LYNDON
A *vermont* STATE COLLEGE

August 13, 2013

Commission on Institutions of Higher Education
c/o Barbara Brittingham, Director of the Commission
New England Association of Schools and Colleges
3 Burlington Woods Drive, Suite 100
Burlington, MA 01803-4514

Dear CIHE Commissioners:

Lyndon State College (LSC) had its Decennial Review October 17-20, 2010. We are pleased to submit our Third Year Report. This report speaks directly to successful institutional progress on the two items requested by the Commissioners in their March 3, 2011 letter to LSC:

- development of an integrated enrollment management strategy, and
- implementation of the revised General Education curriculum and of an associated assessment program

Also, in the report's "Institutional Overview – Recent History" section, an update is provided on other noteworthy institutional changes since the NEASC Visiting Team's review. This includes structural and personnel changes within the institutional leadership team and several new campus initiatives.

If I can be of assistance regarding this report, please do not hesitate to contact me.

Sincerely,

Joe Bertolino
President

Lyndon State College
Lyndonville, VT 05851

Subject of Report:

Third-Year Report (after Decennial Review of October 17-20, 2010)

Introduction

This report is Lyndon State College's Third-Year Report after the institution's October 2010 Decennial review.

The focus of this report is on the Commissioner's request for a report which discusses the institution's progress on two items (letter of March 3, 2011):

- "Developing and implementing an integrated enrollment management strategy, with attention to recruitment activities and initiatives designed to enhance student retention and persistence to graduation"

- "Implementing its revised general education curriculum, including effective mechanisms to assess student learning of the outcomes of the program"

The report was developed from the following process:

Starting in spring 2012, information was collected and drafts of the report were prepared. Over the ensuing year, four drafts were reviewed by the president. These reports were drafted by a person with experience in institutional activities before, during, and after the institution's October 2010 review by the NEASC Visiting Team. This experience included chair of the steering committees for the NEASC 2000 (decennial), 2003 (third-year), 2005 (fifth-year), and 2010 (decennial) reports, 17-year member of the President's Leadership Team (ending in January 2013); 15-year (and current) NEASC Accreditation Liaison Officer, and 5-year (and current) Coordinator of Assessment.

In mid-summer 2013 the latest draft was reviewed for currency and accuracy by the President and President's Leadership Team (PLT) Members (all direct reports to the President and a faculty representative, Chair of the Faculty Assembly, and a staff representative, Director of Admissions). In late summer, a near-final draft was sent for review and comment to all full-time members of the campus community (administration, faculty, and staff) and to a NEASC staff member for review and feedback. A final draft underwent updating and review to reflect current progress before the final version was submitted to the CIHE Commissioners.

Institutional Overview

a. Institutional Description

Lyndon State College (LSC) is a public, undergraduate, comprehensive college of approximately 1,500 students, 60 full-time faculty, 100 part-time faculty, and 150 full-time staff and administrators located in Lyndonville, Vermont. LSC recently celebrated its 100th anniversary (it was originally established as a Normal School in 1911). Over the past 100 years, Lyndon has evolved from a normal school to a teachers college and finally in 1961 into a comprehensive, four-year college. It has existed throughout this time as a portal of opportunity for regional students who would otherwise be unable to pursue higher learning. The current student body consists of about 60% from Vermont, 90% from New England, 95% from the U.S, and 5% international students. About 90% of these students receive some form of financial aid and 60% are first-generation college students. LSC has an annual budget of about $32,000,000.

It has several well-respected, pre-professional programs (e.g., Atmospheric Sciences, Mountain Recreation Management, Exercise Science, Music Business and Industry, Electronic Journalism Arts) that have been regional and national leaders for many years. LSC has 44 degree programs at AAS, AA/AS, BA/BS, and MA/MS levels in 25 academic departments. These include many of the traditional liberal arts programs (in sciences, arts, humanities, and social sciences) as well as many additional pre-professional programs (such as Business, Education, Graphic Design, Human Services) and two graduate programs (Education and Liberal Arts).

