance

Kenyon College:

Kathryn Edwards, Biology
Kate Elkins, Humane Studies
Laurie Finke, Women and Gender Studies

Chris Gillen, Biology
Bill Klein, English
Sarah Murnen, Psychology   *Critical Thinking Working Group Leader*

Ohio Wesleyan University:

Barbara Andereck, Physics and Astronomy
Cameron Bennett, Music
David Hickcox, Geography & Environmental Studies

The College of Wooster:

Nancy Grace, English   *Creative Thinking Working Group Leader*
Simon Gray, Computer Science
Bill Macauley, English & Program in Writing
John Neuhoff, Psychology
John Rudisill, Philosophy
Elizabeth Schiltz, Philosophy

Year 2 Faculty Participants

Denison University:

Representative: Kim Coplin, Associate Provost
Toni King, Black and Women's and Gender Studies
Gill Miller, Dance

Kenyon College:

Representative: Sarah Murnen, Psychology
                    Critical Thinking Working Group Leader
Kathryn Edwards, Biology
Kate Elkins, Humane Studies
Laurie Finke, Women and Gender Studies
Chris Gillen, Biology
Bill Klein, English

Ohio Wesleyan University:

Representative: Barbara Andereck, Physics and Astronomy
Cameron Bennett, Music
Vicki DiLillo, Psychology
David Hickcox, Geography & Environmental Studies

The College of Wooster:
Representative: Simon Gray, Computer Science
                        Creative Thinking Working Group Leader
Bill Macauley, English
John Rudisill, Philosophy
Elizabeth Schiltz, Philosophy

Year 2 Test-Data Collection Participants:

Denison University:

Gary Baker, German; Toni King, Black and Women's & Gender Studies; Nestor Matthews, Psychology; Gill Miller, Dance

Kenyon College:

Eliza Ablovatski, History; Jeff Bowman, History; Ted Buehrer, Music; Jane Cowles, French; Ruth Dunnell, History; Kathryn Edwards, Biology; Kate Elkins, Human Studies; Laurie Finke, English and Women's & Gender Studies; Simon Garcia, Chemistry; Chris Gillen, Biology; Karen Hicks, Biology; Joe Klesner, Political Science; Bill Klein, English; Hugh Lester, Dance and Drama; Victoria Malawey, Music; Michelle Mood, Political Science; Maria del Carmen Parafita-Cuoto, Modern Languages; Patricia Lyn Richards, Italian; Marta Sierra, Spanish; Judy Smith, English; Mary Suydam, Religious Studies

Ohio Wesleyan University:

Barbara Andereck, Physics and Astronomy; Laurel Anderson, Biology – Microbiology; Cameron Bennett, Music; Dale Brugh, Chemistry; Vicki DiLillo, Psychology; Karen Fryer, Geology and Geography; Bonnie Milne Gardner, Theatre and Dance; David Hickcox, Geology and Geography; Sarah Leupen, Zoology; Juan Rojas, Spanish; Laura Tuhela-Reuning, Botany-Microbiology; Paula White, Education

The College of Wooster:

Mary Bader, Religious Studies; Christa Craven, Anthropology; Dean Fraga, Biology; Harry Gamble, French; Mark Graham, Religious Studies; Simon Gray, Computer Science; Shirley Huston-Findley, Theatre and Dance; Rick Lehtinen, Biology; Sharon Lynn, Biology; Bill Macauley, English; Todd McAlpine, Physics; John Rudisill, Philosophy; Elizabeth Schiltz, Philosophy; Larry Stewart, English; Tom Tierney, Sociology; Megan Wereley, Education; Walt Zurko, Art History

Year 3 Faculty Participants

Denison University:

Campus Contact: Kim Coplin, Associate Provost

Kenyon College:

Campus Contact: Sarah Murnen, Psychology

Eliza Ablovatski, History
Jeff Bowman, History
Kate Elkins, Integrated Program in the Human Studies
Laurie Finke, English and Women's & Gender Studies
Sheryl Hemkin, Chemistry
Nurten Kilic-Schubel, History
Hugh Lester, Dance and Drama
Marta Sierra, Spanish
Jan Thomas, Sociology and Women's and Gender Studies

Ohio Wesleyan University:

Campus Contact: Barbara Andereck, Physics and Astronomy

Laurel Anderson, Biology - Microbiology
Cameron Bennett, Music
Dale Brugh, Chemistry
Vicki DiLillo, Psychology
Karen Fryer, Geology and Geography
Bonnie Milne Gardner, Theatre and Dance
David Hickcox, Geology and Geography
Sarah Leupen, Zoology

The College of Wooster:

Campus Contact: Nancy Grace, English

Mary Bader, Religious Studies and Women's, Gender, & Sexuality Program
Carol Bucher, Education
Amber Garcia, Psychology
Shirley Huston-Findley, Theatre and Dance
Sharon Lynn, Biology
John Rudisill, Philosophy
Elizabeth Schiltz, Philosophy
Megan Wereley, Education

Summary and Listing of Reports

Report A: Creative and Critical Thinking Rubric Data
Did Students' Creative and Critical Thinking Change Across Time?

This report contains the final results of the research "experiment." We contend that we have measured creative and critical thinking in students on assignments designed to facilitate these processes and that we have shown that students do increase on these skills across time. In our longitudinal data set where one group of students was assessed on an assignment at two different points across time, students' performance on each trait showed statistically significant improvement from time 1 to time 2. In the cross-sectional data set where less expert students were compared to more expert, there was significant differences in performance on many of the traits with the more expert students showing better performance. We also saw in these data that different traits were emphasized in different disciplines, and a great deal of change occurred among the students in interdisciplinary courses where many different traits were assessed.

Report B: Teagle Faculty On-Line Survey
What was Faculty Response to Using the Creative and Critical Thinking Rubric?

This short report indicates faculty responses (N = 24) to the use of the "generic" creative and critical thinking rubric in their classes. Faculty indicated that they had discussed the use of the rubric with colleagues, and that the rubric helped them learn more about creative and critical thinking among their students. Some faculty ideas for promoting creative thinking in students are included in the report.

Report C: Faculty Interview Responses
What Ideas do Faculty have for Promoting Creative Thinking?

Interviews with participating faculty were conducted (N = 22) and much data were yielded from their responses.   We report on the variety of types of assignments that faculty use to promote creative and critical thinking in students, as well as what faculty consider "best practices." Faculty talked about a variety of "active learning" techniques that facilitate student engagement with course material, about the importance of connecting material inside the classroom with the "real world" outside of the classroom, and the benefits of interdisciplinary work. Faculty also discussed "standards" and habits of disciplines that might inhibit creative thinking, and stressed the important connections between creative and critical thinking. Finally, faculty discussed institutional practices that might facilitate creative thinking including faculty development and support, and the value of assessment.

Report D: Student Survey Data

What are the Creative and Critical Thinking' Attitudes and Experiences of Students?

First-year students and sophomores at the four schools completed the on-line survey piloted and developed during years 1 and 2 of the grant (total $N = 749$). From these data we learned that students rated their environments as being quite conducive to promoting both creative and critical thinking, and that their attitudes were very positive about these processes. Once again (as in year 2) we saw that the classroom was more closely associated with critical thinking than with creative thinking. Students saw few barriers to critical thinking, but frequently listed variables coded as "pedagogy" as barriers to creative thinking. (However, if faculty want to promote more creative thinking, students again rated "class projects" as facilitating both creative and critical thinking.)

Report E: Quantitative Survey Data Combined from Years 2 & 3

What are the Creative and Critical Thinking Attitudes and Experiences of Students and Faculty?

In the last report we combined this year's survey data with those from last year, resulting in a total N of 1,532. We then compared first-year students, sophomores, seniors, and faculty on the various quantitative responses.   All groups studied indicated that they thought their environments promoted creative and critical thinking, and all groups showed positive attitudes towards creative and critical thinking. When the groups differed in responses it was generally the faculty (and sometimes the senior students) whose responses were more tempered or negative.

Appendix A. "Generic" Creative and Critical Thinking Rubric

Appendix B. Student and Faculty Creative and Critical Thinking Surveys

Report A: Creative and Critical Thinking Rubric Data
Did Students' Creative and Critical Thinking Change Across Time?

For the third and final year of the Five Colleges of Ohio Teagle Project, faculty at three of the colleges used the "generic" rubric that was created at the completion of year two of the grant to measure both creative and critical thinking. The rubric was developed through the use of Primary Trait Analysis and included traits that were involved in either creative thinking and/or critical thinking. See Appendix A for a copy of the rubric that was used.

Faculty were asked to choose an assignment that they believed promoted creative and critical thinking and to measure student performance using the generic rubric. Faculty did not need to measure all of the traits, and they could use either a cross-sectional design comparing less experienced students with more experienced students, or a longitudinal design where they examined student performance on an assignment given multiple times in a course. For example, a faculty member in psychology at Ohio Wesleyan had students critically evaluate a research article at the beginning of the semester and again at the end and compared their performance in a longitudinal design. Two professors teaching women studies at Kenyon collected data on a similar assignment given to an introductory class and to majors in a senior seminar class for a cross-sectional set of data. An education professor at the College of Wooster compared performance of licensure candidates to non-licensure candidates on an assignment for another cross-sectional set of data. In the longitudinal data set, 17 classes were examined with a total of 246 students. In cross-sectional data set, there were 198 students across the 14 classes examined. The breakdown of students by discipline is provided below:

	FA	HUM	NSCI	SOSC	INT	Across Disciplines
Longitudinal Data:						
N Students	41	42	49	23	91	246
N Classes	3	4	4	2	4	17
Cross Sectional Data:						
N Students	32	23	36	59	48	198
N Classes	2	2	2	6	2	14
Combined Samples:						
N Students	73	65	85	82	139	444
N Classes	5	6	6	8	6	31

Note: FA = fine and performing arts; HUM = humanities, NSCI = natural sciences, SOSC =Social sciences; INT = interdisciplinary studies course.

Results

Table A1. Traits Measured in Classes by Discipline – All Data

One question that was of interest is whether there were particular traits that could be measured across all of the disciplines. Table A1 shows the proportion of students by discipline tested on particular traits across both data sets. The traits measured most frequently across all disciplines were *original* and *complete* measured in 89 and 87% of students, respectively, followed by *knowledge* measured in 85% of students. The traits least likely to be measured included *abstract, logic,* and *germinal.* There seem to be differences in traits that were emphasized across disciplines. All of the fine arts courses emphasized *knowledge*, and almost all assessed *complete, elegant,* and *engaged.* In the humanities, most faculty assessed *explain, analyze, flexible*, and *original.* In the natural sciences, the traits of *explain, analyze* and *complete* were assessed most frequently. All of the social science courses examined *explain, evaluate, synthesis, abstract, complete,* and *original.* Finally, all of the interdisciplinary courses examined *complex, complete, original, engaged,* and *risk.* The interdisciplinary courses seem distinct in their concern for *complexity,* and they share with fine arts a greater concern for *engagement* and *risk.*

Table A2. Average Performance on Traits Across Time – Longitudinal Data

Table A2 presents data on student performance on the traits across time in the longitudinal data set. Correlated group t-tests were conducted to determine if students performed significantly better on a trait at the later point in time. (Some faculty provided data for more than two time periods. In that case the data from the first and last times the assignment was given were used.) Correlated groups t-tests are statistically powerful tests, and there was a significant increase in performance on every trait measured across time. The traits where the most change was evident included *complete, elegant, knowledge,* and *engaged* as indicated by the value of the t-tests. At time 1 the traits where students performed best include *explain, synthesis, analyze*, and *logic.* At time 2 the list was a bit different with students performing best on *logic, analyze, synthesis*, and *abstract.* At time 1 students performed the worst on *transformation, divergent, risk,* and *flexible.* The same traits were lowest at time 2 in a different order with students performing worst on *transformation, risk, divergent*, and *flexible.*

Table A3. Amount of Change Across Time by Discipline and Trait – Longitudinal Data

A change score was created in the longitudinal data by subtracting an individual's score at time 1 from their score at time 2. Thus, a positive score would indicate an increase in performance across time. Change in particular traits by discipline was then examined to see if there were particular traits where students showed a lot of change in particular disciplines. These data are shown in table A3. Traits for which there was a change score of 1 or greater are displayed in bold. In the fine arts there was a large amount of change (1 or greater) on the traits of *risk* and *flexible.* In the humanities, there was a large amount of change in the traits of *engaged, divergent*, and *germinal.* In the social sciences, there was a large amount of change on the trait of *complete.* In

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the natural sciences, there was a large amount of change in traits of *integration, divergent, engaged,* and *risk.* There were many traits that showed change in the interdisciplinary courses, listed in order of the amount of change: *synthesis, germinal, analyze, logic, evaluate, abstract, explain, flexible, transform, integrate, elegant, knowledge, divergent, engaged, original,* and *complete.*

Table A4. Teagle Cross-Sectional Data

The data from the cross-sectional designs are displayed in table A4. The performance on each trait in the less experienced group was compared to the performance on each trait in the more experienced group. Differences between groups were assessed statistically using independent group t-tests. These tests are less powerful than correlated group tests, so it is not surprising that fewer of the tests were statistically significant than was the case in the longitudinal data. Nevertheless, there was significant change in many of the traits across time, with the most reliable change in the traits of *analyze, logic, knowledge,* and *explain.* There was no significant difference between the groups' performance on *abstract, fluent, flexible, elegant, germinal,* and *risk.*

Table A1. Traits Measured in Classes by Discipline – All Data

Number indicates proportion of students by discipline tested on the particular trait.
FA = fine and performing arts; HUM = humanities, NSCI = natural sciences,
SOSC = Social sciences; INT = interdisciplinary studies course.

	ALL	FA	HUM	NSCI	SOSC	INT
Explain	0.62	0.64	**0.88**	**0.87**	**1.00**	0.12
Analyze	0.54	0.44	**0.88**	**0.87**	0.72	0.12
Evaluate	0.44	0.00	0.51	0.73	**1.00**	0.12
Integrate	0.43	0.75	0.71	0.56	0.28	0.12
Logic	*0.40*	0.44	0.12	0.71	0.72	0.12
Knowledge	**0.85**	**1.00**	0.58	0.84	0.72	0.97
Synthesis	0.53	0.79	0.48	0.58	**1.00**	0.12
Abstract	*0.38*	0.00	0.12	0.71	**1.00**	0.12
Complex	0.61	0.00	0.63	0.58	0.55	**.99**
Fluent	0.63	0.45	0.74	0.58	0.72	0.64
Flexible`	0.44	0.21	**0.88**	0.28	0.45	0.45
Complete	**0.87**	**0.89**	0.48	**0.86**	**1.00**	**.99**
Elegant	0.57	**0.89**	0.12	0.28	0.56	0.80
Divergent	0.51	0.21	0.48	0.14	0.72	0.80
Germinal	*0.40*	0.25	0.74	0.69	0.45	0.12
Original	**0.89**	0.79	**0.88**	0.73	**1.00**	**.99**
Transform	0.73	0.68	0.86	0.56	0.72	0.80
Engaged	0.71	**0.89**	0.12	0.56	0.72	**.99**
Risk	0.58	0.75	0.48	0.14	0.28	**.99**
_____						
N Students	444	73	65	85	82	139
N Classes	31	5	6	6	8	6

Note: High responses are noted in bold, low in italics.

Table A2. Average Performance on Traits Across Time – Longitudinal Data

M indicates the average score on a trait, represented at each time period. N indicates the number tested, and SD the standard deviation. Scores on the traits could range from 1 to 6, with a higher score indicating better performance.

Trait	Time	M	N	SD	tvalue
Explain	1	**3.85**	127	1.120	7.26***
	2	4.52	127	1.007	
Analyze	1	**3.76**	89	1.297	7.84***
	2	**4.73**	89	1.126	
Evaluate	1	3.28	99	1.187	8.86***
	2	4.27	99	1.176	
Integrate	1	3.67	75	1.031	5.86***
	2	4.51	75	1.095	
Logic	1	**3.76**	49	1.031	6.85***
	2	**4.78**	49	1.046	
Knowledge	1	3.40	179	1.278	10.63***
	2	4.35	179	1.103	
Synthesis	1	**3.77**	123	1.200	8.50***
	2	**4.63**	123	1.190	
Abstract	1	3.53	72	1.186	9.76***
	2	**4.58**	72	1.110	
Complex	1	3.27	156	1.209	9.60***
	2	4.14	156	1.183	
Fluent	1	3.56	172	1.234	9.16***
	2	4.39	172	1.206	
Flexible`	1	*2.85*	112	1.179	8.56***
	2	*3.82*	112	1.428	
Complete	1	3.56	190	1.201	10.98***
	2	4.41	190	1.145	
Elegant	1	3.03	151	1.278	10.83***
	2	4.05	151	1.221	
Divergent	1	*2.53*	98	1.212	9.00***
	2	*3.61*	98	1.344	
Germinal	1	3.19	83	1.604	5.78***
	2	4.22	83	1.423	
Original	1	3.19	198	1.426	9.40***
	2	4.01	198	1.316	
Transform	1	*2.23*	127	1.352	9.22***
	2	*3.31*	127	1.547	
Engaged	1	3.56	142	1.170	10.58***
	2	4.48	142	1.083	
Risk	1	*2.80*	132	1.188	7.60***
	2	*3.55*	132	1.530	

*** indicates t value is significant at p<.001 revealing change across time.
<u>Note</u>: High responses are noted in bold, low in italics.

Table A3. Amount of Change Across Time by Discipline and Trait –Longitudinal Data

Change measured by score on trait at time 2 – score on trait at time 1, so positive values indicate positive change across time.

Trait	Disc	N	Change	Trait	Disc	N	Change
Explain:				Flexible:			
	FA	15	0.27		FA	15	**1.00**
	HU	34	0.62		HU	34	0.44
	NSC	38	0.29		NSC	24	0.46
	SOC	23	0.83		SOC	0	.
	INT	17	**1.76**		INT	39	**1.74**
	TOT	127	0.67		TOT	112	0.97
Analyze:				Complete:			
	FA	0	.		FA	33	0.58
	HU	34	0.62		HU	8	0.75
	NSC	38	0.84		NSC	37	0.66
	SOC	0	.		SOC	23	**1.00**
	INT	17	**1.94**		INT	89	0.99
	TOT	89	0.97		TOT	190	0.84
Evaluate:				Elegant:			
	FA	0	.		FA	33	0.48
	HU	33	0.79		HU	8	0.50
	NSC	26	0.85		NSC	24	0.96
	SOC	23	0.83		SOC	23	0.83
	INT	17	**1.82**		INT	63	**1.46**
	TOT	99	0.99		TOT	151	1.02
Integrate:				Divergent:			
	FA	23	0.43		FA	15	0.87
	HU	23	0.17		HU	8	**1.13**
	NSC	12	**2.00**		NSC	12	**1.17**
	SOC	0	.		SOC			
	INT	17	**1.47**		INT	63	**1.11**
	TOT	75	0.84		TOT	98	1.08
Logic:				Germinal:			
	FA	0	.		FA	18	0.44
	HU	8	0.00		HU	25	**1.08**
	NSC	24	0.75		NSC	23	0.65
	SOC	0	.		SOC	0	.
	INT	17	**1.88**		INT	17	**2.06**
	TOT	49	1.02		TOT	83	1.02

Table A3, continued

Knowledge:				Original:		
FA	41	0.71		FA	26	0.38
HU	15	-0.07		HU	34	0.82
NSC	35	0.60		NSC	26	0.42
SOC	0	.		SOC	23	0.83
INT	88	**1.36**		INT	89	**1.04**
TOT	179	0.94		TOT	198	0.81
Synthesis:				Transform:		
FA	26	0.58		FA	18	0.56
HU	8	0.88		HU	34	0.62
NSC	49	0.53		NSC	12	0.00
SOC	23	0.96		SOC	0	.
INT	17	**2.06**		INT	63	**1.70**
TOT	123	0.85		TOT	127	1.09
Abstract:				Engaged:		
FA	0	.		FA	33	0.33
HU	8	0.75		HU	8	**1.38**
NSC	24	0.71		NSC	12	**1.17**
SOC	23	0.96		SOC	0	.
INT	17	**1.82**		INT	89	**1.07**
TOT	72	1.06		TOT	142	0.92
Complex:				Risk:		
FA	0	.		FA	23	**1.04**
HU	18	0.39		HU	8	0.13
NSC	49	0.86		NSC	12	**1.17**
SOC	0	.		SOC		
INT	89	**1.01**		INT	89	0.66
TOT	156	0.87		TOT	132	0.74
Fluent:						
FA	33	0.64				
HU	25	0.88				
NSC	49	0.73				
SOC	0	.				
INT	65	0.98				
TOT	172	0.83				

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<u>Note</u>: Change scores of 1.00 or greater are noted in bold.

Table A4. Teagle Cross-Sectional Data

M indicates the average score on a trait, represented for each group.
N indicates the number tested, and SD the standard deviation.
Scores on the traits could range from 1 to 6, with a higher score indicating better performance.
Differences between groups were analyzed with independent sample t-tests.

