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Abstract

Faculty of Washington State University's undergraduate degree programs in Crop Science, Soil Science, and Horticulture initiated the development and implementation of an assessment process to gauge the extent to which WSU students in the plant and soil science programs meet university and program learning goals. This process was undertaken primarily to help improve our joint teaching efforts and students' learning; it also was encouraged by the needed documentation for the 2007 university accreditation and a need to better match our program learning goals with the University's newly developed Learning Goals of the Baccalaureate. The new program-level assessment plan focused on determining and documenting student progress and proficiency at the sophomore and senior levels. This paper describes the development process and results of the initial assessment cycle and how faculty from three degree programs were recruited and trained in the assessment of student research posters in the sophomore level course and oral presentations on soil-plant management plans in the senior level course. Average faculty ratings were 2.8 for the sophomore projects and 4.5 for the senior projects out of a possible 6 points across all rubric dimensions, with inter-rater reliability of 89 and 87%, respectively. Increased scores at the senior level suggest that student proficiency does increase as students progress through our curriculum and can be documented by rubrics of comparable evaluation criteria.

Introduction

The Departments of Crop and Soil Sciences and Horticulture and Landscape Architecture at Washington State University (WSU) began to work together in 2005 to develop a means for assessing how well our students were meeting university and program learning goals. Faculty from the Crop Science, Soil Science, and Horticulture undergraduate degree programs were involved. (The program in Landscape Architecture will not be discussed here because they have developed their assessment program separately). We recently combined several course offerings between departments to improve the efficiency of course delivery and increase attractiveness of our courses to undergraduate students, further emphasizing the need to begin the process of developing a comprehensive learning assessment model for the three programs.

The assessment process was initiated for several reasons, including documentation for the upcoming (2007) university accreditation, increased teaching

Table 1. Washington State University's recently developed Learning Goals of the Baccalaureate. The University's corresponding explanation of the learning goals is also shown (WSU Office of Undergraduate Education, 2005)

Learning Goals of the Baccalaureate	Explanation of the goal
Critical and Creative Thinking	*Use knowledge of evidence and context to reason and reach conclusions as well as to innovate in imaginative ways*
Quantitative and Symbolic Reasoning	*Analyze and communicate appropriately with mathematical and symbolic concepts*
Information Literacy	*Use a disciplined and systematic approach to accessing, evaluating and using information*
Communication	*Write, speak, and listen to achieve intended and meaningful understanding*
Self in Society	*Employ self-understanding and interact effectively with others of similar and diverse cultures, values, perspectives, and realities*
Specialty	*Hone a specialty for the benefit of themselves, their communities, their employers, and for society at large*

collaborations among programs, and the need to revisit our program learning goals and to align them with WSU's six Learning Goals of the Baccalaureate (LGBs) (Table 1; WSU Office of Undergraduate Education, 2005). The University has determined that the six LGBsCritical and Creative Thinking, Quantitative and Symbolic Reasoning, Information Literacy, Communication, Self and Society, and Specialtyare the educational goals our baccalaureate graduates should achieve.

The goal of our assessment plan is to engage faculty with a method that, unlike most tests that merely indicate what students know and don't know, helps them understand how students learn as well as assess what they have learned. This involves training faculty to monitor current student proficiencies by applying discrete criteria to student performance to understand how to improve future student performance and learning (Parker et al., 2001). In addition, the assessment process puts greater emphasis on reflecting on the collective impact of the courses that comprise WSU programs rather than simply "testing" students independent of the larger learning context (Ewell, 1985).

In addition to the question of using testing verses a more comprehensive process that engages faculty with the 'how' of student learning, developing a program-level assessment involves the question of whether to add new activities outside of regular class work or to assess student proficiency using existing activities and assignments already part of the curriculum, referred to as 'embedded' assessment. Other university plant and soil science programs have demonstrated the use of course assignments for evaluating learning outcomes at the course as well as program level. For example, at the course level, Cook et al. (2006) identified student learning outcomes addressed in a particular course, assessed how well students achieved these outcomes using a class assignment, and made course improvements based on the results. Another approach at the program level used 13 different core and essential courses to assess students' progress through their degree program (Criley, 2005). This program level approach is similar to the one implemented in Crop Science, Soil Science, and Horticulture at WSU.