Lyndon State College is well-regarded for its success with its mission to "prepare every student for personal and professional success through experience-based, high-quality programs in the liberal arts and professional studies." It has rates of about 65% for retention, 35% for graduation, and 90% for six-month-placement of its graduates in employment and graduate schools.

b. Highlights of History Subsequent to 2010 Decennial Review

In April 2011, after a successful 13-year presidency (second longest in the school's history), President Moore unexpectedly announced her retirement in order to spend time with family members. Prior to her retirement announcement, the mood on campus was already becoming strained due to announcements of projected budget deficits staring in FY 13, initiation of curriculum restructuring, and related perceived potential losses of job. The result of this growing sense of campus concern and feeling of uneasiness was that the campus lost its way along a previous long and steady path toward institutional stability and quickly deteriorated into discontent, fractionation, and unrest.

In May 2011, the LSC faculty initiated discussions (informally called "Brainstorming Sessions") for campus self-inspection. These brainstorming sessions continued until February 2012 when they evolved into an administration initiated "Campus Visioning Exercise" which included several focus groups led by faculty and staff. Also in May 2011, the Vermont State Colleges' Board of Trustees began

a search for an interim-president. The result was the July 1, 2011, appointment of Interim President Gold who immediately began a process of guiding the institution toward a sense of cohesion and calm.

These activities, with their many well-attended all-campus discussion sessions, resulted in the campus building consensus around a shared vision for its future. This result also served the purpose of creating a new outlook on campus; an attitude shift from confrontational, to healing, to energizing; and an improved campus morale. What could have been several years of lingering status quo was instead a fruitful, enlightening, and invigorating period.

As a result, when the new president took office on July 1, 2012, Dr. Joseph Bertolino found a campus that was comfortable with itself, its position, and ready to move ahead again toward a bright future. Upon arriving on campus, he engaged in a "One Hundred Day Listening Tour" throughout Vermont with leaders in government, education, business, media, the community at-large, and students. At the end of that period, he outlined a number of goals for the campus and implemented a "Moving Forward" initiative. This initiative included the following:

- A presidentially led extensive series of "friend and awareness building" meetings with business, legislative, and community leaders throughout the Northeast Kingdom, the State of Vermont, and New England.

- Restructuring of duties and titles of upper-level of administrative officers (from President, Dean of Academic and Student Affairs, Dean of Administration, and Dean of Institutional Advancement) to President, Provost, Associate Provost/Dean of the Faculty, Acting Associate Academic/Dean for Enrollment Management, Dean of Administration (CFO), Dean of Institutional Advancement (COO), and Dean of Students (see Appendix 1 for the current organizational chart).

- Reorganization of the president's advisory group from a Dean's Council (president, three deans, directors of student affairs and admissions, chair of the Faculty Assembly, and Coordinator of Assessment) to a President's Leadership Team (direct reports to the President, plus one representative each from the faulty (currently the Chair of the Faculty Assembly) and the staff (currently the Director of Admissions).

c. Major institutional achievements during the past 3 years include:

Enrollment – During the last three years, the numbers of incoming students has remained relatively steady (the federal first-time, full-time cohort, varied irregularly from about 330 to 380 to 340). The retention rates increased from 59% to 61% to 65%. This combination has resulted in increased total FTE enrollments from 1304 to 1329 to 1374 (with headcount 1508, second largest in the school's history). As of August 13, 2013, the number of incoming students accepted and making a deposit for enrollment later August is equal to last year at this same time (508). This is certainly wonderful news, but should it continue, it is also beginning to highlight the possible future need for corresponding increases in faculty, staff, and on-campus housing to serve the needs of these students.

Academics - LSC added several new degrees during the past three years; for example, a BS in Applied Psychology and Human Services and an MA in Liberal Studies. These also included a specialized AS (an AAS, Associate of Applied Science) and a specialized BS (a BFA, Bachelor of Fine Arts). Two faculty members were awarded Fulbright Scholarships. The LSC teacher licensure programs were reviewed by the State of Vermont and given full approval. Project Compass (strategies for increasing first-year retention) and the Leahy Center for Rural Students (assisting rural students with entering post-secondary education) expanded their successful programs.