Trait	More Experienced Group			Less Experienced Group			Difference in Groups?
	N	M	SD	N	M	SD	tvalue
Explain	75	3.99	1.10	75	4.71	0.95	4.35***
Analyze	75	3.64	1.12	75	4.65	0.99	5.86***
Evaluate	42	4.18	0.92	53	4.70	1.07	2.51*
Integrate	57	3.47	1.07	57	4.19	0.99	3.72***
Logic	66	3.87	1.08	61	4.80	0.87	5.28***
Knowledge	98	3.29	1.20	99	4.05	1.18	4.39***
Synthesis	61	3.61	1.17	53	4.67	.79	5.59***
Abstract	42	4.26	0.95	53	4.56	0.90	ns
Complex	55	3.05	1.19	61	3.76	1.27	3.08**
Fluent	37	4.45	1.09	69	3.93	1.37	ns
Flexible`	25	3.92	1.12	59	3.59	1.38	ns
Complete	99	3.54	1.34	99	4.23	1.26	3.74***
Elegant	58	2.78	1.26	45	2.98	1.48	ns
Divergent	61	2.66	1.63	69	3.61	1.57	2.49*
Germinal	39	3.38	1.63	57	3.67	1.41	ns
Original	99	2.91	1.38	99	3.58	1.46	3.30***
Transformation	99	2.30	1.45	98	3.02	1.56	3.34***
Engaged	90	3.70	4.22	85	4.22	1.22	2.72**
Risk	67	2.34	1.02	59	2.53	1.25	ns

Note: ns indicates the t value is not significant; * indicates significant at p<.05, **p<.01, ***p<.001.

Report B: Teagle Faculty On-Line Survey
What was Faculty Response to Using the Creative and Critical Thinking Rubric?

Twenty-four faculty who administered the generic rubric responded to an on-line survey concerning their experiences soon after they turned in their rubric data.

Results

Quantitative Responses

Some of the responses were made on five point scales with a higher score indicating more agreement. The average response (M = mean) and standard deviation of the response (SD) are noted below.

Statement (abbreviated)	M	SD
Generic rubric was useful	3.54	0.88
Using rubric led me to be more:		
…Purposeful to introduce creative thinking assignments	3.33	0.92
…Purposeful to emphasize creative thinking assignments	3.52	1.12
…Purposeful to introduce critical thinking assignments	3.22	0.80
…Purposeful to emphasize critical thinking assignments	3.59	0.80
Using rubric helped me learn more about creativity	3.71	0.86
Using rubric helped me learn more about critical thinking	3.70	0.70
Use of rubrics influenced subsequent teaching	3.21	1.10
Discussed rubrics with colleagues	4.21	0.98

Selected Comments in Response to Open-Ended Questions:

Influence of the Rubric:

"The rubric made me much more aware of student's weaknesses in certain areas ..."

"I realized that, if I genuinely valued creativity, I should construct assignments that facilitated its expression."

"I paid closer attention to the criteria used to evaluate the assignments."

"I focused on certain students who were having a hard time developing critical thinking (two of them were first year students), and I think the rubric helped in my awareness of that...."

"I spent more time on the second assignment emphasizing/explaining the elements of creative and critical thinking."

"Don't laugh... but it helped me to see some of what may be the motivation for the movement toward assessment."

Assignments useful to stimulate creative thinking:

"I find authentic assessments allow students to utilize their creative thinking optimally. Many of these assignments require small group involvement--thus encouraging students to engage in meaningful discussion, bounce ideas off of each other, etc. I will often allow class time for the initial stages of planning an assignment as a group as this allows me to observe this creative process and facilitate the meaningful interaction around a specific project."

"I realized that most of the creative thinking takes place during the class discussions, so I try to create a positive environment in the classroom where students can openly express their ideas."

"In my East/West Comparative Philosophy class, I encourage the students to bring surprising thinkers into conversation. In addition, I ask them to choose a cultural artifact, and interpret it in light of the philosophical systems. Both assignments have generated very creative thinking!"

"In this class, the most useful is a free write we do where students are given a scenario and begin writing dialogue between two characters. As they write I throw out additional prompts (e.g. someone enters, the light changes, a loud sound is heard, etc) and they must integrate the change into their scenario. Students are forced to think creatively and quickly, allowing them to explore possibilities for their own writing."

Factors that inhibit creative thinking:

"Preconceived notions of students that scientific writing is only formulaic."

"Usually their unwillingness to make mistakes and explore while being vulnerable."

Assignments that facilitate critical thinking:

"The more that they 'own' the project, the more they engage, and push themselves to find the best possible solutions."

"Think-pair-share about posed questions; 'arguing' in pairs; drawing sketch maps of processes; basically getting them active, and then articulating to each other seems to work very well."

"Again, I think that the more authentic the assessment, the more thoughtful their critical thinking. Often I will ask my students to go into an area classroom or work with a 'real' child or teacher. Placing my students in a situation where they are accountable to not only me, as the instructor, but to an outside entity often encourages them to be very thoughtful in their writing and their habits of the mind regarding critical thinking. We also spend a lot of time in class discussion our experiences and their relationship to course readings (in both small and large groups). I find that group discussion leads to the most thoughtful comments."

"I sometimes ask students to evaluate each other's work based on the criteria."

"I do like to introduce teacher candidates to a variety of questioning techniques, and in this discussion I use Bloom's Taxonomy as well as Gardner's work."

Factors that inhibit critical thinking:

"Just overcoming the sum-total of their past experiences with science -- figuring out their hidden misconceptions that create a barrier to understanding. Their ideas need to be drawn out in conversation or in writing which is time consuming and difficult with a class of 40. An active classroom is critical to getting at the roots of their thinking. Then there is convincing them that something they have 'always known' is a misconception."

"None. I have been designing for over 40 years and teaching design for 25. During that time I have constantly re-examined my work and my process and encouraged my students to critically analyze both their work and mine."

"Getting students to embrace process over product."

Report C: Faculty Interview Responses

What Ideas do Faculty have for Promoting Creative Thinking?

Twenty-two faculty who employed the "generic" rubric to measure creative and critical thinking among the students in their classes were interviewed about their experience by either the project director or the research consultant. Interviewers asked questions about the specific assignment used and whether it promoted creative thinking, other assignments and pedagogies that might promote (or inhibit) creative thinking, aspects of the discipline that might promote (or inhibit) creative thinking, and aspects of the college environment that might be important. Participants were also allowed opportunity for any additional comments or suggestions. The interviews took place in the participating faculty member's office and lasted between 30 and 60 minutes. The interviews were tape recorded and transcribed, and responses are summarized and interpreted below. Interviews signed consent forms guaranteeing their anonymity.

Assignments Used

Most of the faculty who participated chose an assignment they had used previously and did not develop a new assignment for the grant. The assignment they used was supposed to stimulate both creative and critical thinking. About half used a longitudinal design, and half a cross sectional design. The nature of these projects is discussed below by discipline of faculty member.

Fine Arts.

In the fine arts there were a variety of types of projects. One faculty member examined performance juries for music majors. This faculty member said that the use of rubrics helped him to become more purposeful about assessing critical thinking in such performances.   More expert students were compared to less expert students, and the more expert students seemed more purposeful about their work. He said that, "Although performance is about creativity, you still have to think critically.... If you are studying piano it is not just the piano, how are you getting your music theory knowledge into this, how are you getting your music history into this, how are you learning about art going on at that time period, political structure... all of those things go into why this composer wrote this piece at this one time. They didn't just have this grand inspiration and sit down and completely out of context write this piece. It is connected between everything else going on, and you can't be an expert on everything, but to have some sense of historical significance and think critically about what it is you are playing and have that come across in the creative aspect of what you are doing.

"In a class on scene design a professor had students develop projects based on plays they read. Performance on an early assignment was compared to performance on a later assignment. Students needed to respond to peer review. Regarding the importance of peer review, the professor said that it "encourages the cohort to respond in a critical but a very positive critical way so that they also begin to explore their own work based on how others react to it. I think we never

can be sure what meaning our work is going to create. We know what the message is we're trying to send out but we have to be constantly aware of the fact that it is the reader, the audience who is creating the message.... "

A third fine arts professor used the rubric in a class on play writing. Students were given a play, and they either wrote dialogue, wrote stage direction, performed two pages from the play, or designed something to stage the play. Students did this again for a second assignment given a play written by other students in the class. The rubric was applied to the students' justifications for the choices they made. The professor said, "It's all about making a choice, and can they justify that choice that they made based on the material, and then how sophisticated is the choice in terms of their understanding of the aesthetic involved in it... and the part of it that I enjoy by teaching the class is to see the students realize 'oh I can do this' or 'I understand' you know the creative process or how theater uses the creative process. And by the end, especially when they're doing their own pieces that they write and they put on and everything, they're really getting kind of cocky that they, you know, look at this story 'aren't we fabulous.' And of course it's not but it's a whole lot better than they were at the beginning of the semester and occasionally now and again someone really catches on and if it's early enough in their college experience, freshman or sophomore year... they're hooked. "

Humanities.

The professors from the humanities who participated relied on written assignments for their data. Sometimes they stimulated creative thinking by deliberately using provocative prompts for the assignment. For example, one professor had students write about the topic of "What is a Writer" at three different times during the semester. She indicated that, "The goal was to get a baseline sense of what they are thinking, and I intended to have as a concluding assignment to see how much they could complicate the ideas of those concepts by the end of the semester.... I wanted to encourage them to think about their own writing in more expansive ways. I wanted to see if they would integrate some of the work of the authors they had been reading as well."

A professor of religious studies had a series of five assignments where students had to examine how the Biblical character Dina was portrayed variously in different texts. A philosophy professor compared student performance at the beginning and end of the class on an assignment where students needed to "pick out an interesting claim, work backwards, construct the argument for that claim. Then, what's the best objection to that argument? So, ideally they'd choose something that attacks one of the premises in that argument.... When I do the second, that final essay, I have them write the first section of that final one as a 3-5-page paper. We peer review it and I read it as well, giving back feedback.... It's about taking the ideas and applying them... and using your learning in one part of philosophy to influence the way you think about other parts of philosophy or about, you know, the world... and I think that's in part where the creativity is...."

Natural Sciences.

A variety of types of assignments were used by natural science professors. A geology professor uses an assignment she called "geology and your life" where students selected a news story about something that related to geology, found at least one credible web source to explain the science behind the topic, and wrote a short essay. She thought that focusing specifically on creative

thinking by using the rubric and sharing it with students improved student performance on the assignment compared to previous years. "The way I expressed it to them it was in their choice of news story that they could show some creativity (if a volcano went off that isn't very creative)... and then I said if they did happen to pick something that was more obvious, an earthquake or whatever, their connection to it is what could be creative."

Another professor took the traditional labs she usually uses and asked students to provide justification for the decisions that they made in the labs. She said that, "There were multiple ways to substantiate the claim - you had to interact with the data and try to give it some life – make the data tell you something.... It is not a trivial process and they need to work creatively with the process. One signal could be three or four different protons so they need to combine that signal with other information – you had to be careful and think critically and creatively."

Another faculty member had students focus much attention on one primary research article and apply both analysis and synthesis to the material. They had to critique the article and come up with ideas about how to move the research forward. She said, "It is a very difficult assignment.... The part where you critique a primary paper is hard... and the hardest part of the assignment for them is suggesting things that could be done differently and especially new experiments... they are okay with the first part of the assignment, which is a summary. They are used to that.... They are used to looking at the methodology, but they are not used to thinking like a scientist about it.... I would say that more than half of the students produced both truly interesting and actually creative ideas.... To actually have them become mini-experts in this little field, that allows them to have that creative thinking... I mean, the number of papers that were brilliant was low, but it was more than I would have thought...."

Another science professor tried out a software program designed to teach evolution to see if the use of the program improved the ability to think critically and creatively about evolution, and she found that, "Students formulated more interesting scientifically robust and novel hypotheses about evolution " after using the program. In a psychology class students designed a behavior change program for themselves. They proposed it, implemented it, wrote about it, and then presented it orally in a manner typical of presentations at science meetings. Although she thought it should have promoted creative thinking she found that, "They went with the standard thing. A few students did some really interesting innovative creative things but 90 percent of them not as much as I would have thought. Some of that is because I think they have to get a basic level of comfort with the material before they can start to do some of the more creative thinking. For a lot of them it was a challenge to get that basic level of comfort."

Social Sciences.

A couple of the social science professors who participated were working with students studying education. In one of these classes students who were preparing to be licensed teachers were compared to students who were not on an assignment where they were asked to assess the aesthetic value of a classroom they studied (the premise of the course is to teach how to integrate fine arts into the classroom). They were asked the general question of, "Is there evidence that the spirit of the arts is present in the classroom and how?" Students had to observe the classroom, take notes, make a sketch of the classroom, and provide critique and suggestions. The professor said that, "I found again that the licensure students offered a more detailed critique. I don't know if because

drawing on multiple classes, they are more invested (this could be my classroom some day), and others didn't feel that kind of long-term investment so couldn't put themselves in that role? It is not that they didn't do a fine job but they didn't have the same level of detail and their suggestions were to move the furniture around, more supplies; the licensure candidate had more substantive comments about changing the whole curriculum."

In another education class students had to research a disability, create a device to aid someone with the disability, develop criteria to judge the device, build a prototype, and advertise it. In terms of the professor's goals for the assignment she said, "Overall, I really hoped to created an awareness in the course, a good understanding of disabilities and the part that it plays, the impact that it has for disabled and non-disabled. That's my highest goal. From there, with each one of my assignments, I try to build from the one before, to expand it a little bit further and take it in different directions. I particularly like to parallel critical thinking with the creative side because in the end that's what we're really looking for, to have a basis and come with some new ideas."

Several history professors participated in the project and they were concerned with having students see the creative thinking that is part of some of the traditional work that historians do.   One professor said, "I think there's a lot of creative work in that realm and I think that having the rubric where we explain to them what are the creative aspects of the work that you do in a history class, made them more aware of it as creative work. I think that at least we taught them that vocabulary; we taught them that perspective on writing.... I think they began to understand that in order to have your own argument, you have to understand what the author is saying and then be able to use language that shows that you have understood and are now processing something of your own with the thing the author presented to you."

Another history professor used a "source study" where students looked at a piece of primary evidence and were asked a series of directed questions about interpreting the evidence. And after providing interpretation, students were asked to develop an original thesis related to the source. About this project, he said, "For the most part the focus was more on critical thinking, but the questions toward the end, because it is a directed series of questions, that ask them about how they would use it in terms of developing an original thesis of their own research project are ones that invite a certain amount of creativity, so there is some way in which I wanted to think about creativity but in the scheme of things I think it is not a huge part of the assignment, and in terms of the success I would say it was fairly modest...I had not adequately described to them the way creative thinking could play a role in the development of these theses or projects, so that was a kind of efficiency in my part in framing the assignment. Oftentimes, to most historians, there is an important element of creativity in generating these ideas. Students don't necessarily have a tendency to equate historical research with creative thinking and so I guess were I to do this in the future with a similar focus I would spend more time framing the assignment and emphasizing that that is one of the components that I would hope to see."

Interdisciplinary Projects.

Several professors who were interviewed team-taught an interdisciplinary course on AIDS. One professor described the final project for the course, "Students were required to create an awareness campaign about an issue relevant to HIV or AIDS and they had to target a community – either women, children, or men, and it had to be global. Had to incorporate readings from psychology, philosophy, understanding of biology, and somehow bring in an arts component e.g. designing a

logo, participants engage in art therapy, etc. Their final project was a 15-minute presentation using PowerPoint where they were in the role of start-up non-profit organization and they want money from us – we are the funders and they give us a pitch. They had 15 minutes to make their case about why we should fund their campaign. They used PowerPoint, some groups had handouts/brochures, and they also had a reflection paper where they talked about their goals were and how the group worked together so we could make sure the groups...that we didn't have major problems. Everyone had to speak...." The professors were hoping that this would be a creative culminating project. One of the professors said, "For the final project we wanted them to be able to make the connections – AIDS is a complicated issue – their approach to dealing with it needed to be complicated as well. That was our goal to have them make these links.... We had high hopes. As faculty I had a wonderful time doing it. I really enjoyed the experience. I could see the connections... but I think that didn't always translate into students making those connections. So yes, they could, but not to the extent we had hoped."

Two professors teaching in women's studies compared introductory students' performance to students in a senior seminar on an assignment where students had to write about "What is feminism?" to an audience hostile to feminism. The professors concluded that this sparked some creative thinking in the more expert students, but less in the younger group. One of these professors said, "It did [stimulate creativity among the seniors] but I think a lot of it was the context of the course, it has a reputation for being 'anything goes.' So I think they were much more likely to feel like they wouldn't get penalized for taking risks." These same professors compared student responses at the beginning of the course to their responses at the end and did find increases in critical and creative thinking between both groups.

A professor teaching in a humanities-related interdisciplinary course analyzed student posts on the electronic course management tool "Moodle." Given very little guidance, students started to develop more critical and creative responses throughout the semester. She said, "What has happened, every time I use it, the students self correct. A few of the students will do a good job and students will start to comment how some people have done a good job and then start to emulate it. So that they are all sort of learning from each other and even without specific guidelines they all sort of self improved. By the end there was very little distinction as to how the students were doing using the rubric criteria.... They are commenting on their reading so the best ones find something insightful to say about the reading, use particular examples or details, sort of general commentary and then connect it to other things we've discussed in the past or issues. There is sort of a creative aspect because some of the more creative writers will definitely show their personality or be sort of risky in either arguing against other people in the class or against the direction of the class, or in their presentation of their ideas. So although that creative element was not required by any means, the students certainly used creative elements to distinguish themselves from the masses...because students were reading each other's posts and responding to them I think there was a little bit of healthy competition.... It's better than a quiz.... Students keep checking in and reading each other's posts and thinking about it. So there's a lot more time that they are thinking and writing about it rather than just in class.... I don't know whether it's the blogisphere kind of thing or *Facebook* that this desire to sort of have a personality online means the students have to figure out a way to have their own authorial voice in an interesting subtle way because students are pretty harsh critics...."

Summary.

Most faculty took existing assignments that they thought promoted both creative and critical thinking and studied student performance. Many of these assignments seemed designed to stimulate critical thinking more than creative thinking, but using a rubric that emphasized creative thinking increased the focus on these traits and likely increased the amount of creativity students showed. In general, most people thought their assignments did promote creative thinking in students (and this was validated by the quantitative data gathered from the rubrics). As will be clear in the next section, the assignments people used for their data collection were not necessarily the most creative assignments the faculty had used or could imagine using.

Creative Pedagogies

Faculty were asked questions about assignments and pedagogies that promoted or inhibited creative thinking, and whether there were habits related to their discipline that had an impact. A variety of responses came up across the different disciplines. Most of the ideas for promoting creative thinking fell into the categories of the use of active learning techniques in the classroom, having students apply their work to the world outside the classroom, and doing interdisciplinary work.

"Active Learning" Techniques in the Classroom

Faculty reported using a variety of techniques to increase student engagement with course material. One fine arts professor said, "I've been known to really be the devil's advocate and take a very negative approach to a consensually held opinion about a play or about an approach to a play. To force the students to either defend where they are coming from or say Okay, if that's the case, force them to find another solution."

Several professors talked about the use of problem solving in their classes, having students discuss ideas, argue, and debate. One social science professor makes much use of group discussion. She said, "In my public health class using that format of breaking them up into small groups and asking them to talk about some controversial topics that come up and issues of public health has been helpful. They've come up with some really good ideas, really good arguments that I've come into the discussion not necessarily having thought of."

A language professor who uses group work said, "I do different kinds of group work that tries to move beyond the answer to certain questions. I give them certain statements about the text and then they have to prioritize which of these statements more closely correspond to the content of the text or are better at expressing the author's ideas about the text. So they have to come up with kind of an agreement how to prioritize these statements. That has been very helpful."

One natural scientist spoke about student experience with creating their own experiments versus using "canned" labs. She said, "I didn't know when I started doing this in my upper-level comparative class whether they would like it.... The experiments don't usually work, because experiments usually don't work, period. And, so, I would always say next year I am going to write labs. By the end of the class students come to my office to tell me emphatically, they write it on

their evaluations, do not change the lab. This is what we want to do. This is what scientists do. I am always surprised by that... they always like it that way. Even if they have to put in more time. Evenings, weekends to feed their animals, take measurements.... the students like it better, it is better for them... thinking of something that has not been done but is doable is hard and you do have to be creative to do it."   Another natural science professor said, "The laboratory in general is a creative environment. You have to think creatively in order to make progress, to answer the question."

Taking the Perspective of Others.

Some techniques included trying to get students to understand the perspective of others. A social science professor said, "Again, we had this discussion at the Teagle meeting, people think of creativity as having crazy genius ideas but I think there is a lot of reward for the small creative acts that you do when you try to understand the perspective of someone who is writing from a different time and culture. If you can show students how to reap the rewards of those creative ideas, then they get a lot out of it. I like to ask them... what they think someone we had studied in the past might think of some new development to try and imagine that connection."