The objectives of this paper are to present the process, findings, and evaluation of the initial cycle of our program level assessment approach. This approach used a group assignment in a sophomore and senior level course to evaluate student progress in the Crop Science, Soil Science, and Horticulture undergraduate programs.

Methods
Identification and Refinement of Outcomes

In response to our assessment needs, a team of teaching faculty, department chairs, and curriculum committee chairs from both departments was formed with additional consulting from colleagues in the WSU Center for Teaching, Learning, and Technology. Learning goals for each degree program had been established prior to the development of the university-wide LGBs. The faculty team first worked to align the existing program learning goals with WSU's six LGBs.

We also surveyed the teaching faculty from the three programs to determine the extent to which they address the LGBs in each of the courses they teach (data not shown). This information was used to provide us with a clearer idea of what we are emphasizing in our courses, but our experience and the rationale for new efforts to assess outcomes suggests that what faculty emphasize is not necessarily what students learn. It is that distinction between inputs and outcomes that directs this effort and methodology.

Assessment Approach

Discussions among the assessment team and other faculty focused on identifying the most appropriate assessment approach; specifically, how and by whom student proficiency would be assessed in our programs, what existing assignments could be used (if any), and how improvement in proficiency over the course of our degree programs would be measured. We examined the courses required by all students in the three degrees to determine those courses taken by all students to use for the assessment. From these we chose a sophomore level crop growth and development course and a senior level course in soil fertility and plant nutrition. The two courses that were chosen required a substantial, comprehensive group project that involved researching, integrating, and communicating the project information. The projects were comparable tasks in that successful completion of each task required proficient integration of key program and institutional goals.

Comparability between the projects is important since the focus of program level assessment is not on individual students in the traditional (grading) sense, but on the extent to which student performance provides evidence that participation in our programs provides students with the required skills and knowledge. If students' performance is not proficient and/or does not increase between lower and upper-level courses, then strategies must be developed to improve guidelines for these particular activities as well as for prior assignments in preceding parts of the program.

Once the overall approach was determined, the faculty team identified the specific tool for assessing student work in the existing assignments described above. We adapted the Rubric for a Research Project developed by the University of Wisconsin Stout (2006) for each class. A simplified version of the rubric used for the sophomore level course and the relationship of each of the rubric's dimensions to the six LGBs is shown in Table 2. The rubric used for the senior level course was similar but the wording was

adapted for an oral presentation, and the Synthesis and Organization dimension was omitted because of the adaptation for different modes of presentation. While not ideal, this allowed for instructor acceptance during the initial assessment round. The complete rubrics used for the two classes are online at: http://www.css. Wsu.edu/overview/ugrad_ assessment/index.html.

students to demonstrate their ability to work in teams, an essential set of skills for professionals in the field, and to productively contribute to society. Equally important, the focus on groups underscores the shift in the assessment focus from the individual (usually associated with grading students), to an assessment that engages faculty in collectively observing the impact of the program on students.

Table 2. Simplified example of the assessment rubricz used to evaluate student learning in a sophomore level Crops/Horticulture course and the corresponding Washington State University (WSU) Learning Goal(s) of the Baccalaureate (LGB) that relate to each of the rubric's dimensions. (The actual rubrics used in this project are online at: http://www.css.wsu.edu/overview/ugrad_assessment/index.html.)