Student Life - The campus, praised for its "student centeredness" in our 2010 NEASC Review, continued with its student initiatives. A new multi-purpose outdoor recreational facility was added. Student service projects included winning first place in the "most pounds collected per student" category of the 2013 OneShirt National Collegiate Clothing Challenge (out of 26 colleges/universities, ten of whom had enrollments 10 x of LSC's). In another project, 18,000 pieces of donated clothing were sorted, labeled, and the boxed for shipment to victims of Tropical Storm Irene. Shuttle service was initiated from the campus to local ski and shopping areas. The NCAA and NAC recognized over 70 student athletes, including NAC Man of the Year. An LSC Veteran's Park was created in the center of campus.

Finances - There was an increase in unrestricted net assets (over $600,000) and net tuition and fees exceeded projections by $366,000. The college surpassed the $10 million goal for its capital campaign.

IT and Library - The campus was upgraded to Microsoft 2010 and wireless access was expanded, including 100% coverage in the residence halls. The library continued to embrace electronic practices by integrating periodicals, books, and other databases, creating more links to full-text, and initiating an iPad and Kindle lending program.

Areas of Focus

Status of Requested Items for focus (from NEASC Commissioners' Letter of March 3, 2011)

Request 1. "Developing and implementing an integrated enrollment management strategy, with attention to recruitment activities and initiatives designed to enhance student retention and persistence to graduation."

Highlights:

- New interim Admissions Director (July 1, 2010)
- Remodeling of Admissions' internal organization, focus, and processes to be a more efficient and effective operation
- Results in increased applications, deposits, and enrollment for fall 2011 and 2012
- New president, a former Vice President of Enrollment Management, upon taking office on July 1, 2012 immediately begins focusing on building an integrated enrollment management strategy

Current Status:

The remodeling of the Admissions Office included a full business process analysis of their operations. This resulted in a work flow re-organization. The re-organization included elimination of several redundancies within the offices processing system, implementation of the Image Now system (thereby making the admissions process paperless and speeding electronic exchange of applicants' records among offices), and hiring of an additional full-time staff member. The Admissions team now responds to applicants within 24 hours and makes admissions decisions within 48 hours of a completed file.

In October 2012, after observing the operations of the then present recruitment and retention efforts at LSC, the president appointed an Enrollment Management Task Force under the leadership of the Acting Associate Academic Dean for Enrollment Management and the Dean of Students (See Appendix 2 for list of members and charge). It also engaged in conversations with individuals from current campus efforts in international student recruitment, veterans support, articulations agreements, and bridge programs.

The Committee met four times during Fall 2012 and five times during Spring 2013. In addition, three subcommittees were framed around final strategic foci (see below) and met separately 1-3 times during Spring 2013. President Bertolino also met with the committee in Spring 2013 and separately with Committee Co-Chairs.

At the end of the fall semester, the Committee anticipated focusing on five areas. However during Spring 2013, consensus indicated that these were still quite broad areas of focus and the Committee subsequently refined these to a set of Year 1 Strategic Areas: (1) Enhancing Lyndon's Data Capacity, (2) Explorations Students/Major, and (3) Taking Stock of Lyndon's High Impact Retention Practices. These recommendations were organized around the following

three strategic areas identified by the Committee (see below, with comments on either progress or intended work in each area):

STRATEGY 1: INVEST IN AND ENHANCE LYNDON'S DATA CAPACITY

Outcomes Defined

- Create shared institutional culture and buy-in with respect to data-based decision making, retention efforts, and student success strategies
- Streamline reporting and use of retention-focused institutional data for campus as a whole
- Establish baseline levels of retention/graduation/success metrics and systemized process for assessing and reporting on progress toward benchmarks
- More fully evaluate effectiveness of current and future student success efforts

STRATEGY 2: IMPROVE AND EXPAND UNDERGRADUATE EXPLORATIONS EXPERIENCE/MAJOR

Work to Date

- The subcommittee has done an extensive (but not exhaustive) review of colleges and programs that offer undecided and Explorations majors
- Researched what has happened on the campus in the past
- Met with instructor to discuss a course taken by Exporations students
- The subcommittee feels that we can improve and specialize with our Explorations Students and we need to start to develop ideas and strategies to put the best interventions in place for these students.
- A discussion session was held for students to talk about Explorations
- Reviewed the *2011 Explorations Task Force Report*