Similarly, another historian said, "I ask them a question that is surprising. It might be something like, 'What does it smell like in 14th-century Florence?' A question we have not talked about at all, but they have done a great deal of reading from primary sources about markets in Florence, or about demography, or about domestic spaces and ask them to think about that evidence in some new sort of way and to extrapolate about the lived realities of 14th-century people about things they know from records."

A humanities professor talked about having students assume they were authors of a research paper. He said, "Coming up with a research project idea, a proposal, at early stages students don't do a good job of articulating a project so I gave them an article, a published article, that was sophisticated but accessible and asked them to pretend that they were invited to give this exact paper at some point, they had not yet written, this is the paper they would write. Go back and pretend they are at the beginning stage. To help them realize they should have a vision, an idea. Let them think about when I articulate my proposal I should talk in some detail about what it is going to look like, what I think it is going to look like. I found that really improved [their writing].... They needed more hands-on work, more practical doing, so I started to coming up with these series of assignments."

A couple of other professors also mentioned types of "role playing." One humanities professor said, "In my journalism class they do mock press conferences. They are given a topic – such as a political topic that is not a scandal. They have to draw on real-world knowledge, using realistic people who would appear at a press conference. They have to generate the story, present the information, and the rest of the class asks questions as reporters and they write the news story as journalists. Then the student presenting has to field the questions. They think outside, but within the box as well. They have to be active. I go back to the definition of [creativity as] 'new but useful.'"

One social science professor said about the use of active learning techniques that students' "expectations of what a classroom is supposed to be like are changing. Using the classroom as a

place to do presentations, as a place to do small group work, as a place to do debates... use the classroom as a theatre some days, making a place where we do lecture some days... making it a place where when they are getting ready to go to my class they are wondering what are we going to do today? Mixing it up, building some excitement. It can't be like that everyday, but...."

Other Classroom Techniques

Student Choice.

Student choice can be an important element to creative thinking, and it can range from picking the topic of a normally rigid assignment to designing and leading the class. One natural science professor said, "I have students pick the topic of their assignment. So, I need you to learn the taxonomic order. You go pick a species, I don't care what it is, and then tell me its taxonomic sequences and tell me something in the same genus but not species, the same order but not family, and so on. And so, inherently not that creative, but if you have some kind of element in there like tell me about is natural history or something, because it is theirs and they picked it, I think they put more creative energy into talking about it, choosing it...."

One professor of an interdisciplinary course talked about the creation of a student-led senior colloquium. She said, "...second semester senior year giving seniors a term paper is just a death sentence. So I designed the senior colloquium as a way to get them to be more creative and to flow a little bit more with the material, rather than a research paper. The students design some of the colloquium itself, they get to pick the topic, they get to pick the readings and they get to determine the project that they will do collectively.... So for instance this year they did a magazine and I think they liked the opportunity to explore the genre of this sort of women's magazine at the same time trying to make some sorts of statements about women and feminist issues that are important to them. "

Peer Evaluation.

Several professors talked about having students evaluate each others' work as a way to "push" them towards more creativity. One fine arts professor said, "The most creative course I teach is play writing. I am looking to push them beyond where they are now and to open up their comfort zones and their understanding of what a play is.... We share weekly work that we have written in class so they hear what everyone else is doing so students don't just hand their work into me and I grade it and comment on it and turn it back and they continue writing... it is really important that they hear how their peers are tackling that kind of assignment...."

A social science professor said, " I teach the problem solving model so that they understand that you expand and then you contract, settle it down into one idea and then expand it again. And actually the presentation is another expansion by looking at your audience. How do you address that audience? How many different ways can you appeal to that audience to sell your idea? It just continues to involve the critical and creative thinking the whole way down the line."

Many faculty talked about the importance of students engaging with their work, of "owning" their work. Faculty thought that to the extent that their peers would see their work, students would care

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more about it. The professor who had her students use "Moodle" to discuss their ideas publicly found that there was healthy competition among the students to present their unique voice which led to very creative expression.

Projects Drawing on Multiple Skills.

Some faculty talked about projects that drew on multiple skills of the students. For example, one social science professor wrote about having students create projects for a class on "social movements." She said, "They pick a social movement, then they build a portfolio throughout the semester so they have to collect artifacts about the movement like bumper stickers, t-shirts, logos, slogans, that kind of stuff. It can be all kinds of things, a lot of times they can find good artifacts. And then at the end of the semester, the do book reviews, they do a time line, but the timeline has to be presented visually so like on a poster board and that some of them get incredibly creative with. And at the end we do an exhibit of all their work... and a lot of students they don't know what to make of it at first, they do a book review first and that is pretty standard, and next they do a timeline about their social movement and then some of them really get into it.... But they're all pretty good by the end because they've seen each other's. I had them present the timeline to each other in class so they can see the variety of timelines and then we talk about the artifacts they've collected and sometimes we show those just to sort of see what everybody else is doing. So by the time we actually get to the exhibit, most people have sort of picked up the pace and kind of gotten into it. Some are really good; some of the students really get into it. And you don't have to be artistic...."

Teaching Techniques of Creative Thinking.

One social science professor talked about teaching students techniques to facilitate creative thinking and having them reflect on the use of these techniques in their coursework.   She said, "So from that day on they record everything they do, as an inventor would, and so on. But I want them to use at least three of the techniques [from the book] and explain how they applied them to this particular project. So I have knowledge that they've walked away with at least firm knowledge of three. And some people innately do this. But I think for the majority of students, the general public, if you're given a few skills, it changes your thinking enough that you slip over beyond that. Now some are very entrenched in 'facts ma'am only,' but still I think once it opens your mind up and you begin to learn those techniques, even though there are barriers around you, a lot of negativity, it still give them the feeling that they can...."

Moving Outside of the Classroom

Several faculty talked about the importance of making connections between course material and "real life" outside of the classroom to promote creative thinking. One interdisciplinary professor said, "I had them do an op-ed ... to pick a topic that had to be related to a gender issue and it had to be something that would be relevant to the... community. I had envisioned that they would pick something out of the reading that they thought was really interesting or something that was happening around campus ...they had to pitch it to the school newspaper, they had to pitch it in a

way that assumes no knowledge about the topic and they had to do it in 1500 words. I was pretty pleased with that assignment and it was fun to see what some of the students did with it and I think a good example was one with an academic back ground but it was pitched in such a way that people would read it and care about it. So some of the really good students didn't do as well on that because they wrote a very academic op-ed, which wasn't the point in this case. " A natural science professor learned from a teaching conference about an assignment that required that students create a "MySpace" page on a psychological issue that has some relevance to their lives and include art work, information, journal entries, and reflections.

One social science professor talked about how real-world experience might promote more creative thinking. In her education class she compared the teaching licensure candidates to those who were not candidates and found differences. She said, "The non-licensure students tended to quote the textbook – their main resource – maybe a bit about what they know from their own childhood. Licensure candidates tended to make a little bit of reference to the text where it is relevant, but talk about other classrooms they had been in, other experiences and draw from that e.g., I like Montessori style because of this... music in the background, carpeting, appreciation of fine art...you saw things come from other experience –a more synthesized paper."

A social science professor who has students do work outside the classroom said, "If they are out in the community, if they are working with a group of people, I think it gives them a way to think about an issue in a much bigger way... I mean you can look at the school violence issue, you can look at a bunch of material about school violence and have good book knowledge of it and the way that boys and girls interact in high school, but when you go to a football game and you watch it happen, you see these little kids pushing each other around and you see the bullies... it makes them come back with different questions, different ways to think about what they read."

Thus, in some disciplines it is important for students to be working "in the field" as a way to promote creative thinking. One professor said, "In geology it is getting out in the field. Having them take what they have learned in the classroom and realizing that they do have the ability to go out and make observations and then try to figure out what it all means.... They are making drawings, making observations, taking their data and orientations and every once in a while I have them sit down and say what do you think it means so far? It is like really being a geologist. By and large they just love it. They come back so enthused. They are then happier in the classroom."

Interdisciplinary

Several faculty talked about the value of interdisciplinary work in promoting creative thinking. One interdisciplinary professor said, "I think that the interdisciplinary nature of the program kind of encourages creative thinking because one of our goals is making those linkages and making connections between disciplines that might be involved in some way. There is a lot of opportunity in thinking through different disciplines and different contexts."

At Ohio Wesleyan the "National Colloquium" is a way to promote interdisciplinary thinking and discussion of issues outside of the classroom. One of the professors stated, "There's a different topic every year, a major national or international topic, and they bring in speakers and we try to tie in other events on campus and stage a play that focuses on that topic. Students will receive partial credit for attending the lectures or the performances or participating in activities which have

something to do with the topic of the National Colloquium. Making it part of the curriculum kind of forces the students to take advantage of things that are available to them... but that kind of thing is what I think educational institutions could do."

Discouraging Creativity

Although faculty were more excited to talk about what stimulated creativity rather than what discouraged it, some common themes came up pertaining to this issue. Faculty across the disciplines discussed the problem of having habits of thinking or standards that might discourage creative thinking, and the importance of student attitudes.

Standards and Habits of Disciplines

One issue several faculty members talked about that inhibited creativity had to do with rigid standards of various disciplines. One social science professor said, "The standards are written from a factual point, which they have to be, but I don't think there's any allowance for creativity and I think that's what's killed it in the public schools because we're teaching to those standards now, and what we need to do is develop ways that standards can be met using the skills of creativity."

One humanities professor said, "There is a split between the critical and creative work in my discipline and it is hard to get away from using these two terms.... There are rigid forms for critical work and not a lot of room for diverse voices which are not promoted in the profession. There aren't a lot of models to break out of those boundaries.   The profession is so entrenched in that dualism."

Several of the natural and social scientists talked about the tension between teaching about content and trying to promote creative thinking.   "I think there is an understanding as a mature scientist that the information is tentative, but as students they hear it as fact. I think we just forget. We think of students as not knowing how to think like a scientist but then we don't really teach them that as much as we teach them the information. And then we teach them how to make hypotheses and design an experiment, those are valuable things, but you don't teach them to challenge things." Similarly, another science professor said, "I think for me personally, the challenge is always grounding things in the data as a science, and for me, trying to think about how to incorporate issues of creativity in that framework. So it may not be as natural a thing as it might be if I taught art or something along those lines, but I definitely think it can be done."

"I struggle as a very data-driven psychologist with how to incorporate that myself with a lot of the more research based assignments. Like when I'm having students critique journal articles. I think that probably discourages creative thinking and I'm not really looking for creative thinking.... With assignments like that, I need to more explicitly say, 'Please generate as many different questions as you can think of,' Just sort of tap into their brainstorming, " said one of the scientists. Another scientist said, "...there is a body of information that they need when they go to graduate school, they get a job straight out of here, if they had structural geology they need to know this, this, and this. So I can't pare that down, so that is a real balancing act of getting enough of it done trying to

promote the thinking. Whereas I teach a tectonics seminar and I can do anything I want. We read original literature, if we get interested in something, we might read more about it.... We can really take our time more and do more and they are learning how to think, how to apply, but it doesn't matter if we cover A, B, and C. So that really helps."

One of the historians who participated said, "One of the distinctive things about history as a practice, a particular kind of discourse about the past, is that it always has to be grounded in some kind of evidence, some kind of material evidence. The range of evidence might vary widely... and, I think, usually if historians are doing their job they emphasize this fact to students. I think that sometimes students take the emphasis on this to mean that not only does their account have to be predicated on evidence, but that it might have to be rigid an unimaginative in some ways. So, I think that tends to be something that inhibits creative thought. Some of them come believing that what they are in a history class for is 'getting the facts right.' So they don't quite understand invitations to be more creative or exploratory or speculative as part of the process of doing historical research."

A philosopher who participated said, "Something in philosophy that is at least an initial hurdle is the way that philosophy is perceived especially by people coming to it for the first time. It is very much argumentative, we are all about arguments. Fundamental philosophy is logic, it is about argument structure, what does imply what, what doesn't imply what, assessing support for claims. Unfortunately, it might be something about the broader culture as competitive. I think we tend to be dogmatic even. We find over and over that at the very beginning students who are by nature competitive and combative are drawn to that and we need to tell them this is not about competition. It is a good-natured search for answers. You have to calm those folks down and at the beginning they are exacerbating the problem and reinforcing the idea that philosophy is about beating a component. That philosophy is inhibiting and reinforces a dogmatic combativeness and turns away smart students who don't have that. You need to get students beyond that."

While some scientists mentioned trying to encourage more creative thought, a couple of the fine arts professors talked about trying to encourage more critical thought. One fine arts professor said, "By the time they are juniors and seniors they can look at the bigger picture and realize that yes, they are looking critically, but they have to find ways for the creativity to come out.... At the earliest stages a lot of students think 'I just have to play this [composition] correctly.' And correctly in some respects is not thinking widely critically but it is in some respects suppressing creativity, it just has to be accurate. I need to play in tune, sing my words correctly.... It is the creativity thrown into the mix of all that that makes it work."

Another fine arts professor said, "Students approach theatre initially in much the same way as they approach film. Do they like it, do they respond to it.... You have to make sure that people continue to understand there is a social political structure that exists that is more than just individual reactions. I think that's easily one of the greatest inhibitions on our students. I think it affects both critical thinking as much as creative."

One natural scientist said, "I think most of our students, if they have taken a women's studies course or whatever where context is everything, they don't tend to apply that to science. They think that is fine but this is just fact. We could do more of that. Even in class if they don't have time to read this whole other book that is a critique of science when they need to learn what is in the book you can give examples. In animal reproduction I talk about how we used to think here is the egg sitting here and the sperm are muscling their way up to the egg. And now we know that

sperm don't mostly swim, that it is contractions of the uterine tube that pull them, that the egg is releasing a hormone to attract the sperm, and so on. It is not surprising that the old view was passive egg and active sperm and we talk about that more. More context. I think that lets students see the walls aren't right here. There are ideas they could bring."

Creative vs. Critical Thinking.

Many faculty members wanted to talk about the issue of the possible connections and tensions between creative and critical thinking. A natural science professor said, "I think we do a better job with critical thinking than creative thinking. The main problem is that we say, we want them to think creatively, but when it comes down to the test we mostly ask about those things on the lower level of Bloom's taxonomy when it comes to the test. I think that is mostly because we don't know how to write questions, especially in a large class. I just came back from a teaching conference last night a lot of my colleagues there have classes of 200 or 300 and they have to be able to write an objective format, and it turns out you can, there are whole books about it, but most of us don't know those books exist, and how to write multiple choice questions that test higher level thinking. And so, getting the word out about that and making people aware. Take your test and look at the questions. People should start with their goals and design assignments and tests to reach those goals." Another professor said, "I think we're probably more accomplished at that than creativity because we think of creativity as something it's nice to have. It's nice to have if we can afford it; it's a luxury, whereas critical thinking is like the bread and butter. So I kind of imagine that is how we think about creativity, not something we have to do, it's a nice extra. "

A professor who teaches in an interdisciplinary program said about the link between creative and critical thinking that, "It's really finding the intersection of those two that I think many of us are most interested in. But also it does create this resistance from students who see creativity and critical thinking as separate and who bristle at the notion if they decide they want to do a creative project, they are upset that there would have to be a critical component. Because somehow they feel that the creative element is a 'get out of jail free' card. Shut out the critical thinking. What I think is the most fruitful is finding that connection... but a little bit of creativity is inherent in any good critical thinking...."

One fine arts professor said, "I said in one small workshop group, the thing that I hate is the fact that we have to split it. The implication is that you are either teaching creative or critical thinking-- that they are not part of the same process. It seems to me that they are and it's not just this project. I mean I've heard it raised in all kinds of teaching conferences. Where they go up and say how do you teach critical thinking and that's separate. I think that's too bad because my field, I hope, is on the nexus. I don't think I can design scenery if I don't have a really well-tuned critical mind to able to think about this text is trying to say and then make the decision to support that position or create a dialectic to it. I don't think you can do that if you don't have a critical mind. So I'm in a field where I think we have to do both and so I'm at a loss sometimes to understand why we separate those into two separate topics. Having come to this from the hard sciences, I would have been at a loss without a creative mind when looking at a set of data and coming up with something new. Other than that you are just regurgitating what other people have done in the past. I think it's a shame to separate them. That's my soap box."

One of the humanities professors said, "The best critical thinkers need to find a way to be creative and the best creative people need critical mindedness. When you think about creativity you think about bursts of artistic genius, and many artists talk about mysterious force coming out, it just came to me and there it was, so you assume there is not a self-aware critical thinking going on, but I tend to think that for many creative people there is a great deal of critique going on for things around them. So I think it is hard to draw a line between the two."

Other Issues

Various faculty members talked about the fact that students are not generally encouraged to take risks, which can inhibit creative thinking, or that they might not have a habit of getting engaged in their work. One of the professors who taught in the AIDS course said, "The final project was to become activists and as groups put together a plan of action and even those were fairly uninspiring. They didn't take a lot of risks; they were not highly creative in how they made that happen." One social scientist said, "The only thing is they have to want to learn.... College is about all sorts of other things and they are taking three other classes. Not everybody is engaged in your class and things you are trying to do with them and that's the other frustration. I don't want to be resigned to that."

Another professor mentioned the issue of available spaces. She said, "...even the basic things related to technology and the way that our classrooms are set up [are important]. I mean space is at a premium and we don't always get the classrooms that we hope to get and so I have time when I'm in classrooms where students can't move around to talk to one another very easily or I don't have to schlep across campus so if I have a lot of extra materials I'd like to take, it's harder for me to do. I may be less apt to do that than I would if I were just walking down the hall. I think that the technology piece of things certainly support my efforts to try to help students think creatively.... One of the things that we don't have that I think would be helpful is a real center like place for students to interact with one another."

Encouraging More Creativity

Faculty had many ideas for encouraging faculty and students to be more creative in their work. These ideas tended to focus on faculty development, support from the institution, and the value of assessment and self-reflection. One faculty member said, "More talking about what we do is helpful. That's why I think assessment meetings at the end of the year are good... the process of thinking about my own class and going to that meeting and talking with colleagues about the goals and how to achieve them is helpful. More of that should happen. You need to have ideas and talk to other people about what works."

A humanities professor said, "Our students are saying most of the creativity happens outside of the classroom. Having these discussions among ourselves about the flexibility of what can happen in the classroom. I have found myself saying I have to do this because this is what one does in the classroom. Just having conversations about how our students are not seeing classrooms as creative spaces is important. Ways of extending the classroom to not see it as so isolated. We need real

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conversations about what the classroom is, where it is, and how it functions. Maybe those conversations can be a foundation for other processes we put into place."

On the issue of faculty development one person said, "The challenge is to encourage faculty members to be experimental in the ways they imagine student work, without abandoning key commitments to core educational goals having to do with having students express themselves clearly in argument to also say that the ways in which you might go about cultivating a sense of the discipline should go beyond, at least experiment with going beyond, writing 5 or 25 page papers. How you encourage faculty members to do that I am not sure. I suppose one way of doing that is giving them inspirational models. Make sure people within their departments and across disciplines talk to each other about whatever works, whatever seems to gain traction in this area."

Another professor said, "One of the things that I think is really valuable is faculty talking to each other. I think the interactions of faculty have with each other about teaching and specific practices can be really helpful because it gets people thinking creatively. I'm more and more convinced that you have to create an environment where the students feel free to be creative. The best students will be creative no matter what, which is what separates between an A-paper and a non A-paper. I think creativity will always come out, but it's much more restrained if you're not trying to create an environment where creativity can come out. Like if you're in a final exam you're thinking about finishing the exam, not being creative. "

A humanities professor discussed the issue of a teaching center to encourage faculty development. She said, "It would be really, really great to have some kind of place where all these teaching initiatives can be consolidated. I really think so because we are all trying to do great things in our classroom or in our department or someplace you have exchanges with your colleagues in your discipline. There is a women and gender studies table where we discuss some strategies but I really wish we had more like a some kind of an institutional place for that.... I started very, very young and I flipped from so many institutions. I used to teach high school in Argentina, middle school, private school, Catholic school, so I've been to so many institutions, I've crossed the world. My experience has been that sometimes we can have the best intentions in the classroom to do a good thing, but if that does not have an institutional support of some kind, if that isn't echoed somehow by a bigger picture, you know how those things work, it just remains, sometimes its good and sometimes it's very inefficient. I feel like we put all this effort into trying the different things and end of not working."

Time can be an issue as well. One person said, "For what is going on in the classroom, the college needs to make sure professors have enough time to think about their teaching and keep changing it. Going for professional development or whatever. Just making sure we are not on so many committees that we can occasionally just sit down with an empty desk and think.... I think we have to look at the whole picture. Co-curricular kinds of things and try to help them [students] see that the connections with what they are getting in the classroom can be applied to things they are interested in doing. We are not just, professors here in the classroom, and then you go back to your dorm room. The kind of holistic view, that it becomes more of a habit for students in all aspects of their lives, not just the classroom. "

Similarly, another person said, "...we're thinking a lot about the importance of our students engaging in real life and practical types of experiences. I've really been struck by the need for simply the time to do that. So I think if we input noncontent-based experiences, whether they be

creative or practical, we must create the time in the curriculum for both the students and the faculty. So I think there's a bit of an overload issue right now. And if you are going to have a course or a curriculum that really builds creativity or critical thinking and the ideas that mean less focus on content. We really must be true to our word with that and not just add to the students' academic burden."