Rubric for a Research Project			Poster Title			Score	(out of 42)
Dimension	**Problem or Question**	**Collection of Information**	**Information Documentation**	**Analysis and Conclusions**	**Subject Knowledge**	**Synthesis and Organization**	**Final Poster**
WSU's LGB [y]	*Critical and Creative Thinking, Specialty*	*Information Literacy, Specialty*	*Information Literacy, Specialty*	*Critical and Creative Thinking, Quantitative and Symbolic Reasoning, Specialty*	*Specialty*	*Critical and Creative Thinking, Quantitative and Symbolic Reasoning, Specialty*	*Communication, Self in Society, Specialty*
6	Posed a thoughtful, creative question that engaged them in challenging or provocative research. The question breaks new ground or contributes to knowledge in a focused, specific area.	Gathered information from a variety of quality refereed electronic and print sources. Sources are relevant, balanced and include critical info relating to the research.	Documented all sources. Sources are properly cited. Documentation is error-free.	Carefully analyzed the data and information collected and drew appropriate and inventive conclusions supported by evidence. Voice of the student writer is evident.	Subject knowledge is evident throughout the entire product. Info is clear, appropriate, and correct. Evidence supporting topic is presented and linked to the research.	Developed appropriate layout for communicating product. Information is logically and creatively organized. Very easy for the reader to follow and understand.	Effectively and creatively communicated the conclusions and demonstrated effective research techniques. Product displays creativity and originality.
1	Relied on teacher-generated questions or developed a question requiring little creative thought.	Gathered information that lacked relevance, quality, depth and balance.	Poor use of documentation. Clearly plagiarized materials.	Conclusions simply involved restating information. Conclusions were not supported by data.	Subject knowledge is not evident. Information is confusing, incorrect or flawed.	Work is not logically or effectively structured. The reader is unable to follow or understand the product.	Showed little evidence of thoughtful research. Product does not effectively communicate research findings.

[z] University of Wisconsin – Stout (2006). Teacher created rubric s for assessment. Retrieved January 4, 2006. http://www.uwstout.edu/soe/profdev/rubrics.shtml
[y] Refers to WSU LGB that corresponds most closely to that dimension on the rubric.

Implementation of the Sophomore Level Assessment

The sophomore level assessment was performed in the cross-listed HORT/CROPS 202 (Crop Growth and Development) course. This course is required by all majors in Horticulture, Crop Science, and Soil Science and, therefore, provides an efficient opportunity for assessing students in the three programs and an important opportunity to discern variation or comparison in program impact on student learning of shared goals. The assignment assessed was the research, implementation, analysis, documentation, and communication of information in a group research project related to plant growth and development. Groups of two to three students communicated their research objectives, materials and methods, results, and conclusions in a scientific poster presented at the end of the semester. The group project created a real-life, collaborative learning and assessment opportunity where students' levels of proficiency in all six of WSU's LGBs would be evident. Unlike an individual assignment, a group project has the advantage of providing the opportunity for

This is an essential perceptual shift for faculty if we are to learn about our learners in ways that might contribute to improvement and increased programmatic coherence as well as meet the requirements of accreditation (Ewell, 2004; Wiggins, 1998). An additional benefit of assessing group work is that it results in fewer projects to review.

The 42 students in the class were grouped into 16 project teams; a total of 16 posters were evaluated. Three Horticulture faculty, one Crop Science faculty, and one faculty with a split appointment in the two departments assessed the posters. Each poster was assessed on the seven dimensions of the rubric using a conventional scale ranging from 1 to 6 (Table 2). At the high end of the scale, a 5 or 6 on a given dimension indicated mastery level and that the work demonstrated full professional-level competency for that dimension. At the emerging end, a 1 or 2 indicated novice levels of performance. The 6 point scale is generally used by Educational Testing Services (ETS), on the GRE, and many other assessment instruments because the six point scale requires a forced choice which delimits regression to the meanit

is harder to cluster at the middle. A range of six is also large enough to separate ratings, necessary for validity yet still small enough to maintain reasonable levels of reliability, which in turn emphasizes the expert validity (Popham, 1988; Wiggins, 1993). All assessors used the same rubric and rated the same posters. Faculty were trained in the use of the scale criteria to be indicative of absolutes, with a score of 4 representing performance expected of students at the completion of the program. Establishing consensus is important to assure reliable assessment and has the additional benefit of helping build program consensus and coherence.

To further validate the scoring process and to gauge the level of proficiency students will need when they enter the workforce, we also included a pilot study where employers assessed student work. Each of two employers, who were members of the Crop and Soil Sciences departmental Advisory Committee, randomly selected six posters each for evaluation with one poster assessed by both. The remaining posters were not evaluated by the employers.

