

## **Work in Progress: Developing Single Point Rubrics for Formative Assessment**

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## **Introduction**

This Work in Progress describes initial efforts at Ohio Northern University to develop rubrics for assessing student work on a client-based term project in an introductory programming course sequence. Initially, traditional analytic rubrics – where each criterion contains a descriptor for each level in the performance rating scale – were used in a summative fashion to provide feedback. At face value, rubrics of this variety are convenient as they contain qualitative descriptions of the performance criteria used for evaluation, reducing the task of grading to just the stroke of a pen in the appropriate column. Unfortunately, an analytic rubric is usually not designed to communicate precise comments for each dimension, and its summative use disempowers students from applying the received feedback towards improving the project. This all too typical approach toward using rubrics in the classroom can easily have a negative impact. At a minimum, there is a level of incompleteness present that cannot be resolved within the context of the course. Worse, a student being told that they did not perform well on a particular criterion could interpret the message as one of personal failure, leading to possible persistence issues.

## **Motivation**

If our goal is to educate students to be prepared for the workplace, then we as instructors need to be supportive of all student effort, knowing that failure is an ever-present part of the design process.<sup>1</sup> One method of increasing support is by incorporating formative feedback into major assignments, similar to how design reviews are conducted in the real world. In this way, descriptions of various modes of student failure are replaced with constructive messages describing areas for improvement in the assignments, which can then lead to increased student self-satisfaction through successful project completion. However, simply repurposing an analytic rubric from summative to formative use does not necessarily solve this problem. The leading motivation for this research was to better serve our students by finding a mechanism for providing supportive and formative feedback upon their work while still preserving the various benefits associated with rubrics. To achieve this, the issues associated with the use of analytic rubrics need to be examined.

Regardless of the methodology<sup>2,3</sup> selected for their development, one has to deal with the inherent difficulties associated with analytic rubrics.<sup>4</sup> In order for an analytic rubric to fulfill its educational ideal, several things must occur. First, it must be designed for consistency in the performance criteria descriptors across all scale levels. This can be a challenging task alone due to its time-consuming nature. Reliability can be an issue if only generic terms – such as “highly”, “some”, “moderately”, and “minimal” – are used to differentiate between scale levels of a particular performance criterion. The desire to capture all possible negative performance indicators to ensure that lower marks for inadequate performance within a criterion can be justified also factors into rubric development, resulting in an instructor spending additional time to consider all possible modes of failure. By capturing and emphasizing failure through negative terminology in the descriptions of the lower performance criteria levels, a rubric adopts a

dichotomous success/failure tone that can have an adverse effect upon a struggling student. Despite carefully crafting the various performance levels, a student’s work may still prove to be a fringe case of one or more of the criteria. As the detail of the performance level indicators increases, it is not hard to imagine difficulties picking one performance level occurring more frequently. Another aspect of analytic rubrics is that they generally have limited blocks of white space, leaving little room for providing written feedback. Finally, once distributed, students have to read and understand the contents of the rubric. As analytic rubrics are dense documents by nature, it is often the case that essential differentiating elements for a criterion are glossed over when read, especially when there is little to differentiate one performance level from another.

## Hypothesis

The hypothesis being examined by this research is that a variant of the analytic rubric – the single point rubric – can be efficiently and effectively used to provide formative feedback. The remainder of this Work in Progress paper examines the format of and rationale behind the single point rubric, its use within the context of the term project, and current research directions.

## The Single Point Rubric

While a description of the single point rubric was first published in 2010 by Fluckiger<sup>5</sup> and thence gained traction through mentions in various K-12 education blogs,<sup>6-8</sup> Fluckiger gives credit for the concept to Mary Dietz, who presented it at a workshop in 2000. As stated by Fluckiger, one of the purposes of the single point rubric is “to provide specific written feedback on various aspects of students’ work that will help them know *how* to improve.” An example of a single point rubric is shown in Figure 1.