One of the fine arts professors who participated talked about the value of institutional support when she said, "I think if the school values creativity in general it certainly would make for an environment, which would make people think about it more or equally with other educational opportunities on a college campus. Most universities and colleges tend to think of the creative art as a luxury or a thrill something to do to say their students well rounded and not as difficult as other areas.... We've done things from time to time like one of the honors seminars taught by a science professor who brought in a whole lot of other art professors on campus to talk to the students in the seminar on a weekly basis about the whole idea of the creative process ... and that kind of deliberate focus I think was wonderful for those students in the seminar. More of that kind of collaboration or taking advantage of specialized courses could bring the creative process more into all of the students."

Value of Assessment

Assessment was a cornerstone of this project, and many faculty discussed the value of collecting information about creative and critical thinking from students. One professor said, "Over the two semesters having worked with the information I am more conscious of using the language of critical thinking, even more than creativity. I felt weakest there so I focused on that. I tend to think my students are pretty creative. I might need to teach them to think about it a bit more. I have used the critical thinking language a bit more. Not just in the official rubrics but in other rubrics. I have talked about it in course readings. I have tried to use the language more which has been helpful to me in seeing where they were going."

Another professor said, "I am going to keep doing this. Initially I thought it would be helpful for presenting to students what I value in this assignment, and helpful to me to ensure that my grading is uniform, and then to really focus on these areas. It has helped me understand those concepts and grading it well, but it has grown beyond that in its value to me in looking at the different years of students and thinking about, can I come up with another way to reach that group of 'dead seniors' [seniors taking the course only to satisfy a requirement]. It has got me thinking more intentionally about some of those other issues in the classroom. So even though it is the one assignment it is getting me thinking about other things that I might try to do. And I am thinking about whether I should do two assignments. Something early in the semester that is graded. The stuff I do they get more participation points, but maybe one of these more longitudinal things. Definitely it has really been helpful to me. I have used it in my upper-level seminar, and hopefully it was helpful to the students, too."

One fine arts person said, "Well one of the things I've found helpful was it's helpful for me to have the vocabulary that a lot of educators and administrators have so that we can be valued. When it's clear to them how important the arts are, it's great, we need that. We need to be using the same language that people in other disciplines use to be valued equally and for credibility. I really enjoyed some of the complexities that rubric presented to me as a teacher so that hopefully next

time I teach this or a similar assignment I can help the students sort of differentiate between the different components that are involved in a creative project. It will help them understand the complexity and I don't only have to think about being unusual and unique but I also have to think about having resonance and depth it's not easy there are a lot of things to bring it together. It's not as mysterious as a lot of people think it is. It's picking the tools and applying them and testing, testing, testing until you get the best solution. "

One humanities professor said, " This has been really cool... I mean, it's just made me a lot more intentional... about what I want the students to do... students can be – not all – but, just very uptight about getting the grade and that risk is scary to them and so I think the more we say to them 'This is worth the effort. This is worth taking the risk,' the more creative they'll feel. They'll recognize and appreciate it."

One natural science professor said, "Doing the rubrics – I didn't know how that would work, I had my doubts two years ago. I actually started using a rubric and I find it easier to grade consistently... I really like it and use it now for all my labs, it helps my grading. If students would look at them they could realize exactly what they aren't doing well. I give this back to students with written comments, and the ones who look at it could improve their labs which is helpful.... I found it helpful and I was totally shocked. Someone said you can't do it with lab reports – I think you can – I showed that you could."

Summary

Two professors offered summary responses that were representative of the way many faculty were affected by their participation in this project. One person said, "Creativity can be taught and one needs to be intentional about it and needs to reiterate what constitutes creativity, and need to find examples that break the norm of what students assume creativity to be. You can move students toward complexity of thought, synthesis. You can teach them something that is new and useful, but it takes work!"

The second faculty member said, "I hope we would find a way to help all faculty to think about how as we prepare a class, prepare to teach a class, and all the way through the semester, that we introduce a notion that creative and critical thinking go hand-in-hand and that creative thinking is not just an artistic expression of something. Creative thinking really, in my opinion, enhances the way we think critically about something. They are not on opposite ends of the spectrum. In fact, If I am thinking critically and creatively how much more interesting life might be. Not because I am doing an art project, but in the way I think of my writing, my oral presentation and what not.... There is a way we can teach ourselves how to teach our students to think that way. That using both of those things in each and every class we do, we would break down the stigma about creative thinking and find a more enriching way to think in general without thinking of them as separate entities. I don't know if that is possibly because some faculty think that way - maybe we need a different term because creativity is so loaded – what if we call it something else.... How do we get there?"

Report D: Student Survey Data
What are Students' Attitudes and Experiences Associated with Creative and Critical Thinking?

In the first year of the grant, we developed on-line surveys to measure student and faculty perceptions of creative and critical thinking. In the second year, we administered the surveys and reported on data from 260 first-year students, 375 senior students, and 147 faculty. For this third year of the grant, we administered the survey to a group of first-year students, and a group of sophomores at each of the four colleges. These survey results are intended to provide baseline data for any of the participating institutions that elect to continue to track the performance of cohorts of students over the next several years. We report on these data here and provide comparisons between schools on some questionnaire items so schools can receive results specific to their students.

Method

Participants:

In this second year, there were a total of 749 respondents; 338 from the College of Wooster (COW), 78 from Denison University (DU), 190 from Kenyon College (KC), and 143 from Ohio Wesleyan University (OWU). The majority of these participants (65.8%) are women. Slightly more than half (53.9%) are first-year students. Almost eighty percent of the sample (79.8%) is Caucasian. Students were asked to indicate the discipline of their major (or intended major). (When a double-major was given the first major listed was categorized). In the sample, the discipline of major is represented such that 16.6% of the sample have a fine arts major, 26.9% a humanities major, 29.3% a natural science major, and 27.2% social science. These proportions were not equally distributed across the four schools, though, such that social science majors were over-represented at OWU and under-represented at KC; humanities majors were under-represented at OWU, and fine arts majors were over-represented at KC.

All first-year students and sophomores were sent an email link to the survey as well as a couple of follow-up reminder emails in the Spring semester 2009. Participants had the chance to win $200, with eight awards given on each campus.   The response rate for women participants across the four campuses was 64%, but it was only 34% for the men (which is similar to national trends). Students responded to a series of questions, some yielding quantitative responses and some qualitative ones that were coded into categories.

Results

Quantitative Data:

Quantitative data from the survey are displayed in the tables and graphs that follow.

Table D1: Students Rate Creative and Critical Thinking of Various Events.

Table D1 presents data on the extent to which various activities were perceived to involve creative and critical thinking. Writing papers for classes and completing projects for class were rated high in critical thinking, and engaging in a hobby and completing projects for class were rated as high in creative thinking. Thus, completing class projects likely engages students' creative and critical thinking skills. On the other hand, communicating with peers over the internet and "surfing" the internet were rated as low in both critical and creative thinking.

Table D2: Frequency of Critical and Creative Activities of Students by School.

Table D2 portrays data on the frequency of various creative and critical thinking events by school. Students across the four schools reported a high frequency of many different events. For example, on a 6 point scale the most frequent activity reported was "working on a paper or project that required integration..." with an average frequency of 4.81. There were some statistically significant differences across schools such that DU students were most likely to report "taking an assignment in a different direction" and working on a paper that required integration, while KC students were most likely to report "wanting to read more" and "letting go and having fun intellectually".

Table D3: Students Rate Creative Environment Characteristics.

In Table D3 data are presented on the prevalence of various environmental characteristics that promote creativity. Most characteristics were rated as prevalent, with the highest ratings given for "challenge" and "freedom," and the lowest ratings for "risk taking" and "conflict." There were some differences across schools such that COW students were most likely to perceive their environment to have "freedom" and KC students were most likely to perceive that their environment had "dynamism/liveliness" and "debate."

Table D4: Critical Thinking Attitudes by School.

Participants were asked to indicate their level of agreement with various attitudes related to critical thinking using a scale where 1 = disagree strongly and 7 = agree strongly. These data are displayed in Table D4. The attitudes with the highest level of agreement across schools were that both the natural and social sciences are associated with critical thinking. The attitudes students were least likely to agree with include the idea that too little teaching is focused on critical thinking, and that extracurricular activities involve critical thinking.   Students at COW showed the highest agreement with the idea that the senior project, thesis, or independent study required critical thinking. Students at DU were most likely to agree that critical thinking is important in the humanities. Students at KC were most likely to agree that faculty on campus model critical thinking, and that courses encouraged critical thinking.

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Table D5: Creative Thinking Attitudes by School.

Table D5 presents data on creative thinking attitudes. Across all of the schools the items with the highest agreement were that creativity is important in the fine arts, and that students value creativity. Students showed the lowest agreement with the idea that too little teaching at their college was focused on creative thinking, and that the higher education system is conducive to encouraging creative thinking. Students at COW were most likely to agree that the senior project, thesis, or independent study involved creative thinking, and that their college values their efforts to be creative. KC students were most likely to agree that they value creativity, that it is important in the humanities, that extracurricular activities encourage creativity, that there is a "creative vibe" on campus, that a liberal arts education is conducive to creative thinking, and that courses on campus encourage creative thinking. OWU students were most likely to agree that too little teaching on campus encouraged creative thinking.

Qualitative Data

Students were asked a number of open-ended questions. For these data the qualitative responses were coded into categories. These responses are portrayed in the figures that follow, and sample responses are provided for some questions.

Figures 1 & 2: Words Associated with Critical and Creative Thinking.

Students were given a list of 47 words and asked to indicate which words were associated with critical thinking, and which with creative thinking. The words most commonly associated with each type of thinking are displayed in figures 1 and 2. The five words most commonly associated with critical thinking including *analytical, interpreting, evaluating, focusing,* and *comparing.* For creative thinking, the five words most often selected were *imaginative, artistic, visionary, original,* and *spontaneous.* The characteristics of *insightful* and *reflective* were in the "top twenty" list of words associated with both critical and creative thinking.

Figure 3: Where Critical Thinking Happens.

Across all schools, critical thinking was most commonly associated with the classroom with 72% of the students listing something about the classroom as being associated with critical thinking. Seventeen percent of students indicated that critical thinking happened "everywhere." Representative responses for each school are listed below.

COW: *"I see critical thinking thriving in the academic buildings and the libraries, but also within the guest speakers who arrive on campus, and the number of students who attend their lectures."*

DU:　*"Critical thinking thrives due to the emphasis Denison places on higher learning, and assignments and discussions that go beyond the textbook outline to foster dynamic education and critical learning."*

KC: *"The library and dorm rooms are the most obvious study spaces, but in a way I think that our coffee shop/cafe is a hub for critical thinking too. Students get to talking about what they are really interested in, so that sharing and analysis of ideas is common."*

OWU: *"I feel like critical thinking is pushed in almost every class. Your limits are pushed to the maximum from art to mathematics. All classes push hard for you to think for yourself and succeed over challenges. Even activities like dance as a class or student-led, really push you to think of your own choreography and think critically about the piece that you will present to class or the student body...Critical thinking is almost found at every corner of OWU."*

Figure 4: Where Creative Thinking Happens.

Students most frequently associated creativity with extracurricular activity (48%), and then with the arts (37%). Unlike critical thinking, creativity was not closely associated with the classroom such that only 29% of students listed the classroom as the place where creativity was most likely to occur. Responses from students at each school are listed below.

COW: *"Creativity happens all over campus. The 1st places that come to mind are the program houses where groups of students put together programs to benefit the campus. These houses not only give students a space to be creative and constructive, but they can also open other avenues for creativity, for instance one house holds poetry readings and puts on concerts. Creativity also happens in the music and arts buildings, and in the English department. The dormitories also offer avenues for creativity, in that residents can personalize their rooms and doors. Outdoor spaces sometimes offer creative spaces depending on what students are doing there, sometimes students are studying, but other times depending on the weather, students will be outside playing games, or making music or engaging in other forms of creativity."*

DU: *"Creativity flourishes in art, language and science especially. For all three, creativity is something that is absolutely indispensable when it comes to understanding and creating new things/thoughts/ideas."*

KC: *"I feel like Kenyon in general creates a creative environment. The teachers push you to be creative and the students are creative in every aspect of their lives. The beautiful campus creates a welcoming environment that allows people to be creative."*

OWU: *"Creativity flourishes with the clubs found on campus and at the Creative Arts House. Inside the classroom, several assignments require a deal of critical thinking that incorporates a level of creativity."*

Figure 5: Barriers to Critical Thinking.

The most common barrier to critical thinking was listed as "none" which was listed by 46% of participants, as shown in Figure 5. The general campus atmosphere was indicated as a barrier by 28% of participants.

COW: "*There are no boundaries inside the classroom, however there are some outside the classroom because often the social aspect of the student's lives are purposely molded by the students to minimize critical thinking (usually) to give themselves a break from this mindset.*"

DU: "*In some sense today's media might stymie critical thinking. In the classroom, the use of workbooks, basic textbooks, or simple worksheets would probably also stymie critical thinking.*"

KC: "*Because so much of the social life on campus relies on drinking and partying, critical thinking opportunities are almost entirely limited to classroom settings, and assignments for said classes. Guest speakers and other intellectual activities, promoted entirely by the college, are relatively common; however, there is usually a meager turnout.*"

OWU: "*Everywhere, today we live in a culture of 'Buy now' and 'Sell out' and the critical thinkers of our society have to fight the barriers where and when we can. It's a struggle against the almost overwhelming sense of anti-intellectualization in America.*"

Figure 6: Barriers to Creative Thinking.

As for barriers to creative thinking, "pedagogy" was described most often (by 38% of students). The second most common response was that there were no barriers with 36% indicating that response.

COW: "*No. The liberal arts education here at Wooster is very supportive of thinking creatively. The senior IS (independent study) project is all about creativity.*"

DU: "*Inside the classroom, there are certain barriers such as time which sometimes doesn't allow for full creativity in evaluating or discussing topics. Classes are only so long which doesn't allow full creativity within the classroom. However, discussion not held in class can be and is often carried outside of class.*"

KC: "*The small classroom environment provides an intimate area which encourages some students to speak freely about their ideas. However, some students may feel intimidated by other students' confidence.*"

OWU: "*Yes, in the classroom there are general guidelines that should be considered when completing the assignment for the particular class. The teacher will have certain things they want in the paper or project but how you address them is up to you.*"

Figure 7: Diversity and Critical and Creative Thinking.

Most students indicated that diversity promoted both critical thinking (74%) and creative thinking (76%) as shown in figure 7. Some representative responses for both critical and creative thinking are listed below.

For critical thinking:

"Yes...both the most grave and the most interesting problems cannot be solved with a narrow perspective; in order to think critically and discover solutions, you must understand the problem in all its dimensions and from multiple perspectives. Diversity is inextricably linked to critical thinking."

"Yes, diversity challenges people to think outside of themselves in an attempt to understand other individuals."

For creative thinking:

"Well yes because when people have something to say, particularly when they have a problem or feel limited, they will take up some creative form to get others to listen. If they were dull, who would pay any attention?"

"Yes, there are so many different cultures, etc. represented here and each person with their own unique perspectives wants to share a little piece of themselves with others."

Figures 8: Technology and Critical and Creative Thinking.

Slightly more than half of the students indicated unqualified agreement that technology facilitated critical thinking, with 54% giving that response. Students were very likely to mention that the resources provided by technology could expand critical thinking. Sixty percent of students thought that technology facilitated creative thinking. Students indicated that technology facilitated creative thinking by allowing many different forms of expression. Some representative responses are given below.

For critical thinking:

"Technology can facilitates critical thinking when it is use to aid us in solving a problem so that more time can be spent on the analysis portion."

"I think technology both encourages and inhibits critical thinking. For example, the internet is a great resource with tons of information, but having instant access to it discourages people from thinking for themselves or thinking critically."

For creative thinking:

"I think technology allows us to be more creative. Technology is so advanced these days that we can each use it to promote our own interests. One may use the internet in ways that I don't therefore we are both able to express ourselves in different ways."

"We have access to so much through technology nowadays. There are limitless sources of inspiration. The only drawback is that it can be so captivating that you forget to make time to see the real world, experience things, and actually begin to create!"

Figure 9: Students' Experiences that Involved the Most Critical Thinking.

Students also reported on the experience they had had that most involved critical thinking. The most frequent critical thinking experience mentioned was an experience related to class, with 55% of students indicating such an experience. These data are shown in figure 9 and sample narrative responses are included below.

COW: "*Sociology opened my mind to the larger picture. That a lot of problems are society based and caused. You can't always blame the individual.*"

COW: "*First year seminar, a discussion based class challenged me to form my own opinions and think critically about the books we read.*"

COW: "*Organic chemistry and race, gender, and justice were two really good classes that fostered critical thinking. Also there was a book called 'Why We Get Sick' that also enhanced my ability to think critically.*"

DU: "*All of my courses require me to take facts, and come out with new meanings and understandings that I have not known before. To me, this is the working definition of critical thinking.*"

DU: "*My first year seminar was about human rights and critical thinking which was hard for me because human rights seems like a more emotional issue, but I learned to address it in a different and perhaps more effective way.*"

DU: "*I think my Ecology and Evolution class has fostered my ability to think critically into the primary literatures of ecologists. Also the Breakaway trip I took during winter break made me to think critically into social issues.*"

KC: "*Yes, I've had many books and courses alter my perspective, ultimately changing my critical thinking. I also saw several guests that came to campus and gave lectures. Books: (e.g. Beloved-Toni Morrison) Courses: (Quest for Justice, Silenced Histories, Ethnomusicology, Cultural Anthropology).*"

KC: "*There is a history class here called the Making of the Contemporary World which has really fostered my critical thinking abilities. I think more globally now than I did before. I think this class should be required.*"

KC: "*Some of the political science classes that I have taken have forced me to question my views and then have to defend them. They have also taught me to read and analyze more carefully.*"

OWU: "*All of my classes help enhance my critical thinking to a certain point. Lectures and simple processing of information does not necessarily enhance critical thinking, but it is when an instructor asks a student to make the connections between information and solve problems that critical thinking can thrive.*"

OWU: *"The education course I am currently incorporates a wide variety of books and class discussion fostering students to think critically instead of being docile to any system and become like zombies. <u>Dumbing us Down</u> by John Taylor Gatto is presently advocating a lot of thinking outside of the box in many facets."*

OWU: *"Yes, everything theatrical causes us to think critically, we always have to have plans in case something goes wrong, we have to make sure all the pieces of our huge theatrical puzzle fit the right way."*

Figure 10: Students' Most Creative Experiences.

Most creative experiences were more varied than the critical experiences such that 24% of students mentioned a writing experience as their most creative, 23% mentioned a project, and 19% indicated an arts-related activity.

COW: *"One of the interdepartmental classes right now about leadership is really making us think about what is means to be a leader and the different ways we can accomplish this. I am involved in a non-profit and this class will really help me establish myself and stand out because of new ideas."*

COW: *"FYS (First-Year Seminar) – the papers involved, analyzing books and movies--themes had to be developed that weren't always crystal clear – connections were made in creative ways"*

COW: *"I had to do a final project in astronomy that related astronomy to my political science major. That caused me to be very creative in my thinking."*

DU: *"One of my most creative academic experiences happened in my field experience for one of my education classes. Being with a group of third graders really fostered my creativity and enthusiasm for learning."*

DU: *"Writing papers for my Film Noir class first semester freshman year. That class enabled me to view not only film differently but also the world."*

DU: *"Designing and filming an alternate ending to a Spanish language video. Challenged my skills in coming up with an interesting ending, filming, working with others in a new setting besides the classroom, being flexible, and also caused me to think about what the process was like for the director of the original movie."*

KC: *"My IPHS course (Integrated Program in Humane Studies, a first-year course) requires me to compile resources from all over and see how they relate--the course does a great job of showing to me how interconnected many things are."*

KC: *"Giving a presentation of my research for a physics seminar. It requires a lot of creativity to explain complicated physics to an audience that doesn't know the formulas and some of the properties that are required in a specific field of research. It requires creativity to teach the necessary physics quickly so you can then dive into the more interesting aspects of your research."*

KC: *"An English class. The teacher asked us to write many different styles of stories. I'm a math/science major so it not only involved a different kind of thinking, but it also allowed me to take the ideas and do what I wanted without a fear of it being 'wrong'...."*

OWU: *"My experience with our Sagan National Colloquim program was my most creative. My project was 'meatless Mondays.' My group had to come up with creative and healthy options for our dining halls and had to creatively market this event every Monday to get students interested in it. It was a lot of fun."*

OWU: *"A tutorial I took during fall semester called Zombie 101 was the most creative academic experience so far. It forced me to think creatively, because the discussions combine the abstract nature of being a zombie and the philosophy of mind and body."*

OWU: *"A three part project in Botany where I researched the fall of the civilization of Rapa Nui due to the deforestation and possibly Rattus Exulans. This forced me to pull information about topography, zoology, botany, anthropology, history, and other fields. Some of my sources were not even in English, which presented another level of creativity. Then I compiled all of the different resources into an essay, a PowerPoint presentation with moving visuals, and an oral presentation/ summary of the essay."*

Table D6. Responses by Class Year.

