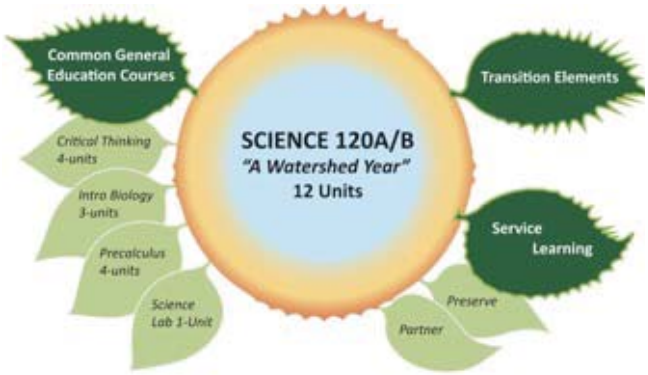
Appendix 4
Educational Quality

Appendix 4.1
Freshmen Year Experience in STEM

With seed funding from the National Science Foundation, SSU SSU has designed a program that immerses freshman students into a year-long, inquiry-based, 12-unit academic learning community that transforms lives and creates scientists: *Science 120, A Watershed Year*.

Within the framework of existing general education courses, students are immersed into the multi-disciplinary subjects of water and sustainability while utilizing the SSU Preserves and various community partners including the Sonoma County Water Agency and Resource Conservation Districts as real-world test-beds for investigation and experimentation.



Science 120 provides students tools across many disciplines to make meaningful contributions to the truly interdisciplinary field of environmental sustainability. *Science 120* introduces science in unexpected yet meaningful and experiential ways so students can determine what field is best suited for their talents and interests. In *Science 120, A Watershed Year* emerging scientists gain awareness of biological principles and build confidence in their skills while enhancing their connection to Sonoma State and the region. Using the watershed—the environment's basic unit—as a classroom, students:

- Study the flow, chemistry and physics of water
- Analyze the relationship of water to the planet and our physical form
- Travel through and experience the diversity of a watershed from headwaters to ocean
- Study organisms in waterways and wetlands
- Participate in faculty and peer mentored research that hones quantitative skills.

Science 120 and the watershed work together to engage the students' natural curiosity.

The benefits and impacts of this innovative curriculum are far reaching:

- Students gain valuable hands-on experience through mentored research and exploration
- Solutions for critical environmental problems are explored
- Our success provides a benchmark for other Universities and organizations seeking to expand diversity and increase STEM retention and graduation rates.

- Integrated service-learning enhances the region economically and environmentally.

The approach works. Students who use applied math and statistics in problem solving in the watershed begin to understand the language of numbers. Biology and geology become lenses through which life and the land are viewed and understood. Physics, chemistry, and engineering become the tools to employ to unravel a puzzle.