Next Steps: Moving Forward

The Subcommittee identified areas to review to better recruit/serve/retain 'undecided' students:

- A new exploratory program or specific Course
- Advising
- More web presence and target recruiting efforts

STRATEGY 3: REFINE, IMPROVE, AND CREATE NEW HIGH IMPACT PRACTICE INITIATIVES AT LYNDON

Areas to explore during 2013-2014 academic year

A. First Year Seminar and Experiences
B. Common Intellectual Experiences
C. Undergraduate Research
D. Internships
E. Collaborative Assignments and Projects
F. Learning Communities
G. Diversity/Global Learning
H. Service Learning, Community-Based Learning

Also, as a result of the Fall 2012 Enrollment Management Task Force identification of the need for an early identification of students contemplating withdrawing from the college, a survey was developed and disseminated in the 2012-2013 academic year. Students who indicated an intent to withdraw were contacted. The resulting conversations between these students and appropriate academic and support personnel resulted in clarifying troublesome issues for these students. As a result of this further clarification and discussion, a student made more informed decisions, including many students who have found renewed resources and desires to continue in college. This will be continued on an annual basis.

Request 2. "Implementing its revised general education curriculum, including effective mechanisms to assess student learning of the outcomes of the program."

Highlights:

- Spring 2011 - New General Education Unit (GEU) Program with Student Learning Outcomes (SLO) approved by faculty and administration (See Appendix 3 for program details)
- Fall 2011 - New GE implemented
- Fall 2011 - First collection of data for assessment of new GEU SLOs
- Spring 2012 - development of an electronic scheme for collecting and analyzing this assessment data
- Spring 2013 - First "closing the loop" (using assessment data to make program changes)

Current Status:

As a result of the teaching and assessment experience gained from each semester's activities, the committee overseeing the implementation of an assessment feature to our general education program (the GEU Committee of the Faculty Assembly) continues to refine the program's SLOs, rubrics, and electronic collection, and analysis software. For example, during the spring semester 2013, the faculty groups associated with each of the eight general education course categories met to discuss the results from the fall 12 course category assessments. Each group identified several changes in emphasis and pedagogy for the instructors in that category to implement during the 2013-2014 academic year. Examples include:

> Category 1 (Self and Social Interactions) - "Professors teaching [this category's] courses are now encouraged to provide students with an essay question relating to Irving Goffman's social interaction theory asking, 'How do you act differently when you are alone, than when you are in a group?' This essay will be followed with an in-depth discussion on 'group-think' and 'dramaturgical analysis.'"
>
> Category 4 (Cross-cultural Awareness) - Instructors "next year will provide an assignment that links traditional indigenous culture with its modern-day corollary, asking 'What elements of the tribe's history are still present in modern times?' This will be followed with an in-depth discussion on cultural loss and diaspora [Jews living outside Israel]".
>
> Category 5 (Perspectives on the Past) - "The weakest outcome in this category was the third ['Explanation of the Argument']. It seems clear to the instructors that the largest problem in regards to this outcome is that students in general need to be better at explaining within each paragraph now its content supports the general argument that a student is making. Next semester, instructors in this category will have a session early in the semester on teaching this skill."

Category 7 (Natural Resources and Sustainability) - For one of the courses in this category, the assessment results proved to be very thought provoking for the group. In that course, each of the four SLOs averaged 2.7. Further analysis of the individual student assessments indicated that students either scored well on all four SLOs or scored poorly on all four SLOs. The group realized that this implied that knowledge of the general concept of global sustainability was dependent on the prior knowledge of the nature and use of the resources on the planet. This realization led to a thoughtful discussion of the impact of various pedagogical approaches on student learning of the sustainability concept. These discussions are ongoing as instructors are now reflecting on this realization in terms of possible redesign of the content, emphasis, and sequencing of topics in their courses.