Table D6 presents the categorized qualitative data by response year. Where the percent of first-year students endorsing a response and the percent of sophomores endorsing the same response differs by five percent or more, the values are highlighted.   First year students were more likely to say that creative thinking happened everywhere compared to sophomores (22% versus 15%), and therefore less likely to see creativity in extracurricular activities than sophomores (43% versus 54%). First-year students were more likely to perceive no barriers to both critical thinking (51% first year, 38% sophomores) and to creative thinking (38% first year, 30% sophomore). First year students were less likely, then, to list the atmosphere or pedagogy as barriers to critical thinking. First year students were more likely to list "no" critical thinking experiences compared to sophomores (12% versus 6%). Sophomores reported experiencing a class as a critical thinking experience more frequently than first years, and a project as a more frequent creative experience compared to first-year students.   With respect to diversity, sophomores were more likely to agree that diversity promoted critical thinking. Sophomores were less likely to give unqualified agreement that technology promoted either critical or creative thinking.

Table D1: Students Rate Creative and Critical Thinking of Various Events

Average response of students across all schools.

Scale: 1= not at all to 5 = great deal.

How much does each event involve...?

Event:	Critical Thinking	Creative Thinking
Interacting with students and faculty in class	3.80	3.13
Cultural events on campus	3.04	3.42
Extra-curricular or co-curricular activity	3.16	3.76
Listening to speakers on campus	3.76	3.03
Interacting …students outside of class	3.01	3.63
Engaging in a hobby	3.08	**4.26**
Reading material for class	4.31	2.77
Interacting with faculty outside of class	3.58	3.15
Completing projects for class	**4.35**	**3.88**
Communicating with peers over the internet	*2.34*	*2.93*
Writing papers for classes	**4.62**	3.72
"Surfing" the internet	*2.17*	*2.64*

Note: The two highest responses are presented in bold and the two lowest in italics.

Table D2: Frequency of Critical and Creative Activities of Students by School

Scale: 1= never to 6 = always or almost always.

How often have you...?

	COW	DEN	KEN	OWU	ACROSS ALL	diff?
Taken an assignment in a different direction	3.31	3.45	3.38	3.06	*3.29*	*
Found yourself wanting to read more …	4.09	4.05	4.41	4.29	4.21	**
Used brainstorming during a class	3.95	3.91	3.97	3.81	*3.92*	
Used brainstorming in a class assignment	4.32	4.47	4.45	4.19	4.34	
Used brainstorming outside of class (e.g., club activity)	4.10	3.89	4.22	4.16	4.12	
Worked on a paper or project that required integrate	4.87	4.99	4.77	4.62	**4.81**	*
"Let go" and had fun intellectually	4.00	3.91	4.35	4.09	4.10	*
Engaged in abstract thinking	4.31	4.18	4.53	4.29	4.35	
Put together ideas or concepts from different courses …	4.35	4.39	4.50	4.39	**4.40**	
Used a story, metaphor, or visual in a class assignment	4.16	4.01	4.17	4.11	4.14	
Incorporated diverse viewpoints in a class assignment	4.09	3.93	4.17	4.06	4.09	

Note: differences in means between three groups were examined; significant differences are noted with   * = p < .05, ** = p < .01, *** = p < .001.

Across all schools highest responses are presented in bold, and lowest in italics.

Table D3: Students Rate Creative Environment Characteristics

Scale: 1= not at all present to 7 = extensively.

Frequency of characteristic:

	COW	DEN	KEN	OWU	ACROSS ALL	diff?
Challenge	5.53	5.47	5.67	5.55	**5.56**	
Freedom	5.62	5.18	5.55	5.55	**5.55**	*
Idea Support	5.52	5.32	5.49	5.45	5.48	
Trust/Openness	5.26	5.03	5.38	5.41	5.30	
Dynamism/Liveliness	5.12	5.21	5.51	5.17	5.24	*
Playfulness/Humor	5.42	5.36	5.69	5.45	5.49	
Debate	5.32	5.11	5.65	5.30	5.38	**
Risk Taking	4.83	4.59	4.99	4.87	*4.85*	
Idea Time	5.03	4.95	4.99	4.85	4.98	
Conflict	4.29	4.61	4.33	4.20	*4.31*	
Supportive Environment	5.50	5.26	5.48	5.40	5.45	
Working in groups	5.21	5.26	5.36	5.06	5.22	
Active models …	5.30	5.27	5.48	5.29	5.34	
Assignments …	5.46	5.36	5.39	5.37	5.42	

<u>Note:</u> differences in means between three groups were examined; significant differences are noted with * = p < .05, ** = p < .01, *** = p < .001.

Across all schools highest responses are presented in bold, and lowest in italics.

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Table D4: Critical Thinking Attitudes by School

Scale: 1= disagree strongly to 7 = agree strongly.

Summarized question:

	COW	DEN	KEN	OWU	ACROSS ALL	diff?
I consider myself a person who thinks critically	5.63	5.85	5.94	5.69	5.75	
Too little teaching at this college is focused …	2.85	2.86	2.83	3.23	*2.91*	
Faculty can create conditions critical thinking	5.49	5.66	5.77	5.62	5.60	
Faculty on campus model critical thinking	5.71	5.69	5.95	5.64	5.76	*
Courses offered encourage critical thinking	5.80	5.78	6.10	5.58	5.84	***
Extracurricular activities… critical thinking	4.47	4.20	4.39	4.41	*4.41*	
I value critical thinking	6.05	6.14	6.22	6.22	6.13	
Critical thinking valued in major	6.13	6.22	6.26	6.09	6.17	
Critical thinking important fine arts	5.35	5.26	5.29	5.26	5.31	
Critical thinking important humanities	5.96	6.17	6.13	5.71	5.99	*
Critical thinking important natural sciences	6.22	6.34	6.45	6.24	**6.30**	
Critical thinking valuable social sciences	6.19	6.35	6.34	6.26	**6.26**	
It is possible to assess critical thinking	5.45	5.68	5.70	5.48	5.54	
The senior project, thesis, independent study …	6.31	5.78	6.01	5.75	6.08	***
This college values my efforts critical thinker	6.04	5.71	6.14	5.90	6.01	
A liberal arts education is conducive…	6.11	6.09	6.29	6.06	6.15	
Higher education system is conducive	5.22	5.17	5.15	5.07	5.17	

_____

Note: differences in means between three groups were examined; significant differences are noted with * = p < .05, ** = p < .01, *** = p < .001.

Across all schools highest responses are presented in bold, and lowest in italics.

Table D5: Creative Thinking Attitudes by School

Scale: 1= disagree strongly to 7 = agree strongly.

Summarized Question	COW	DEN	KEN	OWU	ACROSS ALL	diff?
I consider myself a creative person	5.58	5.64	5.79	5.49	5.62	
Creativity can be learned	4.43	4.69	4.41	4.37	4.47	
Creativity should be taught college courses	4.81	4.86	4.71	4.94	4.83	
Too little teaching at this college is focused	3.66	3.98	3.54	4.04	*3.81*	*
Faculty can create conditions …	5.67	5.88	5.82	5.71	5.77	
Faculty on campus model creative …	5.13	4.94	5.30	5.03	5.10	
Courses offered on our campus encourage …	5.04	4.83	5.24	4.88	5.00	*
Opportunities no right or wrong answers	5.39	5.20	5.28	5.11	5.24	
Extracurricular activities encourage creativity	5.31	5.03	5.52	5.26	5.28	*
Creativity valued in my major	5.41	5.20	5.57	5.11	5.32	
I value creativity	6.39	6.27	6.54	6.22	**6.36**	*
Creativity important in the fine arts	6.62	6.65	6.78	6.67	**6.68**	
Creativity important in humanities	6.11	6.19	6.38	6.15	6.21	*
Creativity important in natural sciences	5.21	5.23	5.40	5.38	5.31	
Creativity important in social sciences	5.65	5.73	5.84	5.80	5.76	
It is possible to assess creativity	5.03	4.92	5.11	5.06	5.03	
The senior project, thesis, independent study …	6.27	5.64	5.87	5.42	5.80	***
This college values my efforts to be creative	5.75	5.42	5.73	5.19	5.52	***
This college provides time for me to be creative	5.26	4.95	5.07	5.06	5.08	
This college gives me space to be creative	5.33	5.11	5.40	5.25	5.27	
There is a creative vibe on this campus	5.11	4.77	5.76	5.18	5.20	***
A liberal arts education is conducive …	5.73	5.86	6.14	5.68	5.85	***
Higher education system is conducive …	4.49	4.22	4.24	4.27	*4.31*	

Note: differences in means between three groups were examined; significant differences are noted with * = p ＜ .05, ** = p ＜ .01, *** = p ＜ .001.

Across all schools highest responses are presented in bold, and lowest in italics.

Figure 1: Words Associated with Critical Thinking
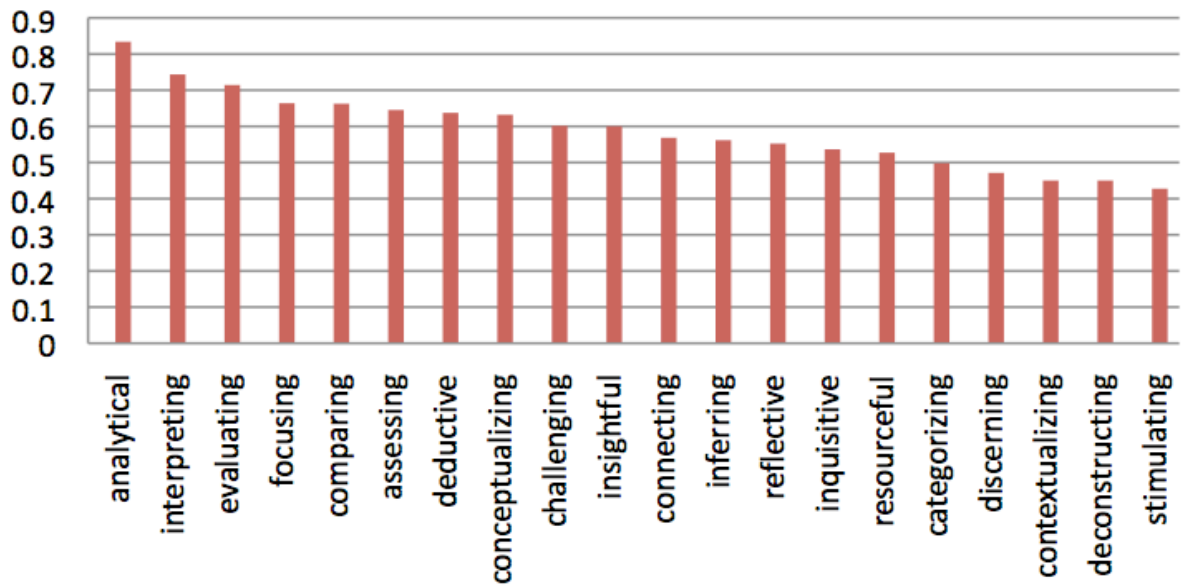
Figure 2: Words Associated with Creativity

Figure 3: Where Critical Thinking Occurs

	class	dorms	every	extra
COW	0.72	0.04	0.17	0.07
DEN	0.89	0.03	0.05	0.03
KEN	0.61	0.06	0.26	0.07
OWU	0.76	0.02	0.13	0.09
All	0.72	0.04	0.17	0.07
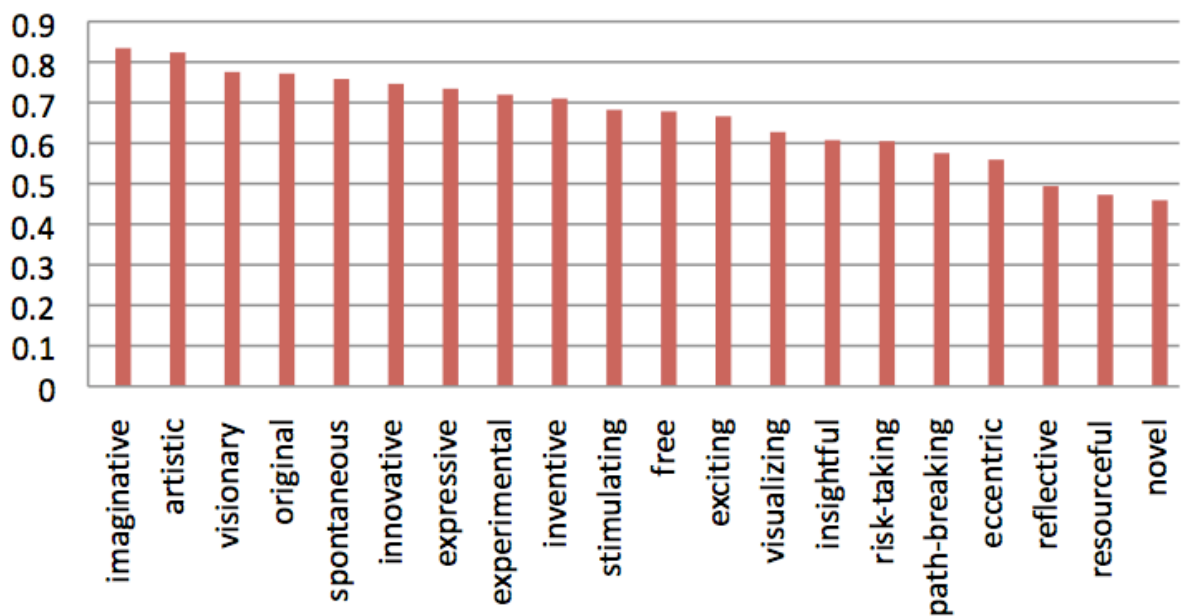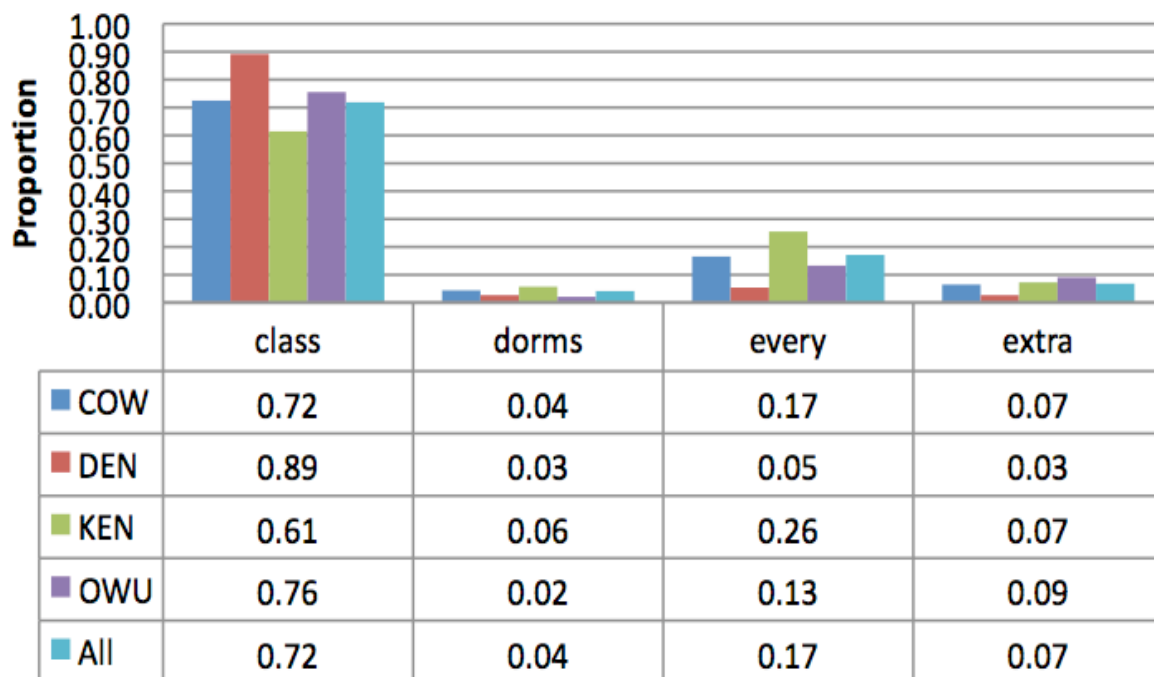
Figure 4: Where Creativity Happens

	arts	class	dorms	every	extra	nowh
COW	0.31	0.30	0.43	0.20	0.44	0.02
DEN	0.38	0.32	0.17	0.10	0.58	0.04
KEN	0.50	0.31	0.24	0.26	0.52	0.00
OWU	0.35	0.25	0.33	0.10	0.46	0.02
All	0.37	0.29	0.24	0.18	0.48	0.01
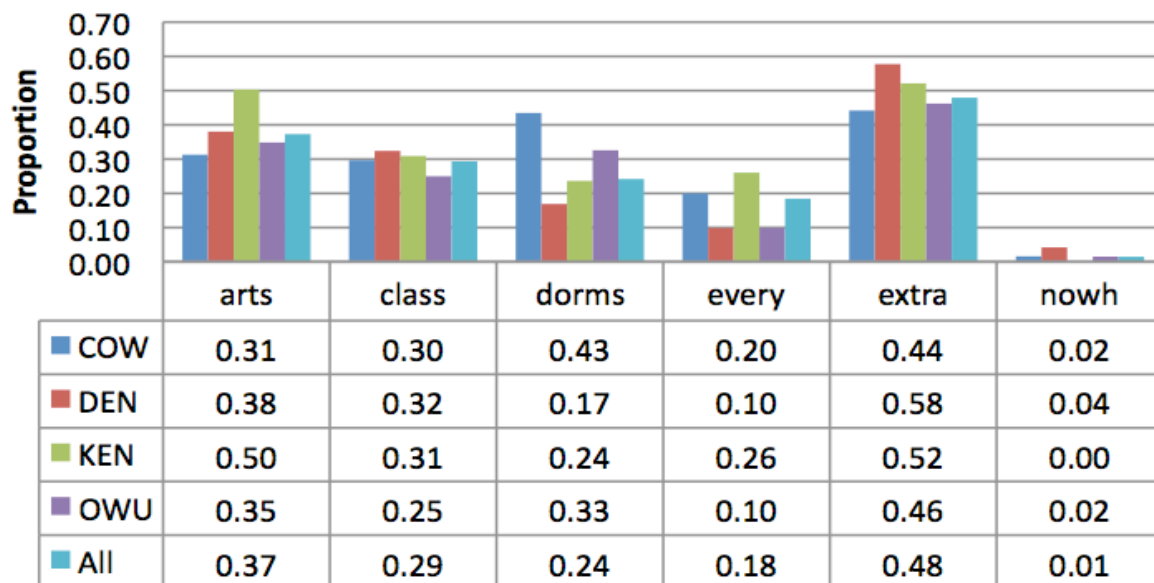
Note: Extra = anything outside of class; Nowh = nowhere.