Implementation of the Senior Level Assessment

At the senior level, student work was assessed in the Soils 441 (Soil Fertility and Plant Nutrition) course. In this class, students worked in groups over the semester to develop soil fertility management recommendations for the plant-soil system of their choice. The students were grouped into nine project teams of four to five people each. Teams were challenged to 1) characterize their systems, 2) identify major soil fertility and environmental issues to be addressed, 3) develop a data collection and analysis plan, 4) construct a nutrient management plant, and 5) present the plan to fellow students and faculty as an oral presentation. Projects were assessed by two Soil Science faculty, one Crop Science faculty, and one faculty with a split appointment in the two departments. A total of nine presentations were evaluated. Each presentation was assessed on the six dimensions of a rubric similar to that used in the sophomore level course. All assessors used the same rubric.

Inter-rater Reliability

Inter-rater reliability is necessary to establish a score as "free from errors of measurement" (Popham, 1988). It is "a necessary but not sufficient condition for a test's validity," though it is understood by educational researchers that an assessment without reliability "cannot yield valid inferences under any circumstances (Popham, 1988)." The consensus of experts in a particular discipline is the most important step in establishing the validity of the process as well as addressing the need for a reliable assessment. Furthermore, it is the consensus of faculty experts that makes the assessment meaningful to the faculty stakeholders in ways that are essential for motivating improvements in the program.

The inter-rater reliability was calculated as follows. For the sophomore level posters, an average of the ratings for each of the rubric dimensions was first obtained. Then, each faculty rating for the poster in that specific dimension was compared to the average. Consistent with the principles reflected in standard ETS assessment, if the faculty rating was within one point of the average, it was considered reliable; if not, that particular rating was considered to be a discrepancy. Finally, the number of discrepancies (from the mean) was calculated for each poster to establish a measure of inter-rater reliability. Since all five faculty ratings could potentially fall outside of the +/- 1 point range of the mean on each of the seven rubric dimensions, the maximum number of possible discrepancies was 35, with zero discrepancies being ideal and indicating 100% reliability, and 35 indicating no reliability. The same method was used to assess inter-rater reliability among the faculty evaluators in the senior level course. For the senior level ratings, the number of discrepancies from the mean was calculated for each presentation in a similar manner to that described above, with zero discrepancies being ideal and indicating 100% reliability, and 24 indicating the maximum number of possible discrepancies for each poster, or no reliability.

Effectiveness of the Process

For the assessment approach to be valuable, we must be able to understand and document differences in student proficiency between the sophomore and senior levels. The assignments chosen for evaluation had overlapping content to look for gains in students' collective proficiency between the course levels. In addition, the assessment process can be further integrated to improve student outcomes by engaging students with the dimensions of the rubric to know what is expected of them. To that end, we asked each student in the sophomore level class to assess three of their classmates' posters to expose them to the range of work performed by their peers. Student scores were not included in our official assessment, but assessment results were compared with faculty.

It is also important to evaluate how well people involved in the assessment understood the process and used it effectively. After rating the sophomore level posters, students (n = 32), faculty (n = 5), and employers (n = 2) completed a self-report survey regarding the assessment process. Survey questions (Table 3) focused on determining the assessors' abilities to clearly understand the assessment process and were aimed at determining how effectively the rubric could be used to assess students' skills in accomplishing their projects. The surveys for the three groups were similar, with adjustments made to the survey questions to accommodate different types of evaluators (students, faculty, and employers). Each survey used a 5-point scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Table 3. Questions and responses from survey given to student and faculty assessors after completing their project ratings. The words in italics indicate differences between wording in faculty and student versions of the survey.

Question	Mean response[z][y] (standard dev.)	
	Student	**Faculty**
1. Evaluating my peers' (*students'*) posters helped me think more about the information and format used in my own poster (*the information I present in class*).	3.9 (0.78)	4.6 (0.89)
2. Evaluating my peers' (*students'*) posters taught me more about their topic than I would have learned from just viewing their poster rather than evaluating it too.	4.0 (0.84)	4.0 (1.22)
3. Evaluating my peers' *(students')* posters was stressful because I find it difficult to grade my peers (students) harshly, even when their work isn't that good.	2.8 (1.02)	2.4 (1.14)
4. Evaluating my peers' (*students'*) posters using the rubric provided was easier than if there had been no rubric.	3.8 (0.92)	4.4 (0.89)
5. I clearly understood all of the rubric items.	4.0 (1.05)	4.0 (1.22)
6. I would have rated a peers' poster with a 2 or even 1 if it met the stated description for that item. (*The criteria in this rubric mapped well to skills and knowledge I use when grading*).	3.4 (1.16)	4.3 (0.58)

[z] Students' (n = 32) and faculty (n = 5) average responses to the survey questions.
[y] Response values range from 1 to 5; where 1 = "strongly disagree" and 5 indicates "strongly agree."