<b>Breakfast in Bed: Single Point Rubric</b>		
<b>Advanced</b> Evidence of exceeding standards	<b>Criteria</b> Standards for this performance	<b>Concerns</b> Areas that need work
	<b>Food:</b> All food is at the correct temperature, adequately seasoned, and cooked to the recipient’s preference.	
	<b>Presentation:</b> Food is served using porcelain plates on a clean tray with silverware. Some decorations may be present.	
	<b>Comfort:</b> Recipient is wakened gently, assisted in seating adjustment, and given reasonable time and space to eat.	

FIGURE 1. EXAMPLE OF A SINGLE POINT RUBRIC (ADAPTED FROM GONZALEZ<sup>6</sup>)

While similar to an analytic rubric, the key distinguishing characteristic of the single point rubric is that, for each criterion, only the expected level of performance is provided with a qualitative definition or precise quantitative measure. The remaining performance levels are deliberately left unspecified. The single point rubric thereby presents a single set of criteria, or “one point”, for students to consider. This approach solves many of the problems inherent with the analytic

rubric.<sup>5, 8</sup> First, less development time is required in constructing the single point rubric. All that needs to be stated are the expected standards for performance; one does not have to develop a laundry list of ways to perform poorly within each criterion. Second, by not specifying the characteristics of above-standard performance, the single point rubric encourages creativity. The student who goes above and beyond will typically use the information specified in the higher performance levels of an analytic rubric as their goal, and then stop once it is achieved; accordingly, such specifications often only serve to constrain student potential to that which is specified. Third, students can clearly see what the instructor's expectations are, as now only the expected performance standards are presented to the class. Fourth, the eye of the typical reader of an analytic rubric is naturally drawn to the left-most column, which can either be daunting (if it presents above-standard performance information) or provides a false sense of security (if it presents below-standard performance information). By removing this content, as well as removing the other non-standard columns of performance information, students are no longer distracted by this "noise" and can then focus upon meeting the characteristics associated with standard performance. Finally, the open spaces within the non-standard performance columns provide room for writing targeted, specific comments of praise and/or encouragement regarding that student's work, thereby providing an avenue for formative assessment.

### **Application: Introductory Programming Term Project**

The application of single point rubrics is presented here in the context of a term project for a programming course to provide a grounded example of not only the construction of the rubrics, but also the components of the project they were used to evaluate.

The introductory programming course sequence of Programming 1 and Programming 2 at Ohio Northern University has used the term project theme of developing K-12 educational software for many years, but until 2014 the project was done without the benefit of having a client to satisfy. Consequently, the instructor could only provide feedback on the technical aspects of the implementation, and most of the feedback was *summative*. With the recent establishment of an engineering education degree program, the opportunity arose for providing the programming students with a meaningful client-driven design experience. The engineering education majors, acting as clients, developed lesson plans for STEM outreach programs as part of a fall semester course that were afterwards supplemented by software applications written by teams of introductory programming students in the spring semester.<sup>9-11</sup> Traditional analytic rubrics were used for project assessment.

In an effort to improve the project, the investigators conjectured that adopting the single point rubric would provide the means for implementing a formative assessment practice to improve each programming student's learning experience and scaffold their processes through targeted feedback. To improve collaboration, the lesson plans crafted by the engineering education majors would be created in conjunction with the programming teams' software design processes, and structured to accommodate multiple iterations of Kolb's Experiential Learning Cycle,<sup>12, 13</sup> where learning is understood to be a continuous process of framing and reframing experiences. The structure conveniently ties to formative assessment; rather than evaluating student work in a summative mode, the instructor can now provide feedback to the students for each significant step in their project.

## **Methodology: Development of Single Point Rubrics**

A total of five single point rubrics (with some intended for summative assessment use) were developed in preparation for the Spring 2015 term project<sup>14</sup> in Programming 2:

- “Client: Proposal Evaluation Rubric” – designed to evaluate the initial proposals and to provide constructive feedback before full-fledged development begins.
- “Client: Program Evaluation Rubric” – used to both evaluate the programs developed by the student teams and the perceived level of interaction by the programming team with the client.
- “Judges: Software Application Evaluation Rubric” – used by external reviews to evaluate the software applications from an educational and non-technical standpoint.
- “Written Report Evaluation Rubric” – used to evaluate both the content and the mechanics of the final report submitted by each team.
- “Peer Evaluation: Teamwork and Effective Collaboration Rubric” – used to evaluate each student’s participation on the project in terms of the effort they put into team tasks, their manner of interacting with others on the team, and both the quantity and quality of the contributions they make when collaborating in team discussions.