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Figure 5: Barriers Critical Thinking

	atmos	pedagogy	personal	time	other	none
■ COW	0.23	0.17	0.14	0.03	0.01	0.49
■ DEN	0.44	0.12	0.04	0.03	0.00	0.37
■ KEN	0.29	0.16	0.07	0.02	0.00	0.46
■ OWU	0.30	0.20	0.04	0.03	0.01	0.42
■ ALL	0.28	0.17	0.06	0.03	0.00	0.46
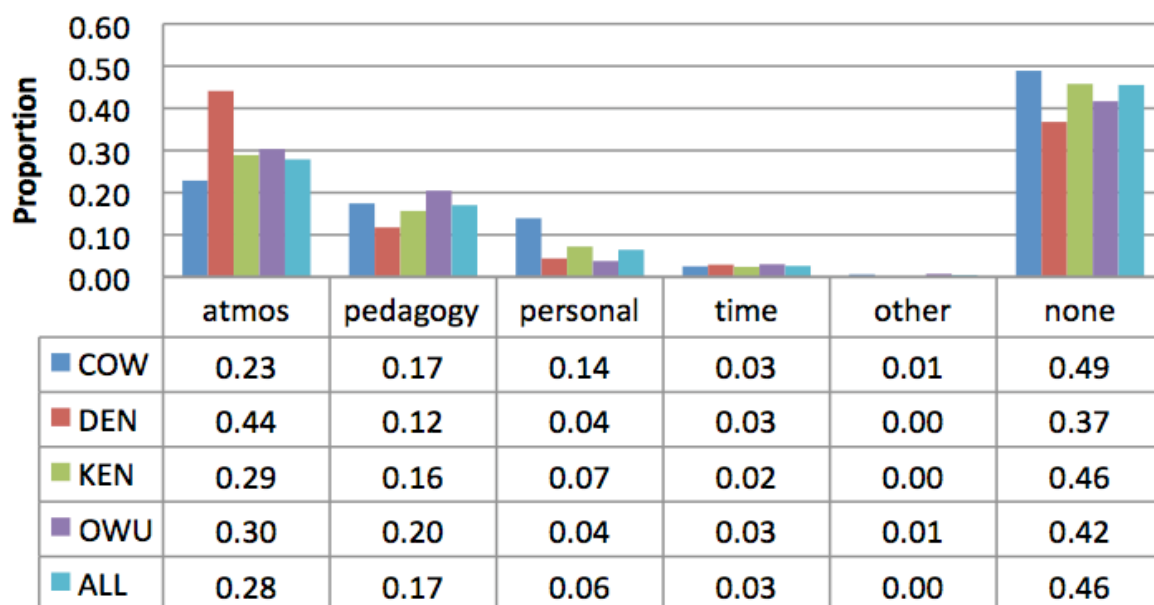
Figure 6: Barriers Creative Thinking

	atmos	grades	pedag	personal	time	other	none
■ COW	0.09	0.01	0.41	0.03	0.06	0.02	0.38
■ DEN	0.24	0.04	0.39	0.01	0.07	0.06	0.21
■ KEN	0.16	0.04	0.35	0.04	0.10	0.11	0.32
■ OWU	0.13	0.03	0.34	0.08	0.02	0.04	0.36
■ ALL	0.13	0.02	0.38	0.04	0.06	0.07	0.34
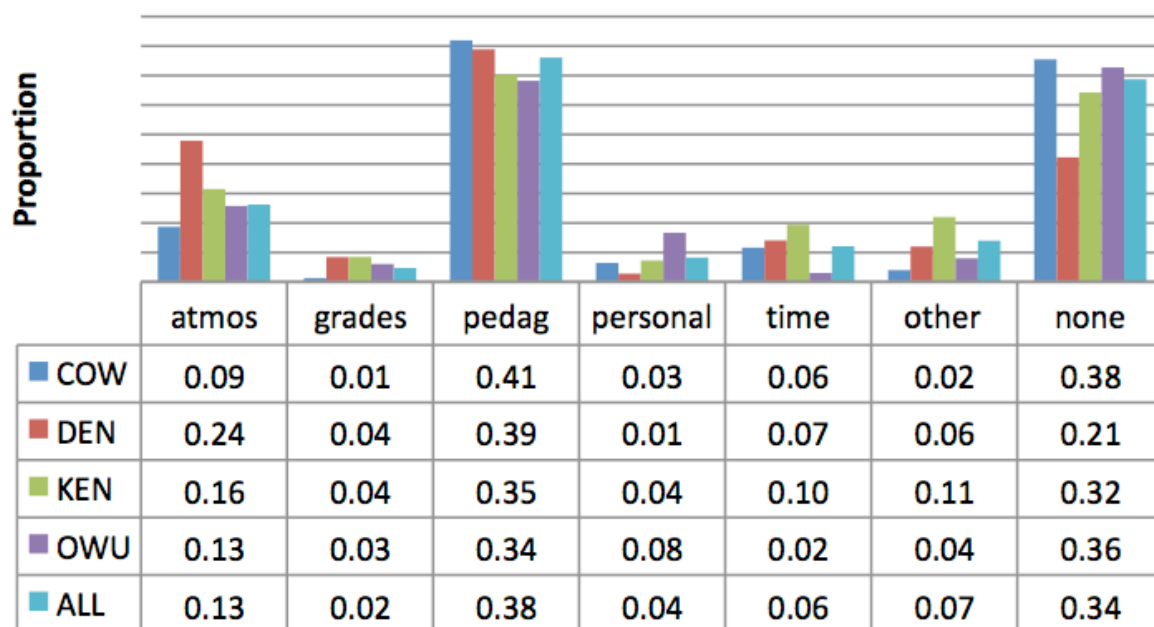
Note: atmos = atmosphere on campus; pedag = pedagogy;
      personal = personal problem of students.

Figure 7: Diversity Promotes Critical and Creative Thinking?

	COW	DEN	KEN	OWU	ALL
YES, critical	0.74	0.71	0.74	0.73	0.74
NO, critical	0.26	0.29	0.26	0.27	0.26
YES, creative	0.78	0.73	0.72	0.78	0.76
NO, creative	0.22	0.27	0.28	0.22	0.24
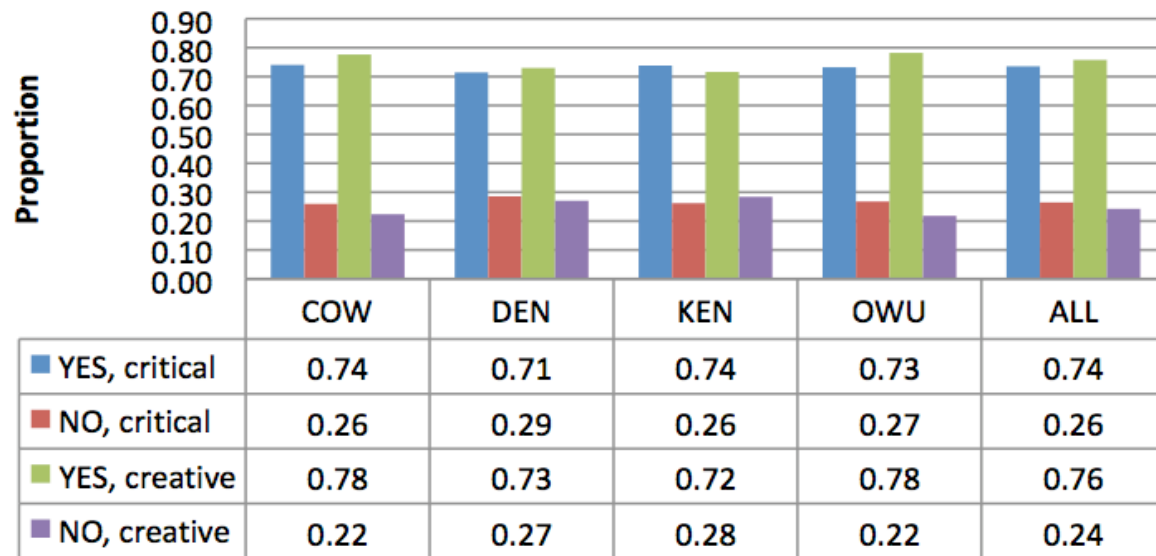
Figure 8: Technology Facilitates Critical and Creative Thinking?

	COW	DEN	KEN	OWU	ALL
Y, critical	0.59	0.59	0.46	0.52	0.54
NO, critical	0.15	0.23	0.20	0.22	0.18
depends	0.26	0.17	0.34	0.26	0.27
Y, creative	0.62	0.73	0.55	0.57	0.60
NO, creative	0.10	0.11	0.15	0.17	0.12
depends	0.29	0.16	0.31	0.26	0.27
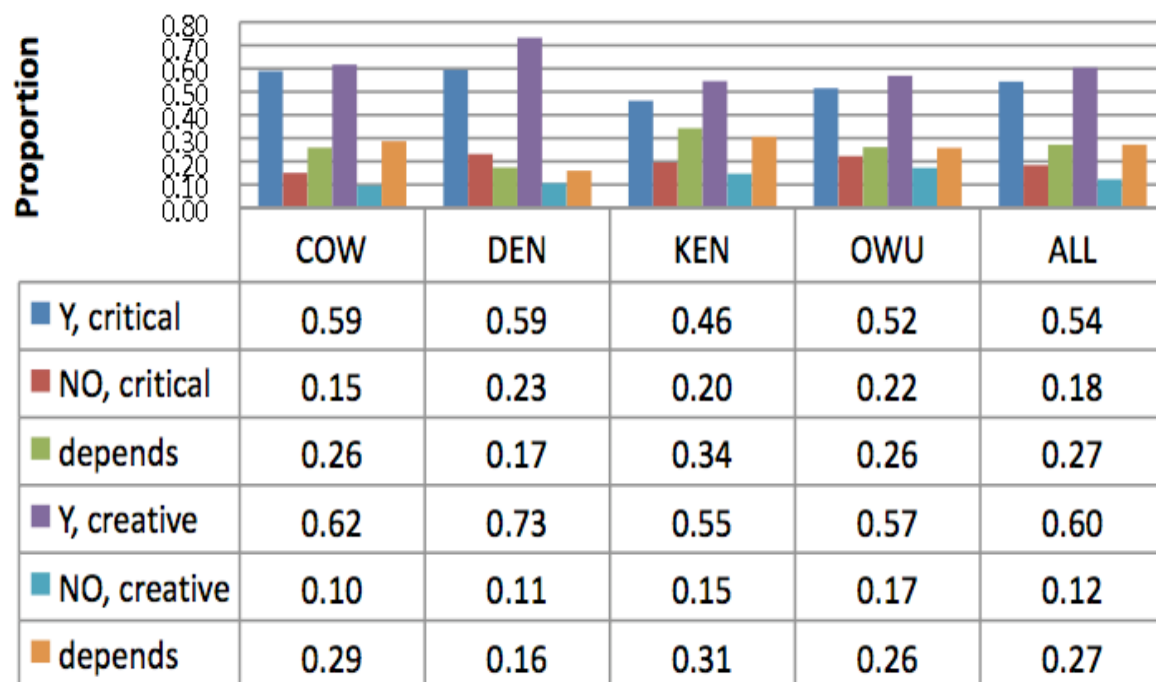
Figure 9: Most Critical Experience

	arts	books	classes	every	extra	fys	lect	none
■ COW	0.01	0.10	0.42	0.05	0.02	0.14	0.15	0.12
■ DEN	0.01	0.07	0.57	0.03	0.00	0.12	0.06	0.14
■ KEN	0.02	0.09	0.63	0.05	0.01	0.05	0.07	0.06
■ OWU	0.02	0.04	0.73	0.06	0.00	0.01	0.09	0.06
■ ALL	0.01	0.08	0.55	0.05	0.01	0.09	0.11	0.10
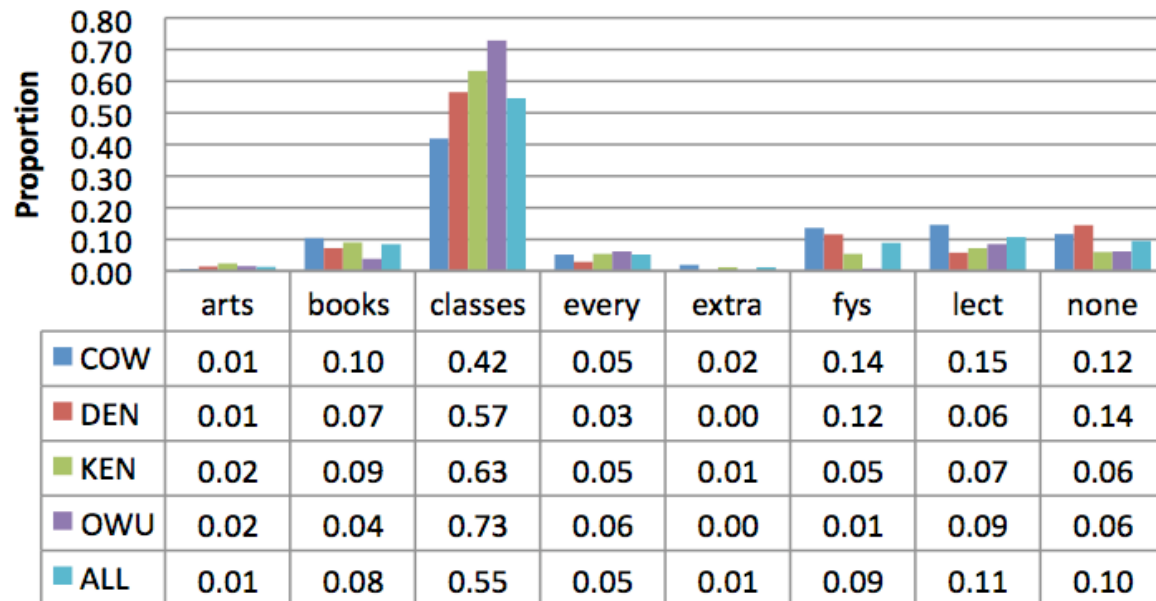
Figure 10: Most Creative Experience

	arts	class	extra	fys	presnt	project	writing	none
■ COW	0.15	0.05	0.07	0.13	0.01	0.27	0.19	0.13
■ DEN	0.25	0.09	0.04	0.07	0.03	0.20	0.25	0.07
■ KEN	0.31	0.08	0.06	0.00	0.01	0.12	0.29	0.12
■ OWU	0.12	0.09	0.06	0.00	0.05	0.26	0.27	0.16
■ ALL	0.19	0.07	0.06	0.07	0.02	0.23	0.24	0.13
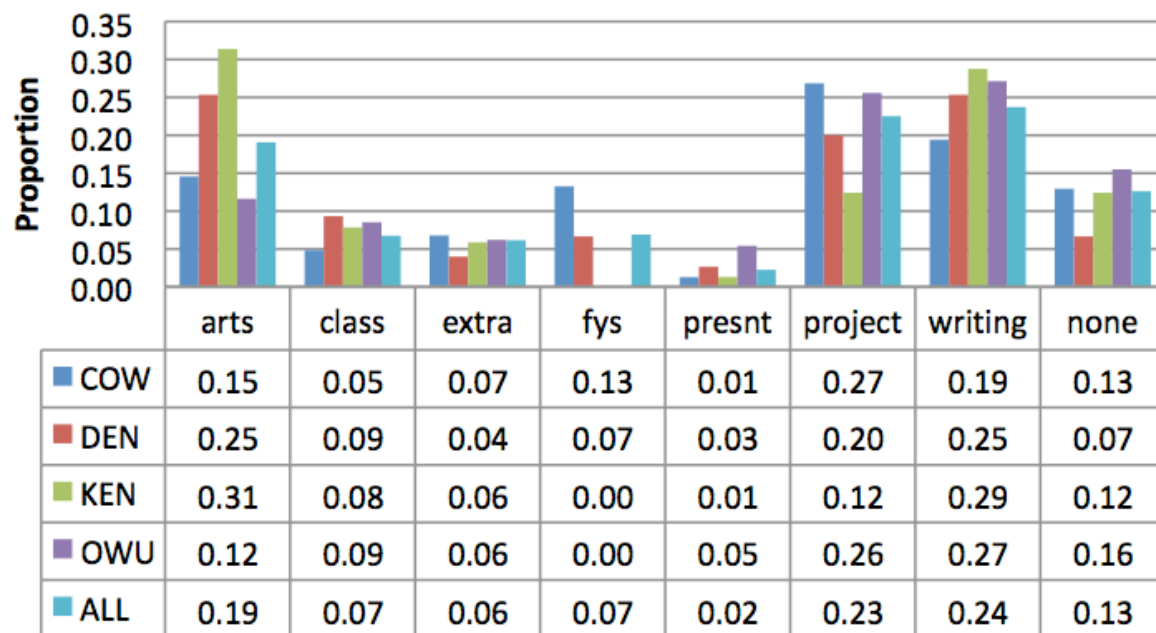
Note: extra = extracurricular activity; fys = first-year seminar; lect = forum or lecture; presnt = presentation.

Table D6: Responses by Class Year

Where Critical Thinking Occurs

	First	Soph
class	0.72	0.72
dorms	0.05	0.04
every	0.16	0.18
extra	0.07	0.06

Where Creative Thinking

	First	Soph
arts	0.36	0.39
class	0.29	0.29
dorms	0.24	0.25
every	**0.22**	**0.15**
extra	**0.43**	**0.54**
nowh	0.02	0.01

Barriers Critical Thinking

	First	Soph
atmos	**0.25**	**0.31**
pedagogy	**0.14**	**0.21**
personal	0.07	0.05
time	0.02	0.03
other	0.00	0.01
none	**0.51**	**0.38**

Barriers Creative Thinking

	First	Soph
atmos	0.15	0.11
grades	0.01	0.04
pedag	0.36	0.40
personal	0.04	0.04
time	0.05	0.08
other	0.02	0.03
none	**0.38**	**0.30**

Most Critical

	First	Soph
arts	0.01	0.01
books	0.09	0.07
classes	**0.48**	**0.63**
everything	0.06	0.05
extracurr	0.00	0.03
forum, lectures	0.12	0.09
fys	**0.12**	**0.05**
none	**0.12**	**0.06**

Most Creative

	First	Soph
arts	0.20	0.18
class	0.07	0.07
extracurr	0.06	0.07
fys	0.09	0.05
prstation	0.03	0.02
project	**0.18**	**0.28**
writing	0.24	0.23
none	0.14	0.11

Diversity Promotes?

	First	Soph
y, critical	**0.70**	**0.78**
n, critical	**0.30**	**0.22**
y, creative	0.76	0.76
n, creative	0.24	0.24

Technology Promotes?

	First	Soph
y, critical	**0.57**	**0.51**
n, critical	0.19	0.18
depends	**0.24**	**0.32**
y, creat	**0.63**	**0.57**
n, creat	0.11	0.14
depends	0.26	0.29

Note: Differences between first-year and sophomore students of more than 5% are presented in bold.

Report E: Quantitative Survey Data
Combined from Years 2 & 3
What are the Creative and Critical Thinking
Attitudes and Experiences of Students and Faculty?

In the first year of the grant, we developed on-line surveys to measure student and faculty perceptions of creative and critical thinking. In the second year, we administered the surveys and reported on data from first-year students, senior students, and faculty. For this third year of the grant, we administered the survey to a group of first-year students, and a group of sophomores at each of the four colleges. We combined the data from all of these groups resulting in data from 668 first-year students, 333 sophomores, 382 seniors, and 149 faculty, and the data are displayed in the tables that follow.

Results

Table E1: Combined Samples:
All Students Rate Critical Thinking of Various Events

Table E1 presents data on the extent to which various activities were perceived to involve critical thinking among the groups of students. The events that were rated to involve the most critical thinking include "writing papers for class," and "completing projects for class." The events rated the lowest were "surfing the internet" and "communicating with peers over the internet." There were some group differences in responses such that seniors were most likely to rate "interacting with students and faculty in class," "interacting...students outside of class," and "surfing the internet" to involve critical thinking compared to the other student groups.

Table E2: Combined Samples:
All Students Rate Creative Thinking of Various Events

The events analyzed in Table 1 were also analyzed with respect to how much each event involved creative thinking and these data are displayed in Table 2. The events rated as involving the most creative thinking included "engaging in a hobby" and "completing projects for class," and the events associated with the least critical thinking were "surfing the internet," and "reading material for class." There were some differences in ratings of the different groups of students such that seniors were least likely to rate "cultural events on campus," "listening to speakers on campus," "reading material for class," and "communicating with peers over the internet" as involving creative thinking.

Table E3: Combined Samples:
Frequency of Critical and Creative Activities of All Students

Table E3 displays data on the frequency of various activities associated with creative and critical thinking. The most frequent activities were "working on a paper that required integration" and "putting together ideas..." and the least frequent activities were using brainstorming in class and "taking an assignment in a different direction. Seniors were more likely to report writing papers that required integration, and putting together ideas across courses, and they were least likely to report using brainstorming.

Table E4: Combined Samples:
Students and Faculty Rate Creative Environment Characteristics

In Table E4 data are presented on the prevalence of various environmental characteristics that promote creativity. The responses of all student groups and of the faculty were compared. Most characteristics were rated as prevalent, with the highest ratings given for "challenge" and "freedom," and the lowest ratings for "conflict" and "risk taking." There were some differences across the groups in the perception of the prevalence of the characteristics. Generally, faculty rated most of these characteristics as less prevalent than students did, although sometimes the seniors' ratings were quite low as well. (For example, the ratings for "freedom" were lowest for the seniors.)

Table E5: Combined Samples:
Students and Faculty Critical Thinking Attitudes

Participants were asked to indicate their level of agreement with various attitudes related to critical thinking using a scale where 1 = disagree strongly and 7 = agree strongly. These data are displayed in Table E5. The responses of the three student groups and the faculty were compared. There were many differences between the responses of students and faculty. Faculty indicated more agreement with the idea that they consider themselves people who think critically, that faculty can create conditions to promote critical thinking, that they value critical thinking, that it is possible to assess critical thinking, and that a liberal arts education is conductive to promoting critical thinking. Faculty were the group least likely to rate courses as encouraging critical thinking, to rate extracurricular activities as involving critical thinking, to agree that the college valued their efforts to engage in critical thinking, and that the higher education system facilitates critical thinking. Students rated critical thinking to be most involved in the natural sciences, followed by social sciences, humanities, and fine arts indicating fairly stereotypical responses in their perceptions of these disciplines. Faculty in all disciplines rated the importance of critical thinking to their discipline as very high.

Table E6: Combined Samples:
Creative Thinking Attitudes of All Students and Faculty

Table E6 presents data on creative thinking attitudes. The responses of the three student groups and the faculty were compared. There were some differences between the responses of students and faculty. Faculty indicated more agreement with the idea that creativity can be learned, that it should be taught, that too little teaching focuses on creativity, and that a liberal arts education is conductive to promoting creativity. Faculty were the group least likely to agree that the college provides time and space for creativity, that there is a creative vibe on campus, and that the higher education system facilitates creative thinking. For a few questions senior students provided the lowest ratings including agreement that courses encourage creativity, that there are opportunities for no right or wrong answers, that extracurricular activities encourage creativity, that creativity is valued in the major, and that the college values efforts to be creative. Students rated creative thinking to be most involved in the fine arts, followed by humanities, social sciences, and natural sciences indicating fairly stereotypical responses in their perceptions of these disciplines. Faculty in all disciplines rated the importance of creative thinking to their discipline as high.