Results and Discussion

Student Proficiency at the Sophomore Level

The average faculty rating for posters in the sophomore level course across all dimensions was 2.8 (Table 4). This indicates that student teams are developing skills in critical and integrative thinking; however, there is room for improvement since, as noted earlier, we identified a score of 4 as the minimum expected for a WSU student graduating with a Bachelor of Science degree. The involvement of both faculty and employer assessors were useful for placing faculty ratings in perspective with the expectations of professionals and helped us to determine the acceptable rating for seniors in our programs. The faculty inter-rater reliability percent agreement coefficient was 89% for the sophomore level ratings, indicating high levels of agreement among faculty assessors.

Student Proficiency at the Senior Level

The average faculty rating for presentations in the senior level course across all dimensions was 4.5 (Table 4). The inter-rater reliability coefficient was 87%. The ratings above 4.0 indicate good overall class performance on the rubric criteria for all presentations. While the rubric used in the senior level course differed slightly from that used in the sophomore level course and had one less dimension, it was possible to perform a comparison of student performance at different stages in their programs due to similarity in rubric criteria. The level of "progress," defined as the difference between senior and sophomore level ratings in student proficiency, was at least 1.5 points across all dimensions (Table 4), indicating that mean student performance increased from 'developing' at the sophomore assessment to 'proficient' at the senior level.

Progress toward Proficiency

The rubric dimensions in which students made the most progress between the sophomore and senior levels were: the collection of the information for the assignments (LGBs: Information Literacy, Specialty); data collection, analysis and conclusions (LGBs: Critical and Creative Thinking, Quantitative and Symbolic Reasoning, Specialty); subject knowl-

Table 4. Sophomore and senior level faculty assessment ratings for each of the rubric dimensions (given in Table 2), progress between the two levels, and corresponding Washington State University Learning Goal(s) of the Baccalaureate

Dimension	Learning Goals of the Baccalaureate	Faculty assessment ratings		
		Sophomore level	Senior level	Progress
Developing a problem or question	Critical and Creative Thinking, Specialty	3.0	4.6	1.6
Collection of information	Information Literacy, Specialty	2.8	4.6	1.8
Documentation of information	Information Literacy, Specialty	2.6	4.1	1.5
Data collection, analysis, and conclusions	Critical and Creative Thinking, Quantitative and Symbolic Reasoning, Specialty	2.8	4.6	1.8
Subject knowledge	Specialty	2.8	4.6	1.8
Synthesis and organization	Critical and Creative Thinking, Quantitative and Symbolic Reasoning, Specialty	2.9	Not assessed	Not applicable
Final project	Communication, Self in Society, Specialty	2.9	4.7	1.8
Average		2.8	4.5	Not applicable
Inter-rater reliability[z]		89%	87%	Not applicable

[z]Total sum of discrepancies across all presentations ÷ total possible discrepancies.

edge (LGB: Specialty); and communication of the results (LGBs: Communication; Self in Society, Specialty) (Table 4). The dimension of least improvement from the sophomore to the senior level and lowest ratings at both levels was in documentation of information sources (LGB: Information Literacy). Although students understand how to find information from libraries and other sources, they still lack the ability to properly document this information in their assignments, or fail to recognize its importance.

Effectiveness of the Assessment Process.

Faculty perception of the assessment process. In general, average faculty responses to the self-report survey were between 4.0 and 4.6, indicating strong agreement with these statements (Table 3). This indicates that faculty were comfortable with the rubric and assessment process, and further suggests that involvement in the assessment process was a learning experience for them (Table 3; Questions 1 and 2). The one exception was the statement "evaluating students' posters was stressful because I find it difficult to grade students harshly, even when their work isn't that good." For this statement, faculty responded toward the "neutral" to "disagree" end of the scale, suggesting that that they felt comfortable rating presentations in a fair and objective manner.