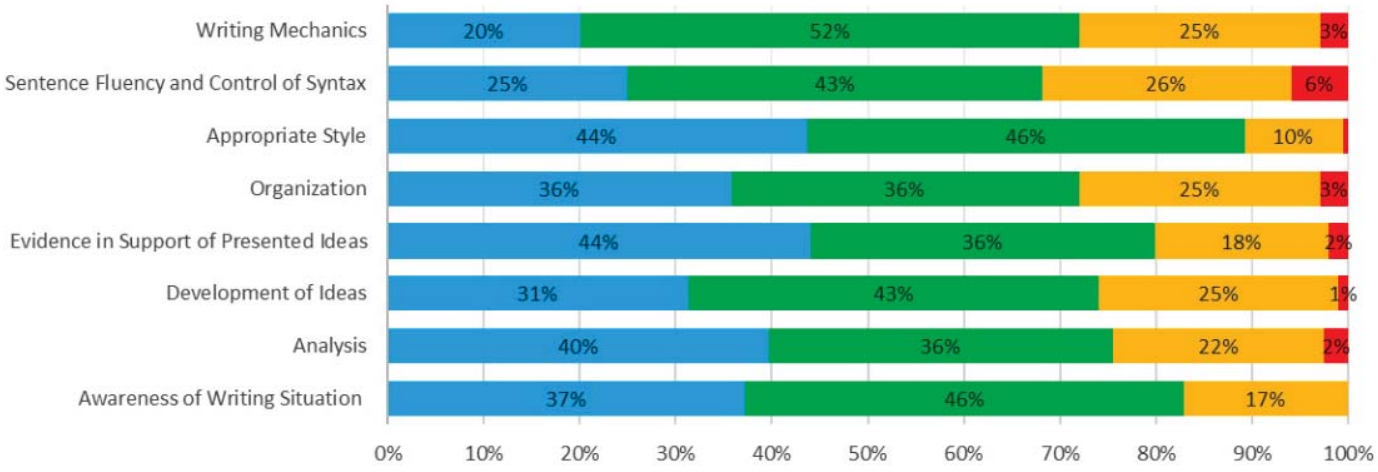
Science 120 has succeeded in increasing the recruitment and retention of STEM majors: our findings show that *Science 120* students are three and a half times more likely to enter into a STEM major one year after their *Science 120* class and are more likely to return as sophomores (i.e., Eighty percent (80%) of the students who were declared as STEM majors at the start of the 2015-16 STEM-FYE cohort continued as STEM majors in their sophomore year. This compares to the overall SSU STEM freshman continuation rate of 70% (from 2010 continuation data).

Appendix 4.2
Writing Literacy Rubric

Outcomes	Achievement Levels			
	3 (Highly Developed)	2 (Developed)	1 (Emerging)	0 (Beginning)
Awareness of Writing Situation **Shows understanding of** • **audience** • **purpose** • **conventions of the writing genre**	Sophisticated	Meets expectations	Partially achieved	Incomplete or poor
Analysis **Uses analysis to** • **generate claims**	Compelling and persuasive	Persuasive	Less clear	Weak or only implied
Development of ideas	Skillful	Persuasive	Underdeveloped	Weak or only implied
Evidence in support of presented ideas	Ample and appropriate to argument; evidence use specific	Sufficient to argument; evidence use varies from general to specific	Somewhat appropriate to argument;-evidence use general	Insufficient and/or not appropriate to argument; evidence use lacking or not specific
Organization • **organizes ideas according to genre conventions**	Skillful	Coherent	Occasional lack of coherency	Ineffective
Appropriate Style • **uses rhetorical conventions of genre** • **uses discipline-specific language**	Engaging and confident in the conventions of the genre	Suitable	Partially achieved	Inappropriate
Sentence Fluency and Control of Syntax Appropriate for Genre	Sophisticated and skillful use of fluency and control of syntax	Clear, accessible fluency and use of syntax	Fluency and control of syntax occasionally lacking	Problems with sentence fluency and control of syntax
Writing Mechanics • **self-edits prose** • **uses standard grammar and correct format for genre**	Error-free prose and correct format for genre	Mostly error-free prose and correct format for genre	Prose contains some errors in writing mechanics and/or in use of correct format for genre	Meaning is lost, numerous errors in grammar/mechanics and/or in format for genre

Appendix 4.3

Written Communication Assessment Results Summer 2016



	Awareness of Writing Situation	Analysis	Development of Ideas	Evidence in Support of Presented Ideas	Organization	Appropriate Style	Sentence Fluency and Control of Syntax	Writing Mechanics
Highly Developed (Level 3)	0.3725	0.3971	0.3137	0.4412	0.3578	0.4363	0.25	0.201
Developed (Level 2)	0.4559	0.3578	0.4265	0.3578	0.3627	0.4559	0.4314	0.5196
Emerging (Level 1)	0.1716	0.2206	0.25	0.1814	0.25	0.1029	0.2598	0.25
Incomplete or Poor (Level 0)	0	0.0245	0.0098	0.0196	0.0294	0.0049	0.0588	0.0294