A copy of each of these rubrics is provided in Appendix A.

The rubrics were developed in a collaborative effort between the programming course instructor and the group of engineering education majors that formed the research group. As the key distinguishing characteristic of the single point rubric is that, for each criterion, only the expected level – or “single point” – of performance is provided, care needed to be taken to ensure that the resultant description accurately captured this expectation. The rubrics were thus developed by surveying the available literature for examples of assessment in software application design, teaming, and entrepreneurship (which was included since students were required to provide a customer-oriented value proposition in support of their application). The identified rubrics, along with existing assessment tools such as the AAC&U VALUE Rubrics,<sup>15</sup> were then synthesized into appropriate criteria for single point rubric use. This process involved two critical aspects. First, the researchers looked for commonalities across a set of multiple rubrics focused upon a particular topic. Such commonalities were used to develop an initial set of relevant criteria. The second aspect was to examine the associated performance level descriptors to determine if these descriptions accurately fitted the associated criterion or if they should be broken out into separate criteria. By using this methodology, the rubrics did not have to be created from scratch by the researchers; instead, the merits of each of the examined rubrics were discussed as a group, and the most salient features correlating to proficient performance were extracted and then incorporated into the single point rubric then under development. This streamlined approach was found to be quite effective in developing the five aforementioned rubrics.

## **Instructional Use and Example Results**

The project started with the engineering education majors giving in-class presentations to the programming student teams regarding the topic and focus of their preliminary lesson plans; hard copies of the plans were also distributed. A bidding process was used to assign teams to plans,

after which each team would meet with the lesson plan’s author to jointly explore feasible concepts for the software application to be developed. Each team would then submit a written proposal to their client for approval. The proposals were evaluated using the “Client: Proposal Evaluation Rubric.” Appendix B provides an example use of this rubric, containing the feedback provided to one of the programming teams. This rubric was used formatively, with teams not permitted to go forth into the code development phase until they satisfactorily addressed all design-oriented shortcomings via submission of a revised proposal, which was also evaluated via application of the Proposal Evaluation Rubric.

For purposes of implementing a critical design review process, teams presented their applications in a science fair exhibition-type format, illustrated in Figure 2, to a collection of judges with diverse backgrounds, such as professors specializing in elementary and middle school education, STEM outreach coordinators, and computer science upperclassmen. Each judge would individually interact with each team, thereby providing one level of formative feedback, and then fill out a “Judges: Software Application Evaluation Rubric” to formally provide their feedback; an example is provided in Appendix B. The teams were able to use the various forms of feedback received from the judges to fine-tune their applications prior to final submission.