Student scoring and their perception of the assessment process. Students in the sophomore level class consistently rated each poster higher than faculty. Students' average scores of their peers' work, using the same rubric as the faculty, ranged from 5.1 to 5.4 out of a possible 6 points, with an average across all dimensions of 5.3 (data not shown). This is substantially higher than the faculty and employers' ratings: 2.5 points higher than faculty ratings and 3 points higher than employer ratings. At the beginning of the semester, students were given the rubric and the dimensions of the rubric were reviewed; however, a formal norming process, where the students were educated to produce reliable ratings based on poster standards, was not conducted. Pearson's "r" correlation coefficient was 0.16 between student and faculty dimension average scores, indicating negligible correlation between how students rated a given poster compared to the faculty.

In general, average student responses to the self-report survey statements were between 3.4 and 4.0, indicating moderate agreement with these statements regarding their comfort level with the assessment and that it was a learning experience for them (Table 3). An exception was Question 3, where responses were lower with average student responses (2.8) similar to those of the faculty (2.4), indicating that students believed they could evaluate their classmates' work objectively.

Survey responses indicated that most of the rubric dimensions are working to encourage critical and integrative thinking, but that there is room for improvement. Secondly, the survey showed that,

overall, student survey responses were lower than those of the faculty indicating inadequate understanding of the assessment process by the students. In some cases, lack of clarity in some of the rubric dimensions appeared to be linked to reduced student performance. A study by Andrade and Du (2005) on student perception of rubrics reported that many students did not read the entire rubric and some used it as a tool for satisfying an instructor's requirements for an assignment. As our rubric is refined and becomes better understood by the students, it is expected that this link between appropriate assessment ratings and student performance will improve. The steps outlined below provide suggestions for improving the student and faculty assessors' understanding of the rubric, the validity of the rubric, and its function as an assessment rather than a grading tool.

Summary and Future Steps

The comparison of student work between the two courses indicates a higher relative proficiency at the senior level compared to the sophomore level across the University's six LGBs, including both disciplinary and lifelong learning skills. This was supported by faculty assessment of student performance using comparable versions of a rubric for rating student proficiency demonstrated with group project assignments in a sophomore and a senior level course. High inter-rater reliability coefficients between faculty assessors at both course levels, coupled with increased proficiency ratings in the upper division course, indicates that the combination of the selected assignments and rubrics provide a suitable approach for documenting changes in student proficiency over the course of their time in our undergraduate programs. Although a rating of 4 is the minimum we expect graduates from our programs to achieve in the various rubric dimensions, our goal is for them to attain a rating closer to 6 in each of these areas.

The involvement of both faculty and employers in assessing student work was useful for placing faculty ratings in perspective with the expectations of the professional world, and for addressing the challenges of using employers in the process. We could not reliably compare the employer and faculty ratings since there were only two employers. However, the process established valuable benchmarks for future assessment and revisions in the assessment instrument (See Table 5 for revised rubric to be used in the next round of our assessment). We also plan to expand our pilot study with employers and involve more employer assessors in the future.

Discussion of our results with faculty teaching the two courses will help them clarify expectations to students, and link assignment development and instruction more directly to the overall program goals that are being assessed. Discussion of the relative differences between faculty and student ratings with students in future classes will help students see the

Table 5. Resulting revised rubric[1] to be used for future program level assessment in Crop Science, Soil Science, and Horticulture courses at Washington State University

Washington State University Crop Science, Soil Science and Horticulture Program Rubric   Project #_____   Score _____   (out of 36)