Appendix 4.4
Critical Thinking Rubric and Information Literacy Rubric

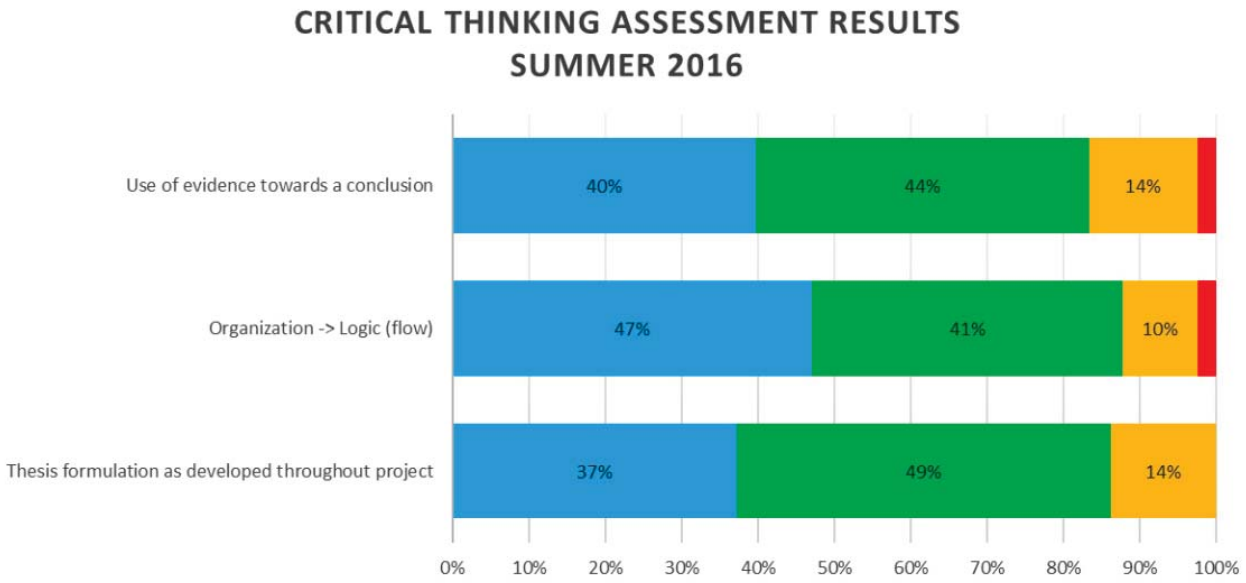
Critical Thinking Rubric

Outcome	Achievement Levels			
	3 (Advanced)	2 (Intermediate)	1 (Beginning)	0 (Not Meeting)
Formulate and defend original thesis in light of compelling evidence that takes into account multiple points of view				
Thesis formulation as developed throughout project	Clear and comprehensive (with multiple perspectives)	Clear, not comprehensive (with limited perspective)	Unclear	Not present/lacking
Organization • Logic (flow)	All elements relevant, linked logically with each other	Incomplete connections between elements	Elements linked illogically	Lacking to no links among elements
Use of evidence towards a conclusion	Easy to discern, compelling, organized clearly and related to thesis	Somewhat ambiguous, partially compelling, although mostly clear and related to thesis	Difficult to discern, debatable, unclearly related to thesis	Little to none, or unable to discern, not related to thesis