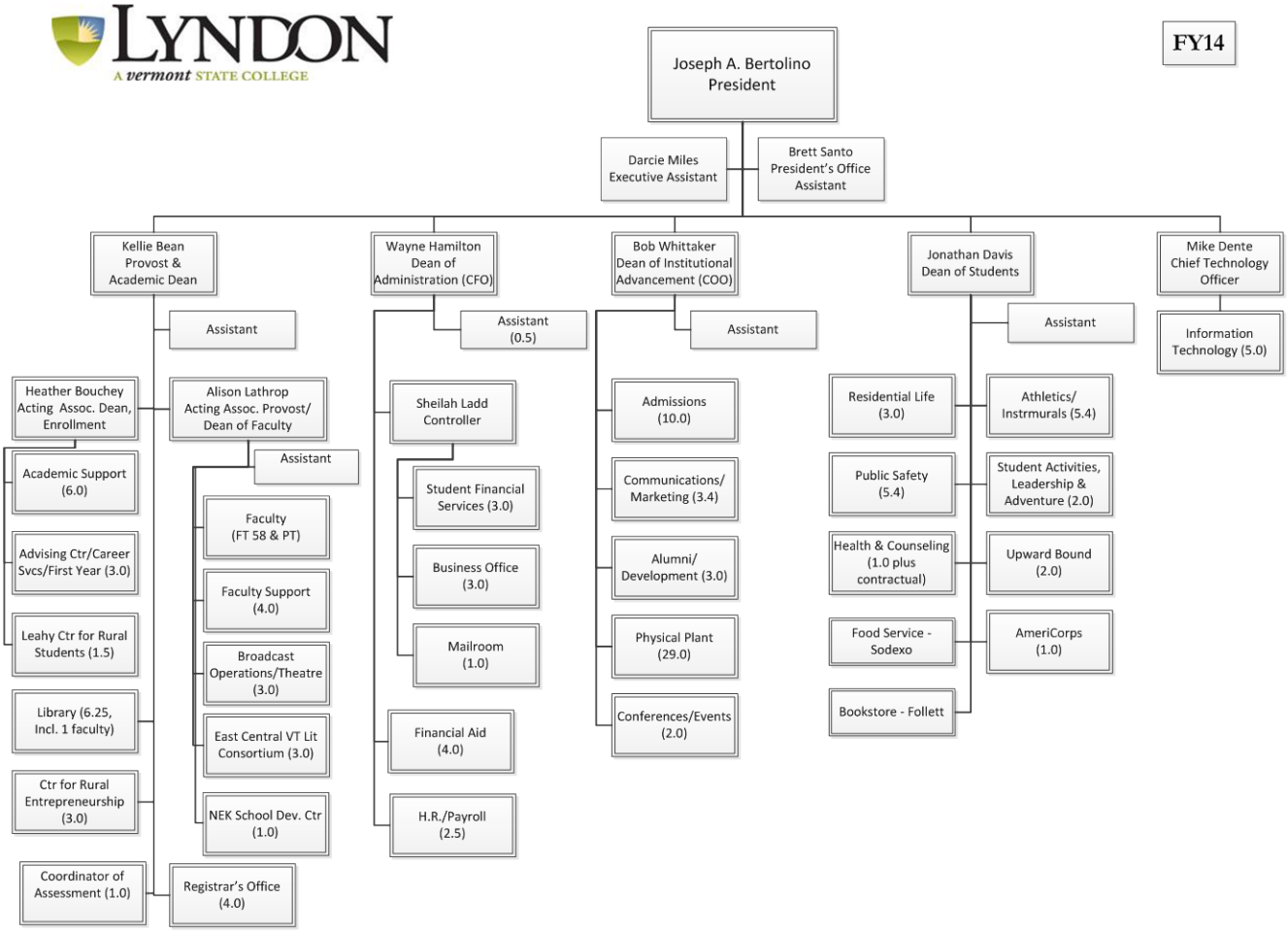
The most recent meeting of the faculty groups associated with the eight GEU categories was held in early summer 2013. At this meeting each group refined the SLOs and rubrics for their category based on the experience gained from use of these instruments during the spring semester. The rubrics have now been revised for use at the end of the upcoming fall semester (see Appendix 4 for an example of a rubric and its recent revision). In general, the groups feel as though they are now (after three revisions and implementations of the forms) converging toward a stable version of the SLOs and rubrics for each category.