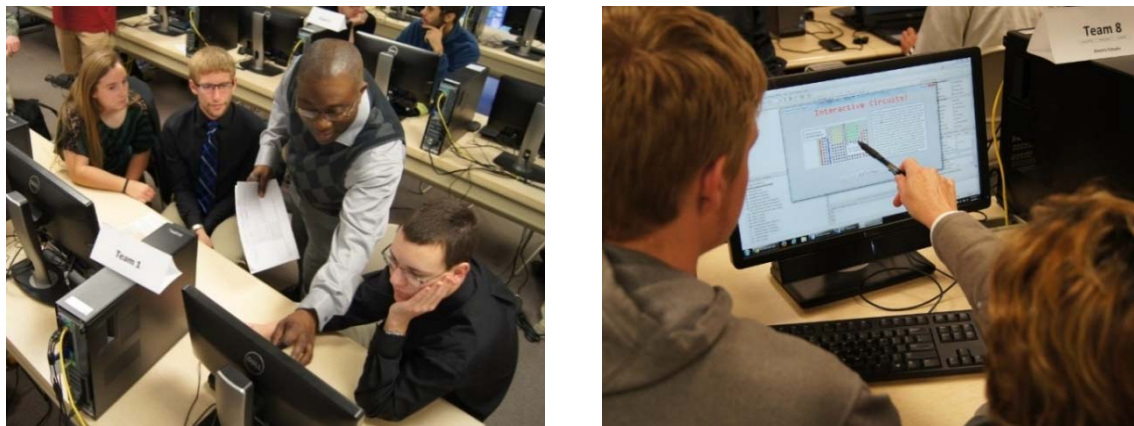


FIGURE 2. JUDGES INTERACTING WITH THE PROGRAMMING TEAMS.

To provide feedback with respect to individual contributions and group dynamics, each programming team member performed a peer evaluation of the other team members, plus a self-evaluation, using the “Peer Evaluation: Teamwork and Effective Collaboration Rubric.” While not formatively used here, this rubric can work as a formative assessment tool if implemented at the conclusion of each of several small-scale projects or periodically during the progress of a larger-scale project. An example use of this rubric is provided in Appendix B.

Following submission of the software application and accompanying report, two summative rubrics were applied. The “Client: Program Evaluation Rubric” addressed the extent to which the programming teams satisfactorily addressed the learning outcomes, audience, comprehension, visualization, and usability attributes of the application. Two additional criteria are present: collaboration by the team with the client and the team's timeliness of transmitting the deliverables to the client. Although applied here in a summative manner, such feedback (an example of which is provided in Appendix B) can be formative in the long term, helping to shape the behavior of students in their interaction with clients. The “Written Report Evaluation Rubric”

addressed both the contents and the mechanics of the submitted report, which was expected to describe what the team’s application was about, how it fitted in with the associated lesson plan, and a discussion of the methods used in developing the application.

### Examples of Aggregate Quantitative Data

A total of 24 programming students, formed into eight teams, participated in the initial classroom use of the single point rubrics provided with this paper. As this is a Work in Progress, a thorough reporting on the possible uses of the quantitative results derived is well beyond the scope of this paper; however, two examples – one individual-focused, the other team-focused – are being presented in order to briefly illustrate some of the aggregate results available through the application of these rubrics.

The first example is the aggregate results from the application of the “Peer Evaluation: Team work and Effective Collaboration Rubric.” This rubric is based on the AAC&U Teamwork VALUE Rubric, but improves upon it by taking the multiple traits that were combined into a total of five criteria and separating them into nine distinct criteria. After collecting information on individual student performance, an obvious use of the rubric is to inform each student of their results and make suggestions for personal improvement. However, an instructor can also examine the aggregate results, looking for trends that need to be addressed at the classroom level. The data presented in Table 1 is based on an aggregate classification of the peer- and self-evaluation results submitted for each student regarding their term project performance in the Spring 2015 offering of Programming 2.

TABLE 1. AGGREGATE PEER EVALUATION RUBRIC RESULTS.

Criteria and Performance Standards	M	P	D	L
<b>Team Meeting Contributions:</b> Offers multiple ideas, solutions, or courses of action that build on the ideas of others.	9	12	1	2
<b>Team Meeting Facilitation:</b> Engages team members in ways that encourages their contributions through constructive means.	1	17	6	0
<b>Completion of Tasks:</b> Completes all assigned tasks by deadline.	8	13	1	2
<b>Completeness of Tasks:</b> Work accomplished is thorough, comprehensive, and advances the project.	8	13	1	2
<b>Respectfulness:</b> Treats team members respectfully by being polite and constructive in all forms of communication.	9	13	2	0
<b>Attitude:</b> Conveys a positive attitude through such means as positive vocal and written tone, facial expressions, and body language.	3	19	1	1
<b>Motivation:</b> Expresses confidence about the importance of the task and the team’s ability to accomplish it.	4	17	2	1
<b>Assistance:</b> Provides assistance and/or encouragement to team members.	7	16	1	0
<b>Response to Conflict:</b> Identifies and acknowledges conflict, addressing it in constructive ways.	2	21	1	0

M: Mastery; P: Proficiency; D: Developing; L: Lacking

From this set of data extracted from the rubrics, an instructor can examine overall trends that might warrant possible interventions through such means as a brief discussion in class or a request to review previously covered material. In this particular example, the “Team Meeting Facilitation” criterion is the only one with more than three students performing below expectations.