Table E1: Combined Samples:

All Students Rate Critical Thinking of Various Events

Average response of students across all schools.
      Scale: 1= not at all to 5 = great deal.

How much does each event involve...?

Event:	1st	soph	senior	total
Interacting with students and faculty in class	3.77	3.76	3.93*	3.81
Cultural events on campus	2.97	2.92	3.09	2.99
Extra-curricular or co-curricular activity	3.10	3.09	3.11	3.10
Listening to speakers on campus	3.76	3.75	3.83	3.78
Interacting ...students outside of class	2.96	2.98	3.14*	3.01
Engaging in a hobby	3.07	3.10	3.13	3.10
Reading material for class	4.32	4.24	4.20	4.27
Interacting with faculty outside of class	3.59	3.54	3.71	3.61
Completing projects for class	4.34	4.32	4.35	**4.34**
Communicating with peers over the internet	2.33	2.34	2.38	*2.35*
Writing papers for classes	4.59	4.57	4.57	**4.58**
"Surfing" the internet	2.15	2.13	2.37**	*2.20*

<u>Note</u>: differences in means between groups were examined; significant differences are noted
      with * = p < .05, ** = p < .01, *** = p < .001.

Highest responses are presented in bold, and lowest in italics.

Table E2: Combined Samples:

All Students Rate Creative Thinking of Various Events

Average response of students across all schools.
        Scale: 1= not at all to 5 = great deal.

How much does each event involve...?

Event:	1st	soph	senior	total
Interacting with students and faculty in class	3.09	3.15	3.04	3.09
Cultural events on campus	3.34	3.37	3.18*	3.31
Extra-curricular or co-curricular activity	3.66	3.66	3.55	3.63
Listening to speakers on campus	2.92	2.96	2.74*	2.88
Interacting ...students outside of class	3.58	3.65	3.52	3.58
Engaging in a hobby	4.25	4.22	4.12	**4.21**
Reading material for class	2.83	2.75	2.61**	*2.75*
Interacting with faculty outside of class	3.12	3.13	3.14	3.13
Completing projects for class	3.84	3.87	3.78	**3.83**
Communicating with peers over the internet	2.96	2.97	2.73**	2.90
Writing papers for classes	3.75	3.71	3.68	3.72
"Surfing" the internet	2.65	2.56	2.59	*2.61*

<u>Note</u>: differences in means between groups were examined; significant differences are noted
        with * = p < .05, ** = p < .01, *** = p < .001.

Highest responses are presented in bold, and lowest in italics.

Table E3: Combined Samples:

Frequency of Critical and Creative Activities of All Students

Scale: 1= never to 6 = always or almost always.

How often have you…?

	1ˢᵗ	soph	senior	total
Taken an assignment in a different direction	3.23	3.27	3.33	*3.28*
Found yourself wanting to read more …	4.23	4.05	4.27	4.22
Used brainstorming during a class	3.83	3.95	3.70*	*3.83*
Used brainstorming in a class assignment	4.29	4.31	4.09*	4.24
Used brainstorming outside of class (e.g., club activity)	4.04	4.17	4.15	4.10
Worked on a paper or project that required integrate	4.68	4.87	5.08***	**4.84**
"Let go" and had fun intellectually	4.13	4.03	4.00	4.07
Engaged in abstract thinking	4.36	4.29	4.45	4.36
Put together ideas or concepts from different courses …	4.34	4.46	4.61**	**4.44**
Used a story, metaphor, or visual in a class assignment	4.05	4.12	4.07	4.07
Incorporated diverse viewpoints in a class assignment	4.01	4.10	4.10	4.05

Note: differences in means between groups were examined; significant differences are noted with * = p < .05, ** = p < .01, *** = p < .001.

Highest responses are presented in bold, and lowest in italics.

Table E4: Combined Samples:

Students and Faculty Rate Creative Environment Characteristics

Scale: 1= not at all present to 7 = extensively.

Frequency of characteristic:

	1st	soph	senior	faculty	all
Challenge	5.57	5.53	5.31	5.02***	**5.44**
Freedom	5.61	5.35	4.94	5.08***	**5.33**
Idea Support	5.47	5.32	4.90	4.69***	5.22
Trust/Openness	5.31	5.18	4.88	4.45***	5.08
Dynamism/Liveliness	5.26	5.00	4.89	4.65***	5.05
Playfulness/Humor	5.40	5.04	5.05	4.50***	5.10
Debate	5.30	5.15	5.32	4.72***	5.21
Risk Taking	4.88	4.67	4.36	3.83***	*4.59*
Idea Time	4.97	4.77	4.45	3.73***	4.68
Conflict	4.26	4.34	4.56	4.14**	*4.34*
Supportive Environment	5.48	5.27	4.99	4.67***	5.24
Working in groups	5.14	5.17	5.04	4.86*	5.09
Active models …	5.31	5.21	4.98	4.58***	5.14
Assignments …	5.37	5.24	5.10	4.88***	5.23

Note: differences in means between groups were examined; significant differences are noted with * = p < .05, ** = p < .01, *** = p < .001.

Highest responses are presented in bold, and lowest in italics.

Table E5: Combined Samples:

Students and Faculty Critical Thinking Attitudes

Scale: 1= disagree strongly to 7 = agree strongly.

Summarized question:

	1st	soph	senior	faculty
I consider myself a person who thinks critically	5.72	5.76	6.06	6.64***
Too little teaching at this college is focused ...	2.78	2.99	3.02	4.01***
Faculty can create conditions critical thinking	5.62	5.68	5.84	6.35***
Faculty on campus model critical thinking	5.74	5.76	5.82	5.58
Courses offered encourage critical thinking	5.83	5.86	5.68	5.25***
Extracurricular activities... critical thinking	4.58	4.29	4.19	4.13***
I value critical thinking	6.11	6.13	6.33	6.86***
Critical thinking valued in major/disc	6.09	6.27	6.39	6.22***
Critical thinking important fine arts~	5.28	5.30	5.38	6.40
Critical thinking important humanities~	6.03	5.98	6.08	6.76
Critical thinking important natural sciences~	6.32	6.27	6.38	6.65
Critical thinking valuable social sciences~	6.29	6.27	6.38	6.50
It is possible to assess critical thinking	5.61	5.49	5.58	6.18**
The senior project, thesis, independent study ...	6.03	6.09	6.07	5.88
This college values my efforts critical thinker	6.01	5.96	5.89	5.55**
A liberal arts education is conducive...	6.15	6.09	6.17	6.51*
Higher education system is conducive	5.21	5.12	4.91	4.28***

Note: differences in means between groups were examined; significant differences are noted with * = p < .05, ** = p < .01, *** = p < .001.

~ Faculty and students were asked different questions for these topics; responses of faculty members within each discipline are noted, whereas students rated importance within each discipline.

Table E6: Combined Samples:

Creative Thinking Attitudes of All Students and Faculty

Scale: 1= disagree strongly to 7 = agree strongly.

Summarized question:

	1st	soph	senior	faculty
I consider myself a creative person	5.65	5.50	5.47	5.78
Creativity can be learned	4.30	4.41	4.60	5.08***
Creativity should be taught college courses	4.69	4.76	4.76	5.37**
Too little teaching at this college is focused	3.66	3.85	3.95	4.07*
Faculty can create conditions …	5.68	5.67	5.68	5.99
Faculty on campus model creative …	5.15	5.06	4.97	5.16
Courses offered on our campus encourage …	5.02	4.92	4.54	4.49***
Opportunities no right or wrong answers	5.46	5.05	4.96	5.11***
Extracurricular activities encourage creativity	5.40	5.07	4.89	4.92***
Creativity valued in my major	5.36	5.34	5.04	5.21*
I value creativity	6.40	6.33	6.23	6.40
Creativity important in the fine arts~	6.69	6.65	6.60	6.86
Creativity important in humanities~	6.19	6.20	6.10	6.00
Creativity important in natural sciences~	5.22	5.30	5.25	6.05
Creativity important in social sciences~	5.68	5.73	5.68	5.17
It is possible to assess creativity	4.99	4.97	4.85	5.23
The senior project, thesis, independent study …	5.93	5.88	5.80	5.66
This college values my efforts to be creative	5.62	5.44	5.08	5.23***
This college provides time for me to be creative	5.15	4.85	4.49	4.17***
This college gives me space to be creative	5.41	5.02	4.73	4.41***
There is a creative vibe on this campus	5.28	5.08	4.49	3.99***
A liberal arts education is conducive …	5.86	5.73	5.61	5.90**
Higher education system is conducive …	4.32	4.26	3.99	3.65***

Note: differences in means between groups were examined; significant differences are noted with * = p < .05, ** = p < .01, *** = p < .001.

~ Faculty and students were asked different questions for these topics; responses of faculty members within each discipline are noted, whereas students rated importance within each discipline.

Appendix A.

Rubric to Measure Creative and Critical Thinking

The product exhibits evidence of the following traits, some of which characterize the quality of the finished product, some the process by which the product was created, and some the person who created the product.

You do not have to assess your students' work for all of these traits. Simply choose the ones that best fit your assignment and either the cross-sectional and longitudinal study that you will conduct.

1. Elements of Argumentation

    a. Explanation — stating the results of one's reasoning; justifying that reasoning in terms of the evidential, conceptual, methodological, criteriological and contextual considerations upon which the results were based. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

    b. Analysis — identifying the intended and actual relationships among statements, questions, concepts, descriptions or other forms of representation. Can include defining, cause and effect, as well as comparing and contrasting. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

    c. Evaluation — assessing the credibility and logical strength of statements or other representations that are accounts or descriptions of a person's perception, experience, situation, judgment, belief, or opinion. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

    d. Interpretation — comprehending and expressing the meaning or significance of something, such as experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures or criteria. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

    e. Logic – following the accepted and understood rules for the discipline.
[Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

2. Domain and Disciplinary Knowledge — drawing upon relevant literature, methods, insights to construct the product. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

3. Synthesis and Connections — combining unlike or distinctly different elements in order to tell a coherent story, provide a logical argument or insightful vision, or create a useful object. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

4. Abstract Thinking – formulating general concepts by identifying common properties of specific instances; posing overarching "theories" and seeing the "big picture" – identifying fundamentals, first principles, general structures. [Disciplinary specifics:___]

1___   2___   3___   4___   5___   6___

5. Complexity of Thought – using many elements at one or more level, such as questioning assumptions, revealing multiple paths of causation, considering multiple variables, recognizing missing elements, and being tolerant of ambiguity. [Disciplinary specifics:___]

1___   2___   3___   4___   5___   6___

6. Ideas Generated – producing alternatives to solving problems, variations on a theme. [Disciplinary specifics:___]

    a. Fluency – the ability to extend an idea (number of)

1___   2___   3___   4___   5___   6___

    b. Flexibility – the ability to cross-conceptual boundaries

1___   2___   3___   4___   5___   6___

7. Completeness/Coherence – being logically or aesthetically consistent with all separate parts fitting together to form a harmonious or credible whole. [Disciplinary specifics:___]

1___   2___   3___   4___   5___   6___

8. Elegance – presenting the product in a refined, understated way. [Disciplinary specifics:___]

1___   2___   3___   4___   5___   6___

9. Divergent Thinking – going against the grain of the usual or expected in a useful way, not perversely or solipsistically. [Disciplinary specifics:___]

1___   2___   3___   4___   5___   6___

10. Novelty or Uniqueness (of Idea, Claim, Question, Form) – newness in terms of new processes, techniques, materials, concepts used; effects on future creative products. [Disciplinary specifics:___]

    a. Germinal – likely to suggest additional future creative products, etc.

1___   2___   3___   4___   5___   6___

    b. Original – unusual or infrequently seen in a universe of products made by people with similar experience and training.

1___   2___   3___   4___   5___   6___

    c. Transformational – an existing idea has been transformed via application in a new way or in a new context

1___   2___   3___   4___   5___   6___

11. Engagement – degree of attraction to, curiosity about, devotion to, or ownership of the task at hand. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

12. Risk Taking – the willingness to undertake a venture that may result in a loss or damage to oneself. [Disciplinary specifics:___]

        1___   2___   3___   4___   5___   6___

Rating Scale Descriptions

6 = Trait is evident to an exceptionally high degree
5 = Trait is evident to a high degree
4 = Trait is evident to an intermediate degree
3 = Trait is somewhat evident
2 = Trait is barely evident
1 = Trait is not evident

Definitions

Creative Thinking

1. We call the products creative if they represent a transformation or a reconceptualization, have aesthetic coherence and appeal, represent a new configuration or connection of ideas, or serve some functional or explanatory purpose

2. Creative intelligence is involved when skills are used to create, invent, discover, imagine, suppose, or hypothesize. (Sternberg and Grigorenko).

3. Creativity is a novel and useful idea or product; "the confluence of intrinsic motivation, domain-relevant knowledge and abilities, and creativity-relevant skills"; the latter includes coping with complexities, knowledge of problem-solving heuristics, concentration, ability to set aside problems, and high energy (Sternberg 1999).

4. Creativity is "a confluence of six distinct but interrelated resources: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment" (Sternberg 1999).

Critical Thinking

1. Purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. (Facione 1990).

2. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. (Facione 1990).

Appendix B.

Student and Faculty Creative and Critical Thinking Surveys:

The Faculty Creativity Survey of the Five Colleges of Ohio

You have been selected to participate in a survey of faculty members on your perceptions of creativity as part of a larger project of the Five Colleges of Ohio. The survey should take approximately 30 minutes to complete.

After completing the survey, you may enter your email address into a drawing to win a $200 Amazon.com gift certificate.

Please note that your email address will be saved to enter your name into the drawing, but your email address will not be tied to the responses. Your responses will be anonymous.

If you have any questions about the survey please contact Sarah Murnen, Professor of Psychology at Kenyon College, by email at murnen@kenyon.edu .

Thank you in advance for your participation.

1.   Please check your current affiliation:

> _____   The College of Wooster
>
> _____   Denison University
>
> _____   Kenyon College
>
> _____   Ohio Wesleyan University

2.   What words would you use to describe creativity? Please check the terms from the list below that come to mind when you think of creativity:

comparing	reflective	evaluating	prioritizing
discerning	interpreting	weird	free
deductive	inferring	unpredictable	querying
spontaneous	conceptualizing	stimulating	analytical
path-breaking	inventive	precise	imaginative
deconstructing	visualizing	entrepreneurial	contrasting
experimental	novel	expressive	predicting
visionary	innovative	enterprising	artistic

resourceful	original	risk-taking	connecting
eccentric	contextualizing	inquisitive	challenging
categorizing	inductive	insightful	assessing
focusing	exciting	synthesizing	

other (Please list any other words separated by commas.)

> **For purposes of this survey, as you respond to the next set of questions, please keep in mind the following working definition of creativity:**
>
> **The word "creative" often refers to artists who are engaged in making a piece of art. But "creative" can also be used to describe any form of creation, originality, or expressiveness. In other words, it is a capacity to generate ideas and products that are novel and appropriate to the task at hand, whatever that task may be.**

3. Please indicate your agreement or disagreement with each statement below using the following scale. If you have no knowledge or no opinion, then leave the statement blank.

1	=	disagree strongly
2	=	disagree moderately
3	=	disagree slightly
4	=	undecided
5	=	agree slightly
6	=	agree moderately
7	=	agree strongly

a. I consider myself a creative person.

1   2   3   4   5   6   7

b. Creativity can be taught.

1   2   3   4   5   6   7

c. Creativity should be taught in college courses.

1   2   3   4   5   6   7

d. Too little teaching at this college is focused on nurturing students' ability to think in creative ways.

1   2   3   4   5   6   7

e.   Faculty can create conditions on this campus in which creativity is more likely to thrive among students.

        1   2   3   4   5   6   7

f.   Faculty on campus model creative thinking and behavior.

        1   2   3   4   5   6   7

g.   In general, the courses offered on our campus encourage creativity.

        1   2   3   4   5   6   7

h.   At this college, there are opportunities for students to learn where there are no right or wrong answers.

        1   2   3   4   5   6   7

i.   The extracurricular activities for students on campus encourage creativity.

        1   2   3   4   5   6   7

j.   Creativity is valued in my department or program.

        1   2   3   4   5   6   7

k.   I value creativity.

        1   2   3   4   5   6   7

l.   Creativity is important in my discipline.

        1   2   3   4   5   6   7

m.   It is possible to assess creativity in an academic environment.

        1   2   3   4   5   6   7

n.   The senior project, thesis, or independent study at this college allows students to think creatively or to be creative in ways they would otherwise not be able.

        1   2   3   4   5   6   7

o.   This college values my efforts to be creative.

        1   2   3   4   5   6   7

p. This college provides time for me to be creative.

        1   2   3   4   5   6   7

q. This college gives me space to be creative.

        1   2   3   4   5   6   7

r. There is a creative vibe on this campus.

        1   2   3   4   5   6   7

s. A liberal arts education is conducive to the development of creativity.

        1   2   3   4   5   6   7

t. The higher education system in the United States is conducive to the development of creativity.

        1   2   3   4   5   6   7

4. Where does creativity flourish on or around campus? (Consider indoor and outdoor spaces; classroom, performance, study, and living spaces; student, faculty, staff, and administrative spaces on or around campus.)

5. Are there barriers to creative expression, ideas, or development inside or outside of the classroom on campus? Please explain.

6. How do you think technology facilitates and/or inhibits creativity on campus?

7. To the degree that diversity (in terms of class, race, sex, sexual orientation, and national origin) exists on this campus, does it contribute to students' development of creative thinking? If so, how?

8. What are some indicators that signify growth or development in your students' ability to think creatively or to be creative?

9. Using the scale below, please rate to what extent the following characteristics exist on your campus:

    1 = not at all

    2 = very little

    3 = little

    4 = moderately extensive

    5 = much

    6 = very much

    7 = extensively

a.   Challenge (the emotional involvement of members in the organization and its operations and goals)

1 2 3 4 5 6 7

b.   Freedom (the independence in behavior exerted by the people in the organization)

1 2 3 4 5 6 7

c.   Idea Support (the way new ideas are treated)

1 2 3 4 5 6 7

d.   Trust/Openness (emotional safety in relationships)

1 2 3 4 5 6 7

e.   Dynamism/Liveliness (the eventfulness in the life of an organization

1 2 3 4 5 6 7

f.   Playfulness/Humor (the spontaneity and ease that is displayed)

1 2 3 4 5 6 7

g.   Debate (the occurrence of encounters and clashes between viewpoints, ideas and differing experiences and knowledge)

1 2 3 4 5 6 7

h.   Risk Taking (the tolerance of uncertainty exposed in the organization)

1 2 3 4 5 6 7

i.   Idea Time (the amount of time people can and do use for elaborating new ideas)

1 2 3 4 5 6 7

j.   Conflict (the presence of personal and emotional tensions, in contrast to the idea tensions in the debate dimension)

1 2 3 4 5 6 7

k.   Supportive Environment (the socio-cultural context that provides opportunities for creativity and encourages as well as rewards such activities)

1 2 3 4 5 6 7

l.   Working in groups

          1   2   3   4   5   6   7

m.   Active models of creative thinking and acting

          1   2   3   4   5   6   7

n.   Assignments that encourage independent problem-solving and risk-taking

          1   2   3   4   5   6   7

10. What has been your most creative academic experience? What about that experience tapped your creativity?

DEMOGRAPHICS

11. In which of the following major divisions is your field? Please check. If you are associated with more than one department or program in two divisions, please check both divisions.

          _____   Fine and Performing Arts

          _____   Humanities

          _____   Natural and Life Sciences

          _____   Social Sciences

Please check the following:

12. Sex: _____   female

                             _____   male

13. Age range: _____   29 or younger

                             _____   30 – 39

                             _____   40 – 49

                             _____   50 – 59

                             _____   60 – 69

                             _____   70 or older

14. Race and ethnicity (check all that apply):

    _____ American Indian or Alaska Native

    _____ Asian

    _____ Black or African American

    _____ Native Hawaiian or Other Pacific Islander

    _____ White

    _____ Some other race

    _____ Hispanic or Latino

15. Tenure status:

    _____ Tenured

    _____ Tenure-track position, but not tenured

    _____ Non-Tenure track position

16. Current position:

    _____ Professor

    _____ Associate Professor

    _____ Assistant Professor

    _____ Instructor

    _____ Lecturer

    _____ Other

17. Please check any way that you have been involved with this project?

    _____ Year 1 working group participant

    _____ creativity working group

    _____ critical thinking working group

    _____ Years 1 and 2 working group participant

    _____ creativity working group

    _____ critical thinking working group

_____   Year 2 rubric use and/or development

_____   Not involved in the project

18. Do you have any general comments on creativity or on the survey?

Thank you for participating in the Creativity Survey!