The committee also continues to discuss with the faculty the philosophy and process of assessment and its importance for continuous program improvement. This has resulted in slow, but steady, increases in the percent of the GEU courses that are assessed each semester. The percent of course assessed (out of approximately 90 GEU courses offered each semester) has risen each of the three semesters, from near 25% in spring 2012 to near 40% in spring 2013.

During fall 2013, the GEU Committee will convene another meeting of faculty representatives from the eight course categories to discuss the spring 2013 assessment results. In addition, during the 2013-2014 academic year, the LSC administration will schedule sessions during previously unused monthly meeting times for faculty to make progress on a number of campus items. One of the first items in the early fall will be a wide ranging discussion of the GEU program, including assessment philosophy, methodology, and use of results. One goal is to continue increasing the response rates for GEU category assessment data from courses in each of the GEU categories.

Appendix 1

Lyndon State College, Organization Chart



Appendix 2

Strategic Enrollment Management Committee

Members

Acting Associate Academic Dean for Enrollment Management (Co-Chair)
Dean of Students (Co-Chair)
Director of Financial Aid
Assistant Professor of Business
Director of Office of Institutional Technology
Director of Advising Resource Center
Director of Admissions
Professor of Mathematics
Associate Professor of Meteorology
Director of Upward Bound
Director of Academic Support Services
Director of First Year Experience

*Note: The co-chairs approached two students in Fall 2012, but both declined membership on the Committee. They anticipated having a student representative on the Committee in Spring 2013, but that did not occur. They will try again for student representation next year.

Committee Charge

Goal: Propose evidence-based, concrete strategies and an action plan for increasing retention rates at Lyndon State College

Objectives:

- Use data and innovative outside-the-box thinking to understand why retention rates are low and pinpoint where along the pipeline retention is particularly risky
- Research best practices for retention at similar institutions
- Capitalize on what is already know about LSC students and evidence-based best practices (Project Compass, NACADA, data to date, substantial collective experience and expertise, etc.)
- Take thinking to the next step so as to re-tool existing practice and/or propose novel innovations to increase retention

Appendix 3

General Education Unit

Required General Education Foundation (18 credits)

These requirements may also be satisfied by LSC placement exams, CLEP, Advanced Placement exams, suitable transfer credit, or departmental waivers. Departmental waivers given as a result of exam or for prior knowledge do not grant credit toward graduation.

- INT 1020 - Entering an Academic Community Credits: 3
- Advised Term 1st semester
- INT 2040 - Critical Thinking, Reading, and Writing Credits: 3
- Advised Term 2nd Year

Required English Courses (6 credits)

- ENG 1051 - Introduction to College Writing Credits: 3
- Advised Term 1st Year
- ENG 1052 - Exposition and Analysis Credits: 3
- Advised Term 1st Year

Required Mathematics Courses (At Least 6 Credits)

Choose courses from the following list totaling 6 credits. At least one of these courses must have an MAT designation, unless MAT-1020, Intermediate Algebra, is waived by placement test score. Students waiving Precalculus by placement test score are exempted from the GEU Mathematics requirement altogether. Make your choice keeping in mind requirements for your major and prerequisites for classes you plan to take in the future.

- CIS 1090 - Object Oriented Problem Solving Credits: 3
- Advised Term 1st/2nd year
- CIS 2060 - Programming with FORTRAN Credits: 3
- Advised Term 1st/2nd year
- CIS 2271 - Java Programming Credits: 3
- Advised Term 1st/2nd year
- MAT 1020 - Intermediate Algebra Credits: 3
- Advised Term 1st/2nd year
- MAT 1060 - Problem Solving with Mathematics Credits: 3
- Advised Term 1st/2nd year
- MAT 1221 - Finite Mathematics Credits: 3
- Advised Term 1st/2nd year
- MAT 1410 - Pre-Calculus Credits: 5
- Advised Term 1st/2nd year
- MAT 2010 - Number Systems Credits: 3
- Advised Term 1st/2nd year
- MAT 2021 - Statistics Credits: 3
- Advised Term 1st/2nd year