The second example is from the application of the “Client: Proposal Evaluation Rubric” to the initial set of proposals submitted by the programming teams. The teams were required to submit a proposal that indicated what they were planning to design and how their design supported the lesson plan. The engineering education client used the rubric to evaluate the proposal and to provide formative feedback. The data provided in Table 2 presents the results of the teams’ initial round of proposal evaluations.

TABLE 2. AGGREGATE INITIAL CLIENT PROPOSAL EVALUATION RESULTS.

<b>Criteria and Performance Standards</b>	<b>M</b>	<b>P</b>	<b>D</b>	<b>L</b>
<b>Learning Objectives:</b> The proposal addresses at least one learning outcome / educational standard outlined in the lesson plan.	2	5	1	0
<b>Audience:</b> The audience of the application is age-appropriate with consideration of the student’s stages of development.	0	6	2	0
<b>Concept:</b> The proposal outlines a workable concept with appropriate detail. Preliminary sketches or mock-ups may be presented in order to aid in communicating the idea.	2	1	5	0
<b>Student Engagement:</b> The proposal describes an application that will likely engage students beyond the knowledge level by possessing some form of interactivity.	0	3	4	1
<b>Context:</b> The proposal describes an application that is fundamental to the lesson plan either as an extension or in-class material.	3	3	2	0

M: Mastery; P: Proficiency; D: Developing; L: Lacking

Each team subsequently used the received feedback to improve their proposals, and hence the concept of their project was strengthened prior to their entering the design process. The aggregate results from this assessment indicate that more work needs to be done ahead of time in informing the programming students about the development of workable concepts. Additionally, it would be helpful for the programming students to be introduced to software methodologies, such as gamification, that can be used to encourage student engagement with the application.

### Qualitative Comments and Planned Modifications

Various forms of qualitative assessment were performed to gauge the initial reaction to the use of the developed single point rubrics by the different constituencies involved: introductory programming students, engineering education majors, and the judges.

#### *Introductory Programming Students*

Following the completion of the term project assignment, the course instructor held an in-class debriefing session over all aspects of the project. The points made by the introductory programming students regarding the rubrics were the following:

- The students generally agreed that single point rubric format was easy to understand.
- Having separate rubrics was a good idea, as it allowed students to focus on a specific aspect of the project. This was mentioned as being much better than dealing with one massive rubric containing everything.
- Rubrics are helpful, but the instructor needs to encourage students to read each rubric prior to its actual use.



To address the prior review issue, students will be asked to examine each of the single point rubrics, first individually, and then collectively within their project groups, and answer the following questions:<sup>16</sup>

- What is unclear on the rubric?
- What is not assessed in the rubric, but should be?

By asking these two questions, and requiring the processing of the answers both independently and collectively, the students are forced to examine and discuss the rubric and, ideally, critically evaluate its content. A side benefit of this approach is that, by being alerted by students to problematic language or missing content before the rubric's application, the researchers can meet to address the issue by making appropriate modifications to the rubric in question.

### *Engineering Education Majors*

The engineering education majors were asked to write reflective essays at the conclusion of the semester. In terms of the positive effects that the rubrics had as a formative assessment tool, one engineering education major mentioned the following:

“We have made many changes that have improved this project for us and for the all the students involved. The communication level has been much better this year and we have been able to help improve the quality of the application.”

Additionally, it was the instructor's observation that the engineering education majors were truly engaged in the development of the single point rubrics, providing many pertinent comments during the development sessions that helped to improve the content.