	Problem/Question/Goal	Sources: Search, Selection, & Evaluation	Methodology & Data Collection	Analysis, Synthesis & Interpretation	Organization & Communication	Conclusions & Recommendations
6	Identifies a focused, unique, original question/goal that is challenging and well defined.	Appropriately identifies all information needs. Uses a wide variety of high quality sources that are relevant, balanced and current. Use of sources is accurate, precise, and complete. Sources are cited accurately. Bibliography is complete and properly formatted. Contains explicit evaluation of sources' perspectives, quality, and relevance.	Data collected and presented demonstrate a clear understanding of the information and its relationship with the project's question/goal. Data collection & presentation follow professional guidelines at the mastery level, support presentation or analyses. Approach and methodology are complete, appropriate and correct for the project question/goal.	Analysis demonstrates firm grasp of evidence. Synthesis integrates literature and data—*evidence*—in appropriate and creative ways. Implications of analysis and evidence guide interpretation, including recognition of multiple perspectives and interpretations.	Progression from evidence to analysis, synthesis, and interpretation is logical, concise, and may be creative. Presentation sequence follows professional conventions including such things as purpose, background, objectives, methods, findings, conclusions and implications. Personality, style, and voice of student(s) are polished, error-free, professional, and engaging.	Conclusions are accurate, appropriate, clearly linked to question or project objectives, and data presented. The implications of the conclusions are linked to future research and/or action, and guide recommendations. Conclusions and recommendations are balanced and qualified to account for uncertainties in the data or unpredictability of the system.
5	Identifies a focused, question/goal that is challenging but not necessarily unique or original. The question/goal is satisfactorily defined and characterized.	Uses information from an adequate range of quality sources that are relevant, balanced, and current. Sources are summarized and cited correctly. Evaluation of sources is present but not in-depth. Bibliography is complete and properly formatted.	Data collected and presented adequately, relationships to the project question/goal are clear, support presentation or analyses. Data collection & presentation adhere to professional guidelines and methodologies. Approach and methodology are appropriate but have minor flaws.	Analysis reflects evidence reviewed, collected, and presented. Synthesis integrates literature and data appropriately, but is not necessarily creative. Interpretation is clear and integrates with other sources or perspectives.	Clear progression from evidence to analysis, synthesis and interpretation in well-organized manner. Student voice or style has a clearly defined personality, is professional, and the presentation is easy to follow and understand.	Conclusions are appropriate, accurate and linked to question or project objectives. The implications of the conclusions are not complete or only loosely linked to future research and/or action, and/or do not guide recommendations. Conclusions and recommendations are reasonable and substantiated. Some accounting of uncertainties is evident.
4	Identifies a somewhat focused question/goal that is interesting but not particularly challenging or is simplistic. The problem/goal is unsatisfactorily defined and characterized, with important omissions of key considerations.	Uses information from a limited range of sources. Source quality or relevance is solid but not stellar, some questions of balance. Sources are summarized adequately, few citation errors. Little or no evaluation of sources. Bibliography is complete, few formatting errors.	Data collected and presented adequately, relationship to the question/goal are not entirely clear. Data collection & presentation adhere loosely to professional guidelines and methodologies and, in general, do not interfere with presentation or analysis. Approach and methodology are related to the goal but do not fully address the question/goal due to flaws or inappropriate approach.	Analysis generally reflects evidence reviewed, collected, and presented. Synthesis from sources is adequate, though perhaps in spots confusing or contains *minor* inaccuracies. Interpretation is singular and clear if unremarkable, though perhaps not fully integrated with other sources or perspectives.	There is a discernable progression from evidence to analysis, synthesis and interpretation. The research question or management plan objectives guide the organization, if not always clearly. The presentation is professional, contains only minor errors and is fairly easy to follow and understand.	Conclusions are reasonable but may not take into account all critical factors. Conclusions relate to the question and arise from the evidence presented, though there may be gaps or redundancies. There is some plausible speculation about implications, but not necessarily true or creative. Recommendations are easy to understand. No accounting of uncertainties is evident.