3 Credits for Mathematics May Be Chosen From

- CIS 1050 - Computer Operation Systems and Spreadsheets Credits: 1
- Advised Term 1st/2nd year
- CIS 1060 - Introduction to Databases Credits: 1
- Advised Term 1st/2nd year
- CIS 1065 - Introduction to Programming Logic Credits: 1
- Advised Term 1st/2nd Year

Required General Education Distribution areas and their Student Learning Outcomes (25 - 27 credits)

One course from each of eight outcomes-based categories (qualifying courses are designated in the catalog and the course registration listings each semester):

Self and Social Interactions: One 3 credit course [LGSS1] Credits: 3

- Students will demonstrate an awareness of fundamental factors influencing human individual and social behaviors.

The Human Experience: Written Language: One 3 credit course [LGWL2] Credits: 3

- Students will practice critical interpretation and analysis of past and present human written expression.

The Human Experience: Arts and Design: One 3 credit course [LGAD3] Credits: 3

- Students will demonstrate aesthetic appreciation for, understanding of, and/or the creation or performance of original works of art.

Cross Cultural Awareness: One 3 credit course [LGCC4] Credits: 3

- Students will demonstrate basic attitudes and skills that enable them to work productively, profitably, and with sensitivity across a wide range of cultural boundaries.

Perspectives on the Past: One 3 credit course [LGPP5] Credits: 3

- Students will identify and analyze change across time, either within their own discipline or across broad human endeavors.

Government and Economics: One 3 credit course [LGGE6] Credits: 3

- Students will demonstrate a fundamental awareness of the complexities and interconnectedness of the economic and political realms in which citizens function at both the local and global level.

Natural Resources and Sustainability: One 3 - 4 credit course [LGNR7] Credits: 3 – 4

- Students will apply the concept of sustainability in critically examining social, ethical, environmental, and/or scientific issues related to the use of earth's natural resources.

Scientific and Empirical Reasoning: One 3 - 4 credit course [LGSE8] Credits: 3 - 4

- Students will practice scientific and empirical reasoning and relate scientific concepts, facts, and theories to problems of wide concern.

Appendix 4

Example of a Rubric change

Rubrics for assessing the student learning outcomes related to the GEU Scientific and Empirical Reasoning category.

A. SCIENTIFIC AND EMPIRICAL REASONING (2012)

Students will practice scientific and empirical reasoning and relate scientific concepts, facts, and theories to problems of wide concern.

	1: Inadequately	**2: Minimally**	**3: Adequately**	**4: Thoroughly**
Student recognizes problems that can be addressed using scientific methods appropriate to the discipline and consistent with the best practices in information literacy, and is able to construct an elementary approach to addressing problems.	Identification of problems appropriate to the scientific discipline is generally incorrect. Proposed approaches to addressing problems generally lack scientific validity or are generally inconsistent with available literature. ● **Select**	Identification of problems appropriate to the scientific discipline is partially correct. Proposed approaches to addressing problems are generally scientifically sound and consistent with available literature, but significant errors in applications, procedures or scientific information exist. ● **Select**	Identification of problems appropriate to the scientific discipline is typically correct. Proposed approaches to addressing problems are typically scientifically sound and consistent with available literature. ● **Select**	Identification of problems appropriate to the scientific discipline is consistently correct. Proposed approaches to addressing problems are scientifically sound, consistent with available literature, and display evidence of thorough understanding. ● **Select**
Student uses appropriate laboratory tools and technologies in a safe and effective manner.	Tools are not generally used in a safe and effective manner. Capacity for unsupervised work not demonstrated. ● **Select**	Tools are often used in a safe and effective manner, but student requires regular supervision. ● **Select**	Tools are typically used in a safe and effective manner. Student requires occasional supervision or guidance. ● **Select**	Tools are consistently used in a safe and effective manner. Student is capable of independent work. ● **Select**
Student draws reasonable conclusions from data and communicates both problems and conclusions effectively.	Conclusions based on data reflect a poor understanding of the scientific process including context-specific limitations of data. Interpretations based on data generally include some major unjustified or incorrect interpretations or extrapolations. Communication of problems and conclusions is generally unclear, wordy or ineffective. ● **Select**	Conclusions based on data reflect a tenuous understanding of the scientific process including context-specific limitation of data. Interpretations based on data may include some major unjustified or incorrect interpretations or extrapolations. Communication of problems and conclusions is-fairly clear, concise and effective. ● **Select**	Conclusions based on data reflect a reasonable understanding of the scientific process including context-specific limitation of data. Interpretations occasionally include minor unjustified or incorrect interpretations or extrapolations. Communication of problems and conclusions is typically clear, concise and effective. ● **Select**	Conclusions based on data reflect a thorough understanding of the scientific process including context-specific limitation of data. Communication of problems and conclusions is clear, concise and effective. ● **Select**