### *Judges*

The judges, while generally favorable with their reviews, mentioned that there were two subject areas that, if sufficiently emphasized, would have resulted in better evaluations. It was noted that the length of text used in the applications were in many cases too long to be useful in addressing a fourth- through sixth-grade audience. Discussing effective and appropriate ways to communicate information to this audience by providing resources on this topic and specifically mentioning text length within the rubric would help guide the programming students to greater success in this area. The second point raised was that some of the applications were “one and done” items that would engage students for about 30 seconds. Accordingly, it was suggested that materials on gamification techniques be presented in the course and referenced somewhere within the overall set of rubrics.

### *Additional Modifications*

The Spring 2016 term project in Programming 2 will again continue with the basic premise of presenting first-year introductory programming students with a real world, client-oriented design experience. A minor modification for this offering is that the engineering education majors will be serving as in-class liaisons for the clients: teachers at a local elementary school. Based upon the constraints provided by the teachers, the engineering education majors will draft lesson plans

for fourth- and fifth-grade level STEM-based activities, and will coordinate with their assigned programming teams to develop engaging software applications that either will be the primary activity or used to reinforce the primary activity. The resultant lesson plans and accompanying software applications will be delivered to the teachers for their evaluation and possible adoption for classroom use.

To help the programming students with their collaborative efforts, additional team-based programming assignments have been added to the Spring 2016 offering of Programming 2. By applying the Peer Evaluation single point rubric multiple times within the same course, it can now serve more effectively as a formative assessment tool, albeit with performance changes being tracked over the duration of a semester instead of a project.

While the Software Application Fair worked extraordinarily well and allowed for a variety of interactions, it featured essentially competed applications. By adjusting the project timeline to reframe the Software Application Fair as a critical design review by a panel of external reviewers, the formative aspect of the Judging rubric would be naturally strengthened.

### **Future Research Directions**

As the research presented in this paper is a work currently in progress, there are various components that still need to be looked into. Either finding or developing a quantitative assessment tool for evaluating the perceived effectiveness of each of the single point rubrics on the parts of both the programming students and the engineering education majors is at the top of this list. Given that most students have not yet experienced a single point rubric, questions that are general in nature regarding rubric use can possibly be used such that the effect of the new format can be measured, with paired *t*-testing applied to determine if the change is statistically significant.

With respect to rubric construction, there are three primary areas where further research is needed: factor analysis, reliability, and validity. Factor analysis is a statistical method used to reduce a large number of variables to a smaller, more manageable set. For rubrics, this means identifying the underlying competency to which an individual criterion belongs, and thus finding those criteria that operate redundantly, essentially measuring the same thing.<sup>17</sup> This aspect of using rubrics as a measurement tool needs to be weighed against the desire to use the single point rubric as a formative assessment tool, where such redundancy is of lesser concern than providing appropriate feedback to the student. Reliability refers to the consistency of assessment scores. For this research, the interrater and clarity components are of particular interest. Interrater reliability refers to the concern that a score for a particular artifact may vary from rater to rater. Consequently, to craft a well-designed analytic rubric, one must pay particular attention to formalizing the set of performance descriptor levels for each criterion, as this can reduce the occurrence of discrepancies.<sup>18</sup> This is not an issue for a single point rubric, as only the expected standard performance level in the single point rubric contains a description. Another aspect related to interrater reliability is that the typical single point rubric provides only one performance level above and below the standard, whereas the research being presented here utilizes two levels below the standard: Developing and Lacking. While this distinction is present primarily for scoring and outcomes assessment purposes,<sup>19</sup> the benefits of having the additional

level needs to be weighed against the consistency desired from interrater reliability. As for clarity, the current rubrics need to be systematically reviewed, preferably with student input, with respect to whether the criteria are sufficiently defined that everyone understands what constitutes expected performance.<sup>18</sup> The development of training materials featuring example cases is also planned so that the various constituencies for this set of single point rubrics can practice their application prior to actual use. Establishing the validity of an instrument first requires that one clearly states both what one hopes to learn from the responses (purpose) and how those being assessed will display the required proficiencies (objectives). From this, evidence can then be collected to determine the extent to which these interpretations are correct. Moskal and Leydens provide sets of questions for examining the three types of validity evidence: content-related, construct-related, and criterion-related.<sup>18</sup> Conversely, Douglas and Purzer contend that an instrument does not contain inherent validity; rather, situational measures define the appropriateness.<sup>20</sup> Regardless, the set of single point rubrics currently under development ideally should not address any extraneous content nor be missing essential content. Finally, a long term goal is to examine both the relevancy of the criteria to the constructs of interest and the correlation between the results from the assessment instruments to the success (or failure) of the developed software applications in their real world use.