3	Identifies a question/goal that lends itself to readily available answers. Scope is either too broad or too narrow. and may embed more than one question/goal. The question/goal is defined and characterized with inaccuracies, and/or irrelevant information.	Information sources are limited but adequate. Source quality or relevance is acceptable, but questions of balance and/or omission of one or more important topic areas. Sources are summarized adequately, few citation errors. Bibliography is incomplete and/or improperly formatted.	Data collected and presented adequately, though relationship to the question/goal are cloudy. Data collection and presentation are sufficient, but reveal some misconceptions or inaccuracies. Data collection & presentation do not meet professional guidelines and methodologies or, at times, interfere with presentation or analysis.	Analysis attempts to link to the evidence provided but implicit aspects and integral relationships may be overlooked. Synthesis from sources is lacking or rough, with little explanation. Demonstrates adequate skill in the interpretation of data, though little evidence of Integration with other sources or perspectives.	Presentation organization does not yet adhere to professional standards, but contains the rudiments of required background information, analysis, and synthesis. Only portions of the presentation stray from the original question/goal. Emerging evidence of student's ownership and engagement with the work, though errors or inaccuracies exist. Some effort is required for the audience to follow and understand.	Draws incomplete, or occasionally inaccurate, conclusions. The question or plan objectives are only partially addressed. The implications of the conclusions are only slightly (or not at all) developed. Conclusions and recommendations follow with vague reference to the problem/question and data but are not always supported by the analysis.
2	The question or system, if identified, is confused or simplistic.	Information sources are inadequate due to low quality or relevance, and are from a limited range of sources. Many errors in citing sources, Bibliography is incomplete and/or improperly formatted.	Limited data were collected or data/approach demonstrate little attention to or understanding of professional conventions. Approach and methodology are only vaguely related to the goal and/or are inappropriate for addressing the question/goal.	Analysis does not link to evidence provided. There is little or no synthesis from sources or what is presented is incoherent, patched together without explanation. There is little Interpretation of data, or there is simply a restatement of facts and ideas found elsewhere.	Presentation of evidence and analysis is haphazard and/or confusing. The presentation has no guiding principle or clear connection to the project's stated question/goal. There is little evidence of student ownership and engagement with the work. There are multiple errors, stumbles and inconsistencies. Difficult for the audience to follow and understand.	Conclusions are inaccurate and unreasonable, or are merely a simplistic summary not tied to the original question/goal. The implications of the conclusions are absent or do not guide future work in any discernable or reasonable way. Conclusions and recommendations are biased and do not reflect the research and data, suggesting views were established before or in spite of the evidence.
1	Does not identify a specific question or system.	No evidence of search, selection, or source evaluation skills. Information sources, if present, lack relevance, quality, and balance. Sources are not cited. Bibliography is incomplete and improperly formatted. Plagiarized materials..	Data appear inaccurate or incomplete. Management of data obscures presentation and analysis. Data/evidence are simplistic, not on topic or are inappropriate. No methodology demonstrated, or approach and methodology are unrelated to the goal.	No evidence of analysis; information is confusing, conflicted, incorrect, or flawed. No synthesis from sources. Organization of ideas obscures the presentation.	Presentation of evidence and analysis is haphazard, confusing, and not connected to the original project question/goal. There's no evidence of student ownership and engagement with the work. Multiple errors, stumbles and inconsistencies misinform or mislead the audience.	Conclusions, recommendations, implications, and consequences are absent.
0	Not able to rate based on this work.	Not able to rate based on this work.	Not able to rate based on this work.	Not able to rate based on this work.	Not able to rate based on this work.	Not able to rate based on this work.

[1]Developed by WSU Center for Teaching, Learning, and Technology in cooperation with the faculty in Crop Science, Soil Science, and Horticulture.

extent to which they are able to comprehend and recognize proficiency in their own work, which also fits into the LGB of Self and Society. Students also need to recognize their responsibility for understanding the assessment process and its influence on their expectations for future learning.

Future steps for this project are to (1) strengthen the alignment between assignments and the university and program learning goals but not lose sight of the course learning goals; (2) use the assessment rubric more often in instruction and as a guide for grading by including the relevant program goals and the rubric in course syllabi and linking it to assignments; (3) reserve class time, preferably at the beginning and middle of the semester, for norming sessions with students to maximize their abilities to understand and apply the rubric; (4) create assignments that require students to give peer feedback using the rubric, and offer students opportunities to revise work after receiving feedback from peers and/or faculty; (5) require students to attach a rubric-referenced self-assessment to key assignments; (6) monitor the use of the rubric in the programs' courses to guide ongoing refinement of the rubric and the assignments; (7) review the assignment documentation in each class and overall program instruction related to information literacy; particularly, information documentation, since this was the lowest scoring dimension at both the sophomore and senior levels.

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