Information Literacy Rubric

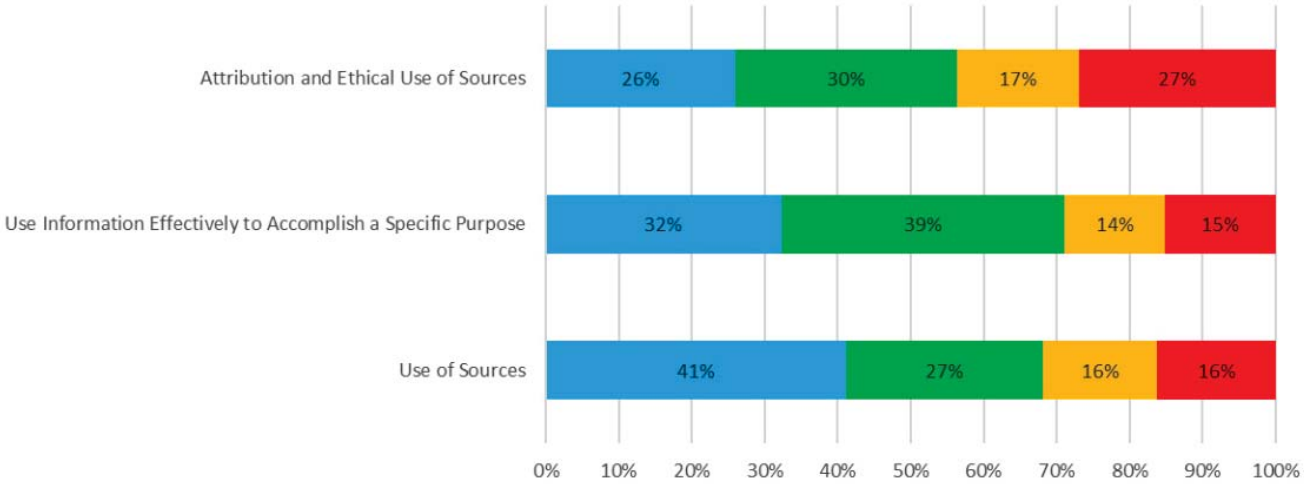
Outcome	Achievement Levels			
	3	2	1	0
Use of Sources	Sources demonstrate expertise and independent thought. • Assumptions of self and others systematically analyzed; • Literature awareness sophisticated; • Sources appropriate and authoritative; and • Claim supported by variety of relevant contexts.	Sources are adequate but lack variety or depth. • Assumptions of self and others identified; • Literature explored but may overlook important avenues; • Sources not the most authoritative; and • Claim supported by some relevant contexts.	Sources are inadequate. • Assumptions ambiguous (More aware of others' assumptions than self's, or vice versa); • Literature awareness weak or minimal source investigation; • Sources too few or inappropriate; and • Claim not supported by relevant contexts.	Sources are absent or do not contribute to claim(s) or argument(s). • Unaware of assumptions (may label assumptions as assertions); • Unaware of literature or scholarship that might strengthen claim(s); • Sources lacking or sources inappropriate; and • Claim not supported by any/appropriate contexts.
Use Information Effectively to Accomplish a Specific Purpose	Information clearly organized and highly synthesized in support of an idea. • Evidence used consistently to support claim(s). • Audience provided appropriately synthesized information. • Distinction between own and others' ideas consistently clear. • Ideas organizes with clarity and depth, fully achieves a specific purpose.	Information proficient in support of an idea. • Evidence used mostly to support claim(s). • Audience awareness adequate in the presentation of information. • Distinction between own and others' ideas usually clear. • Ideas organize sufficiently, intended purpose is achieved.	Information weak in support of an idea. • Evidence used sporadically to support claim(s). • Audience awareness minimal in the presentation of information. • Distinction between own and others' ideas blurred. • Ideas disorganized, intended purpose not fully achieved.	Information lacking and/or inappropriate in support of an idea. • Evidence lacking to support claim(s). • Audience awareness lacking in the presentation of information. • No distinction between own and others' ideas. • Information fragmented, disordered, out of context or used inappropriately, intended purpose not achieved.
Attribution and Ethical Use of Sources	Source attribution is consistent and correct. Sophisticated understanding of when and how to cite sources. • Documents sources consistently and completely • In-text citation and paraphrasing consistently and correctly used • Figures and graphs clearly and completely labeled	Source attribution is usually correct. Adequate understanding of when and how to cite sources. • Documents sources with occasional errors or inconsistencies • In-text citation and paraphrasing consistently used with occasional errors • Figures and graphs usually labeled	Missteps in attribution indicate undeveloped understanding of when and how to cite sources. • Frequently documents sources incorrectly or omits some citations or references • In-text citation with frequent inconsistencies or errors • Figures and graphs Inconsistently or incorrectly labeled.	No understanding of when and how to cite sources. • Omits most or all documentation • Omits most or all in-text citations or misuses paraphrasing (including "common knowledge" errors) • Figures and/or graphs not labeled