### **Concluding Remarks**

From an instructional standpoint, several aspects of the single point rubric were found to be valuable for those situations where formative assessment is desired. First and foremost, developing a single point rubric requires less time and less effort than its analytic counterpart. The primary reason for this is that the instructor can focus attention on the traits being looked for and on the performance level students are expected to attain. No time needs to be wasted trying to account for all the possible ways that something can go wrong. The single point rubric also provided a balance in terms of amount of effort required for providing feedback – that is, between circling the appropriate cells of an analytic rubric and having to provide freeform comments upon a student artifact. The evaluation criteria are limited, through use of a rubric, to those considered key for reviewing the assignment, but feedback can be easily provided in those cases where student performance within a particular criterion is either above or below expectations. Projects of sufficiently long duration, such as term projects or capstones, are the assignments that would be the “best fit” for applying single point rubrics, as there would be sufficient time for students to utilize the formative feedback to improve their project or their performance.

In summary, the authors believe that there is considerable potential in adopting single point rubrics for formative assessment purposes in higher education. The engineering education clients were more engaged in the development and reviewing processes, the programming students received clear performance standards and relevant feedback for their efforts, and the judges were provided with a framework for their interactions with the teams.

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## **APPENDIX A**

### **SINGLE POINT RUBRICS**

The single point rubrics presented within this appendix were developed for use with the Spring 2015 offering of Programming 2 at Ohio Northern University. Please note that, in order to adhere to ASEE paper formatting requirements, the rubrics were reformatted to fit within the specified margin guidelines. Copies of the current version of the rubrics as actually used and formatted are available in Microsoft Word format and can be obtained by contacting the lead author. The authors respectfully request that those who adopt these rubrics for use provide feedback to the lead author as to their effectiveness, any modifications made, repurposing for other assignments, etc. This will greatly assist us in the further development of this resource. Thank you.

## Client: Proposal Evaluation Rubric

Evaluator: \_\_\_\_\_

Team being evaluated: \_\_\_\_\_

*This rubric is used by the clients to evaluate the initial proposals and to provide constructive feedback before code development begins.*

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
	<b>Learning Objectives:</b> The proposal addresses at least one learning outcome / educational standard outlined in the lesson plan.		
	<b>Audience:</b> The audience of the application is age-appropriate with consideration of the student's stages of development.		
	<b>Concept:</b> The proposal outlines a workable concept with appropriate detail. Preliminary sketches or mock-ups may be presented in order to aid in communicating the idea.		
	<b>Student Engagement:</b> The proposal describes an application that will likely engage students beyond the knowledge level by possessing some form of interactivity.		
	<b>Context:</b> The proposal describes an application that is fundamental to the lesson plan either as an extension or in-class material.		

## Client: Program Evaluation Rubric

Evaluator: \_\_\_\_\_

Team being evaluated: \_\_\_\_\_

*This rubric will be used by the client to evaluate the programs developed by the student teams.*

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

	<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
Client Interaction		<b>Collaboration:</b> The client was included in the development of the application during the allotted lecture/lab hours.		
		<b>Timeliness:</b> Deliverables went sent to the client by the stated deadlines.		
Software Application		<b>Learning Outcomes:</b> The proposal appropriately focuses on the learning outcomes outlined in the lesson plan.		
		<b>Audience:</b> The application is targeted towards the age group specified in the lesson plan.		
		<b>Comprehension:</b> The application conveys the material in an understandable fashion.		
		<b>Visualization:</b> The application is presented in a manner that provides clear graphics and a visual understanding.		
		<b>Usability:</b> The application is intuitive and has a clear objective.		