Students understand scientific concepts and related content appropriate to the discipline.	Demonstration of appropriate scientific content is characterized by inaccuracies or omissions. ● **Select**	Demonstration of appropriate scientific content is partially accurate, and includes a few major errors or omissions. ● **Select**	Demonstration of appropriate scientific content includes a limited number of minor errors or omissions. ● **Select**	Demonstration of appropriate scientific content is complete and accurate. ● **Select**

B. SCIENTIFIC AND EMPIRICAL REASONING (2013)

Students will practice scientific and empirical reasoning and relate scientific concepts, facts, and theories to problems of wide concern.

	1: Inadequately	**2: Minimally**	**3: Adequately**	**4: Thoroughly**
Student recognizes problems that can be addressed using scientific methods appropriate to the discipline and is able to construct an elementary approach to addressing problems.	Identification of problems appropriate to the scientific discipline is generally incorrect. Proposed approaches to addressing problems generally lack scientific validity or are generally inconsistent with available literature. ● **Select**	Identification of problems appropriate to the scientific discipline is partially correct. Proposed approaches to addressing problems are generally scientifically sound and consistent with available literature, but significant errors in applications, procedures or scientific information exist. ● **Select**	Identification of problems appropriate to the scientific discipline is typically correct. Proposed approaches to addressing problems are typically scientifically sound and consistent with available literature. ● **Select**	Identification of problems appropriate to the scientific discipline is consistently correct. Proposed approaches to addressing problems are scientifically sound, consistent with available literature, and display evidence of thorough understanding. ● **Select**
Student uses appropriate laboratory tools and technologies in an effective manner.	Tools are not generally used in a safe and effective manner. Capacity for unsupervised work not demonstrated. ● **Select**	Tools are often used in a safe and effective manner, but student requires regular supervision. ● **Select**	Tools are typically used in a safe and effective manner. Student requires occasional supervision or guidance. ● **Select**	Tools are consistently used in a safe and effective manner. Student is capable of independent work. ● **Select**
Student draws reasonable conclusions from data.	Conclusions based on data reflect a poor understanding of the scientific process limitations of data. Interpretations based on data generally include some major unjustified or incorrect interpretations or extrapolations. ● **Select**	Conclusions based on data reflect a tenuous understanding of the scientific process. Interpretations based on data may include some major unjustified or incorrect interpretations or extrapolations. ● **Select**	Conclusions based on data reflect a reasonable understanding of the scientific pro cess. Interpretations occasionally include minor unjustified or incorrect interpretations or extrapolations. ● **Select**	Conclusions based on data reflect a thorough understanding of the scientific process ● **Select**

Student communicates problems, conclusions, assumptions, and constraints related to the results	Communication of problems and conclusions is generally unclear, wordy or ineffective, with no mention of limitations of results. ● **Select**	Communication of problems and conclusions is-fairly clear, concise and effective, limitations of data is given only cursory mention. ● **Select**	Communication of problems and conclusions is typically clear, concise and effective. Process, including several context-specific limitations of data. ● **Select**	Communication of problems and conclusions is clear, concise and effective, context-specific limitations of data are complete. ● **Select**
Students demonstrate ability to know how and where to seek scientifically valuable information	Demonstration of these skills is not apparent or not appropriate. ● **Select**	Ability is minimal – "how" and/or "where" is haphazard, unskilled, and appears "lucky" rather than purposeful. ● **Select**	A few sources are found; but search is not efficient and "key" sources are missed. ● **Select**	Search is thorough, many valuable sources are found, purposely, and efficiently. ● **Select**