Your email address will be entered into a drawing to win your choice of one of four prizes.

The Faculty Critical Thinking Survey of the Five Colleges of Ohio

You have been selected to participate in a survey of faculty members on your perceptions of critical thinking as part of a larger project of the Five Colleges of Ohio. The survey should take approximately 30 minutes to complete.

After completing the survey, you may enter your email address into a drawing to win a $200 Amazon.com gift certificate.

Please note that your email address will be saved to enter your name into the drawing, but your email address will not be tied to the responses. Your responses will be anonymous.

If you have any questions about the survey please contact Sarah Murnen, Professor of Psychology at Kenyon College, by email at murnen@kenyon.edu .

Thank you in advance for your participation.

19. Please check your current affiliation:

_____   The College of Wooster

_____   Denison University

_____   Kenyon College

_____   Ohio Wesleyan University

20. What words would you use to describe critical thinking? Please check the terms from the list below that come to mind when you think of critical thinking:

comparing	reflective	evaluating	prioritizing
discerning	interpreting	weird	free
deductive	inferring	unpredictable	querying
spontaneous	conceptualizing	stimulating	analytical
path-breaking	inventive	precise	imaginative
deconstructing	visualizing	entrepreneurial	contrasting
experimental	novel	expressive	predicting
visionary	innovative	enterprising	artistic
resourceful	original	risk-taking	connecting
eccentric	contextualizing	inquisitive	challenging
categorizing	inductive	insightful	assessing
focusing	exciting	synthesizing	

other   (Please list any other words separated by commas.)

21. Please indicate your agreement or disagreement with each statement below using the following scale. If you have no knowledge or no opinion, then leave the statement blank.

1	=	disagree strongly
2	=	disagree moderately
3	=	disagree slightly
4	=	undecided
5	=	agree slightly
6	=	agree moderately
7	=	agree strongly

a. I consider myself a person who thinks critically.

    1   2   3   4   5   6   7

b. Too little teaching at this college is focused on nurturing students' ability to think critically.

    1   2   3   4   5   6   7

c. Faculty can create conditions on this campus in which critical thinking is more likely to thrive among students.

    1   2   3   4   5   6   7

d. Faculty on campus model critical thinking.

    1   2   3   4   5   6   7

e. In general, the courses offered on our campus encourage critical thinking.

    1   2   3   4   5   6   7

f. At this college, there are opportunities for students to learn where there are no right or wrong answers.

    1   2   3   4   5   6   7

g. The extracurricular activities for students on campus encourage critical thinking.

    1   2   3   4   5   6   7

h. Critical thinking is valued in my department or program.

    1   2   3   4   5   6   7

i.   I value critical thinking.

         1   2   3   4   5   6   7

j.   Critical thinking is important in my discipline.

         1   2   3   4   5   6   7

k.   It is possible to assess critical thinking in an academic environment.

         1   2   3   4   5   6   7

l.   The senior project, thesis, or independent study at this college allows students to think critically in ways they would otherwise not be able.

         1   2   3   4   5   6   7

m.   This college values my efforts to be a critical thinker.

         1   2   3   4   5   6   7

n.   A liberal arts education is conducive to the development of critical thinking.

         1   2   3   4   5   6   7

o.   The higher education system in the United States is conducive to the development of critical thinking.

         1   2   3   4   5   6   7

22. Where does critical thinking flourish on or around campus? (Consider indoor and outdoor spaces; classroom, performance, study, and living spaces; student, faculty, staff, and administrative spaces on or around campus.)

23. Are there barriers to critical thinking inside or outside of the classroom on campus? Please explain.

24. How do you think technology facilitates and/or inhibits critical thinking on campus?

25. To the degree that diversity (in terms of class, race, sex, sexual orientation, and national origin) exists on this campus, does it contribute to students' development of critical thinking? If so, how?

26. What are some indicators that signify growth or development in your students' ability to think critically?

27. Using the scale below, please rate to what extent the following characteristics exist on your campus:

1 = not at all
2 = very little
3 = little
4 = moderately extensive
5 = much
6 = very much
7 = extensively

a. Challenge (the emotional involvement of members in the organization and its operations and goals)

1   2   3   4   5   6   7

b. Freedom (the independence in behavior exerted by the people in the organization)

1   2   3   4   5   6   7

c. Idea Support (the way new ideas are treated)

1   2   3   4   5   6   7

d. Trust/Openness (emotional safety in relationships)

1   2   3   4   5   6   7

e. Dynamism/Liveliness (the eventfulness in the life of an organization

1   2   3   4   5   6   7

f. Playfulness/Humor (the spontaneity and ease that is displayed)

1   2   3   4   5   6   7

g. Debate (the occurrence of encounters and clashes between viewpoints, ideas and differing experiences and knowledge)

1   2   3   4   5   6   7

h. Risk Taking (the tolerance of uncertainty exposed in the organization)

1   2   3   4   5   6   7

i. Idea Time (the amount of time people can and do use for elaborating new ideas)

1   2   3   4   5   6   7

j. Conflict (the presence of personal and emotional tensions, in contrast to the idea tensions in the debate dimension)

        1   2   3   4   5   6   7

k. Supportive Environment (the socio-cultural context that provides opportunities for creativity and encourages as well as rewards such activities)

        1   2   3   4   5   6   7

l. Working in groups

        1   2   3   4   5   6   7

m. Active models of creative thinking and acting

        1   2   3   4   5   6   7

n. Assignments that encourage independent problem-solving and risk-taking

        1   2   3   4   5   6   7

DEMOGRAPHICS

28. In which of the following major divisions is your field? Please check. If you are associated with more than one department or program in two divisions, please check both divisions.

    _____ Fine and Performing Arts

    _____ Humanities

    _____ Natural and Life Sciences

    _____ Social Sciences

Please check the following:

29. Sex: _____ female

                    _____ male

30. Age range:

    _____   29 or younger

    _____   30 – 39

    _____   40 – 49

    _____   50 – 59

    _____   60 – 69

    _____   70 or older

31. Race and ethnicity (check all that apply):

    _____   American Indian or Alaska Native

    _____   Asian

    _____   Black or African American

    _____   Native Hawaiian or Other Pacific Islander

    _____   White

    _____   Some other race

    _____   Hispanic or Latino

32. Tenure status:

    _____   Tenured

    _____   Tenure-track position, but not tenured

    _____   Non-Tenure track position

33. Current position:

    _____   Professor

    _____   Associate Professor

    _____   Assistant Professor

    _____   Instructor

    _____   Lecturer

    _____   Other

34. Please check any way that you have been involved with this project?

    _____   Year 1 working group participant

        _____   creativity working group

        _____   critical thinking working group

    _____   Years 1 and 2 working group participant

        _____   creativity working group

        _____   critical thinking working group

    _____   Year 2 rubric use and/or development

    _____   Not involved in the project

35. Do you have any general comments on critical thinking or on the survey?

Thank you for participating in the Critical Thinking Survey!

Your email address will be entered into a drawing to win your choice of one of four prizes.

Student Creativity and Critical Thinking Survey

of the Five Colleges of Ohio

You have been selected to participate in a test survey on your perceptions of various academic experiences as part of a larger project of the Five Colleges of Ohio. Students from Denison University, Kenyon College, Ohio Wesleyan University, and The College of Wooster will be participating in this survey. The survey will take approximately 40 minutes to complete.

After completing the survey, you may enter your email address into a drawing to win a $200 Amazon.com gift certificate.

Please note that your email address will be saved to enter your name into the drawing, but your email address will not be tied to the responses. Your responses will be anonymous.

If you have any questions about the survey please contact Sarah Murnen, Professor of Psychology at Kenyon College by email at murnen@kenyon.edu .

Thank you in advance for your participation.

36.   Please check your current affiliation:

_____   The College of Wooster

_____   Denison University

_____   Kenyon College

_____   Ohio Wesleyan University

For the set of questions below indicate how often you have had each experience in the past few months of the academic year using the following scale:

1 = never or almost never
2 = rarely
3 = sometimes
4 = often
5 = very often
6 = almost always or always

37.   In the past few months how often have you:

a. Taken an assignment in a slightly different direction?

1   2   3   4   5   6

b. Found yourself wanting to read more about something you learned in class?

      1   2   3   4   5   6

c. Used brainstorming during a class?

      1   2   3   4   5   6

d. Used brainstorming in a class assignment?

      1   2   3   4   5   6

e. Used brainstorming outside of class (e.g., club activity, etc)?

      1   2   3   4   5   6

f. Worked on a paper or project that required you to integrate ideas from various sources?

      1   2   3   4   5   6

g. "Let go" and had fun intellectually?

      1   2   3   4   5   6

h. Engaged in abstract thinking?

      1   2   3   4   5   6

i. Put together ideas or concepts from different courses when completing an assignment?

      1   2   3   4   5   6

j. Used a story, metaphor, or visual in a class assignment?

      1   2   3   4   5   6

k. Incorporated diverse viewpoints in a class assignment?

      1   2   3   4   5   6

38. What words would you use to describe creativity? Please check the terms from the list below that come to mind when you think of creativity:

comparing	reflective	evaluating	prioritizing
discerning	interpreting	weird	free
deductive	inferring	unpredictable	querying
spontaneous	conceptualizing	stimulating	analytical
path-breaking	inventive	precise	imaginative
deconstructing	visualizing	entrepreneurial	contrasting
experimental	novel	expressive	predicting

visionary	innovative	enterprising	artistic
resourceful	original	risk-taking	connecting
eccentric	contextualizing	inquisitive	challenging
categorizing	inductive	insightful	assessing
focusing	exciting	synthesizing	

other (Please list any other words separated by commas.)

> **For purposes of this survey, as you respond to the next set of questions, please keep in mind the following working definition of creativity:**
>
> **The word "creative" often refers to artists who are engaged in making a piece of art. But "creative" can also be used to describe any form of creation, originality, or expressiveness. In other words, it is a capacity to generate ideas and products that are novel and appropriate to the task at hand, whatever that task may be.**

39. Using the following scale, in general, how "creative" do you feel in each situation listed below?

> 1 = not at all creative
> 2 = somewhat creative
> 3 = creative to a moderate degree
> 4 = creative
> 5 = extremely creative
> NA = not applicable

a. Interacting with students and faculty in class

   1   2   3   4   5   NA

b. Attending or participating in cultural events on campus

   1   2   3   4   5   NA

c. Engaging in an extra-curricular or co-curricular activity

   1   2   3   4   5   NA

d. Listening to speakers on campus

   1   2   3   4   5   NA

e. Interacting with other students outside of class

   1   2   3   4   5   NA

f.   Engaging in a hobby

            1   2   3   4   5   NA

g.   Reading material for class

            1   2   3   4   5   NA

h.   Interacting with faculty outside of class

            1   2   3   4   5   NA

i.   Completing projects for class

            1   2   3   4   5   NA

j.   Communicating with peers over the internet

            1   2   3   4   5   NA

k.   Writing papers for classes

            1   2   3   4   5   NA

l.   "Surfing" the internet

            1   2   3   4   5   NA

40. Please indicate your agreement or disagreement with each statement below using the following scale. If you have no knowledge
     or no opinion, then leave the statement blank.

            1   =   disagree strongly
            2   =   disagree moderately
            3   =   disagree slightly
            4   =   undecided
            5   =   agree slightly
            6   =   agree moderately
            7   =   agree strongly

a.   I consider myself a creative person.

            1   2   3   4   5   6   7

b.   Creativity can be learned.

            1   2   3   4   5   6   7

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c. Creativity should be taught in college courses.

        1   2   3   4   5   6   7

d. Too little teaching at this college is focused on nurturing students' ability to think in creative ways.

        1   2   3   4   5   6   7

e. Faculty can create conditions on this campus in which creativity is more likely to thrive among students.

        1   2   3   4   5   6   7

f. Faculty on campus model creative thinking and behavior.

        1   2   3   4   5   6   7

g. In general, the courses offered on our campus encourage creativity.

        1   2   3   4   5   6   7

h. At this college, there are opportunities for students to learn where there are no right or wrong answers.

        1   2   3   4   5   6   7

i. The extracurricular activities for students on campus encourage creativity.

        1   2   3   4   5   6   7

j. Creativity is valued in my major.

        1   2   3   4   5   6   7

k. I value creativity.

        1   2   3   4   5   6   7

l. Creativity is important in the fine and performing arts.

        1   2   3   4   5   6   7

m. Creativity is important in the humanities.

        1   2   3   4   5   6   7

n. Creativity is important in the natural and physical sciences.

        1   2   3   4   5   6   7

o. Creativity is important in the social sciences.

    1   2   3   4   5   6   7

p. It is possible to assess creativity in an academic environment.

    1   2   3   4   5   6   7

q. The senior project, thesis, or independent study at this college allows students to think creatively or to be creative in ways they would otherwise not be able.

    1   2   3   4   5   6   7

r. This college values my efforts to be creative.

    1   2   3   4   5   6   7

s. This college provides time for me to be creative.

    1   2   3   4   5   6   7

t. This college gives me space to be creative.

    1   2   3   4   5   6   7

u. There is a creative vibe on this campus.

    1   2   3   4   5   6   7

v. A liberal arts education is conducive to the development of creativity.

    1   2   3   4   5   6   7

w. The higher education system in the United States is conducive to the development of creativity.

    1   2   3   4   5   6   7

41. Where does creativity flourish on or around campus? (Consider indoor and outdoor spaces; classroom, performance, study, and living spaces; student, faculty, staff, and administrative spaces on campus.)

42. Are there barriers to creative expression, ideas, or development inside or outside of the classroom on campus? Please explain.

43. How do you think technology facilitates and/or inhibits creativity on campus?

44. To the degree that diversity (in terms of class, race, sex, sexual orientation, and national origin) exists on this campus, does it contribute to students' development of creative thinking? If so, how?

45. What was your most creative academic experience? What about that experience tapped your creativity?

46. What words would you use to describe critical thinking? Please check the terms from the list below that come to mind when you think of critical thinking:

comparing	reflective	evaluating	prioritizing
discerning	interpreting	weird	free
deductive	inferring	unpredictable	querying
spontaneous	conceptualizing	stimulating	analytical
path-breaking	inventive	precise	imaginative
deconstructing	visualizing	entrepreneurial	contrasting
experimental	novel	expressive	predicting
visionary	innovative	enterprising	artistic
resourceful	original	risk-taking	connecting
eccentric	contextualizing	inquisitive	challenging
categorizing	inductive	insightful	assessing
focusing	exciting	synthesizing	

other (Please list any other words separated by commas.)

For purposes of this survey, as you respond to the next set of questions, please keep in mind the following working definition of critical thinking:

> **The word "critical" often refers to negative comments regarding something or someone. But "critical" can also be sued to describe a persistent effort to explore evidence that supports any belief, solution, or conclusion. In other words, it is the ability to analyze, to explain, and to reason logically.**

47. Using the scale below, for the next set of questions, in general, how much "critical thinking" is involved in each of the activities listed below?

1 = no critical thinking
2 = small degree of critical thinking
3 = fair degree of critical thinking
4 = moderate degree of critical thinking
5 = great degree of critical thinking
NA = not applicable

a.   Interacting with students and faculty in class

       1   2   3   4   5   NA

b.   Attending or participating in cultural events on campus

       1   2   3   4   5   NA

c.   Engaging in an extra-curricular or co-curricular activity

       1   2   3   4   5   NA

d.   Listening to speakers on campus

       1   2   3   4   5   NA

e.   Interacting with other students outside of class

       1   2   3   4   5   NA

f.   Engaging in a hobby

       1   2   3   4   5   NA

g.   Reading material for class

       1   2   3   4   5   NA

h.   Interacting with faculty outside of class

       1   2   3   4   5   NA

i.   Completing projects for class

       1   2   3   4   5   NA

j.   Communicating with peers over the internet

       1   2   3   4   5   NA

k.   Writing papers for classes

       1   2   3   4   5   NA

l.   "Surfing" the internet

1   2   3   4   5   NA

48. Please indicate your agreement or disagreement with each statement below using the following scale. If you have no knowledge or no opinion, then leave the statement blank.

1	=	disagree strongly
2	=	disagree moderately
3	=	disagree slightly
4	=	undecided
5	=	agree to slightly
6	=	agree moderately
7	=	agree strongly

a.   I consider myself a person who thinks critically.

1   2   3   4   5   6   7

b.   Too little teaching at this college is focused on nurturing students' ability to think critically.

1   2   3   4   5   6   7

c.   Faculty can create conditions on this campus in which critical thinking is more likely to thrive among students.

1   2   3   4   5   6   7

d.   Faculty on campus model critical thinking.

1   2   3   4   5   6   7

e.   In general, the courses offered on our campus encourage critical thinking.

1   2   3   4   5   6   7

f.   The extracurricular activities for students on campus encourage critical thinking.

1   2   3   4   5   6   7

g.   I value critical thinking.

1   2   3   4   5   6   7

h.   Critical thinking is valued in my major.

1   2   3   4   5   6   7

i.   Critical thinking is important in the fine and performing arts.

1   2   3   4   5   6   7

j. Critical thinking is important in the humanities.

     1   2   3   4   5   6   7

k. Critical thinking is important in the natural and physical sciences.

     1   2   3   4   5   6   7

l. Critical thinking is important in the social sciences.

     1   2   3   4   5   6   7

m. It is possible to assess critical thinking in an academic environment.

     1   2   3   4   5   6   7

n. The senior project, thesis, or independent study at this college allows students to think critically in ways they would otherwise not be able.

     1   2   3   4   5   6   7

o. This college values my efforts to be a critical thinker.

     1   2   3   4   5   6   7

p. A liberal arts education is conducive to the development of critical thinking.

     1   2   3   4   5   6   7

q. The higher education system in the United States is conducive to the development of critical thinking.

     1   2   3   4   5   6   7

49. Where does critical thinking thrive on or around campus? (Consider indoor and outdoor spaces; classroom, performance, study, and living spaces; student, faculty, staff, and administrative spaces on campus.)

50. Are there barriers to critical thinking inside or outside of the classroom on campus? Please explain.

51. How do you think technology facilitates and/or inhibits you to think critically in your life as a student?

52. To the degree that diversity (in terms of class, race, sex, sexual orientation, and national origin) exists on this campus, does it contribute to students' development of critical thinking? If so, how?

53. Have there been books, courses, events, or performances etc. that have fostered or enhanced your ability to think critically? What were they?

54. Using the scale below, please rate to what extent the following characteristics exist on your campus:

> 1 = not at all
> 2 = very little
> 3 = little
> 4 = moderately extensive
> 5 = much
> 6 = very much
> 7 = extensively

a. Challenge (the emotional involvement of members in the organization and its operations and goals)

       1   2   3   4   5   6   7

b. Freedom (the independence in behavior exerted by the people in the organization)

       1   2   3   4   5   6   7

c. Idea Support (the way new ideas are treated)

       1   2   3   4   5   6   7

d. Trust/Openness (emotional safety in relationships)

       1   2   3   4   5   6   7

e. Dynamism/Liveliness (the eventfulness in the life of an organization

       1   2   3   4   5   6   7

f. Playfulness/Humor (the spontaneity and ease that is displayed)

       1   2   3   4   5   6   7

g. Debate (the occurrence of encounters and clashes between viewpoints, ideas and differing experiences and knowledge)

       1   2   3   4   5   6   7

h. Risk Taking (the tolerance of uncertainty exposed in the organization)

       1   2   3   4   5   6   7

i. Idea Time (the amount of time people can and do use for elaborating new ideas)

       1   2   3   4   5   6   7

j. Conflict (the presence of personal and emotional tensions, in contrast to the idea tensions in the debate dimension)

      1   2   3   4   5   6   7

k. Supportive Environment (the socio-cultural context that provides opportunities for creativity and encourages as well as rewards such activities)

      1   2   3   4   5   6   7

l. Working in groups

      1   2   3   4   5   6   7

m. Active models of creative thinking and acting

      1   2   3   4   5   6   7

n. Assignments that encourage independent problem-solving and risk-taking

      1   2   3   4   5   6   7

DEMOGRAPHICS

55. In which of the following major divisions is your major(s)? Please check. If you have not declared a major, please check in which division are you likely to major. If you are a double major in two different divisions, please check both divisions.

    _____   Fine and Performing Arts

    _____   Humanities

    _____   Natural and Life Sciences

    _____   Social Sciences

Please check the following:

56. Sex: _____   Female

                             _____   Male

57. Check your college year: _____ first year

                             _____ sophomore

_____ junior

_____ senior

_____ 5th year or more

58. What is your age: _____

59. Race and ethnicity (check all that apply):

_____ American Indian or Alaska Native

_____ Asian

_____ Black or African American

_____ Native Hawaiian or Other Pacific Islander

_____ White

_____ Some other race

_____ Hispanic or Latino

60. Which is your home state in the U.S. or your home country? _____

61. Do you have any general comments on creativity or critical thinking or on the survey?

Thank you for participating in the Creativity and Critical Thinking Survey!

Your email address will be entered into a drawing to win your choice of one of four prizes.