Appendix 4.5
Written Communication Assessment Results Summer 2016



	Thesis formulation as developed throughout project	Organization -> Logic (flow)	Use of evidence towards a conclusion
Achievement Level 3	0.3725	0.4706	0.3971
Achievement Level 2	0.4902	0.4069	0.4363
Achievement Level 1	0.1373	0.098	0.1422
Achievement Level 0	0	0.0245	0.0245

Appendix 4.6
Information Literacy Assessment Results Summer 2016



	Use of Sources	Use Information Effectively to Accomplish a Specific Purpose	Attribution and Ethical Use of Sources
Achievement Level 3	0.4118	0.3235	0.2598
Achievement Level 2	0.2696	0.3873	0.3039
Achievement Level 1	0.1569	0.1373	0.1667
Achievement Level 0	0.1618	0.152	0.2696

Appendix 4.7
Quantitative Reasoning Rubric

	Level 5	**Level 4**	**Level 3**	**Level 2**	**Level 1**
Interpretation *Ability to explain information presented in graphs, equations, tables, data.*	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. including statistical significance. *For example, accurately explains the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.*	Provides accurate explanations of information presented in mathematical forms. *For example, accurately explains the trend data shown in a graph.*	Differentiates among interpretations of quantitative information, including causality and correlation.	Limited ability to differentiate among interpretations of quantitative information.	Inability to differentiate among interpretations of quantitative information.
Representation *Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, words, tables*	Expertly converts relevant information including data into an insightful mathematical portrayal (graph, table, formula) in a way that contributes to a further or deeper understanding.	Competently converts relevant information including data into an insightful mathematical portrayal (graph, table, formula) in a way that contributes to a further or deeper understanding.	Converts relevant information including data into mathematical portrayal (graph, table, formula) in a way that contributes to a further or deeper understanding.	Difficulty converting relevant information including data into mathematical portrayal (graph, table, formula)	Inability to convert~~ing~~ relevant information including data into a~~n~~ mathematical portrayal (graph, table, formula)
Calculations	Calculations are expertly done and are essential to comprehend and solve the problem. Calculations are clearly presented.	Calculations are completely done and are essential to comprehend and solve the problem. Calculations are clearly presented.	Calculations are done in an incomplete fashion comprehend and solve the problem. Calculations are presented.	Calculations are done in an incomplete fashion to comprehend and solve the problem. Calculations are not clearly presented.	Calculations are not done.
Application/Analysis *Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis..*	Expertly utilizes quantitative measures (electronic, graphical, tabular or numerical) to make informed decisions in a variety of contexts. Expertly differentiates between causality and correlation.	Competently utilizes quantitative measures (electronic, graphical, tabular or numerical) to make informed decisions and can competently differentiate between causality and correlation.	Utilizes quantitative measures (electronic, graphical, tabular or numerical) to make informed decisions Differentiates between causality and correlation	Difficulty utilizing quantitative measures to make decisions and limited ability to differentiate between causality and correlation.	Inability to utilize quantitative measures to make decisions.
Assumptions	Explicitly describes	Competently describes	Identifies assumptions	Attempts to describe	Inability to describe
	assumptions and provides compelling rationale for why each assumption is appropriate.	assumptions and provides rationale for why each assumption is appropriate	but does not provide rationale for why each assumption is appropriate.	assumptions.	assumptions.
Communication	Uses quantitative information in connection with the argument or purpose of the work and presents it in an effective format .	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support.	Inability to present an argument or use data.