## Judges: Software Application Evaluation Rubric

Evaluator: \_\_\_\_\_

Team being evaluated: \_\_\_\_\_

*This rubric will be used by each judge to evaluate the software applications from an educational and non-technical standpoint.*

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
	<b>Appeal:</b> The application is engaging and would likely be of interest to 4 <sup>th</sup> -6 <sup>th</sup> grade students.		
	<b>Innovation:</b> The application attracts attention by presenting a topic or concept in a creative way.		
	<b>Performance:</b> The application is polished (i.e. well developed and functional) and essentially free of noticeable errors.		
	<b>Intuitiveness:</b> The application is easy for a 4 <sup>th</sup> -6 <sup>th</sup> grader to use and understand.		
	<b>Appropriateness:</b> The application is supportive of the specified standards.		
	<b>Engagement:</b> The user experiences the gamification method of feedback (i.e. scores, achievements and/or badges)		
	<b>Intended Customer:</b> PowerPoint materials appropriately target 4 <sup>th</sup> -6 <sup>th</sup> grade teachers with a value proposition that properly addresses identified customer needs.		
	<b>Value Experience:</b> PowerPoint materials indicate the benefits resulting from adopting this application to address indicated student needs.		
	<b>Value Qualification:</b> PowerPoint materials identify appropriate pros and cons that allows the customer to judge the merits of adopting this material.		

Adapted from "Learning in Hand with Tony Vincent" Education App Evaluation Rubric and the University of Chicago 2015 UChicago App Challenge Criteria.

Additional Comments (if any):



## Peer Evaluation: Teamwork and Effective Collaboration Rubric

**Evaluator:** \_\_\_\_\_

**Student being evaluated:** \_\_\_\_\_

Definition: Teamwork constitutes behaviors under the control of individual team members (effort they put into team tasks, their manner of interacting with others on the team, and both the quantity and quality of the contributions they make when collaborating in team discussions).

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas needing Improvement</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
	<b>Team Meeting Contributions:</b> Offers multiple ideas, solutions, or courses of action that build on the ideas of others.		
	<b>Team Meeting Facilitation:</b> Engages team members in ways that encourages their contributions through constructive means.		
	<b>Completion of Tasks:</b> Completes all assigned tasks by deadline.		
	<b>Completeness of Tasks:</b> Work accomplished is thorough, comprehensive, and advances the project.		
	<b>Respectfulness:</b> Treats team members respectfully by being polite and constructive in all forms of communication.		
	<b>Attitude:</b> Conveys a positive attitude through such means as positive vocal and written tone, facial expressions, and body language.		
	<b>Motivation:</b> Expresses confidence about the importance of the task and the team's ability to accomplish it.		
	<b>Assistance:</b> Provides assistance and/or encouragement to team members.		
	<b>Response to Conflict:</b> Identifies and acknowledges conflict, addressing it in constructive ways.		

- Derived from the AAC&U Teamwork VALUE Rubric: <https://www.aacu.org/value/rubrics/teamwork>

## Written Report Evaluation Rubric

Evaluator: \_\_\_\_\_

Team being evaluated: \_\_\_\_\_

*This rubric will be used to evaluate the final report submitted by each team.*

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

PART A – CONTENT	<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
		<b>Learning Objectives:</b> The report addresses the learning outcomes outlined in the proposal and exhibited by the application.		
		<b>Audience:</b> The report is written with due consideration towards being read by 4 <sup>th</sup> -6 <sup>th</sup> grade teachers.		
		<b>Concept:</b> The report presents details regarding how the application addresses the lesson plan.		
		<b>Student Engagement:</b> The report presents information regarding how various elements of the application are designed with student engagement in mind.		
		<b>Programming Methodology:</b> The report documents all aspects of applying object-oriented programming techniques towards addressing the needs of the client.		

PART B – MECHANICS	<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
		<b>Literacy:</b> Report contains generally correct prose, with only occasional - and minor - grammatical, spelling, and/or punctuation errors.		
		<b>Style:</b> Report contains serviceable prose featuring a clear and professional tone.		
		<b>Word Choice:</b> Words and idioms are appropriate to the task and are not misused; slang is avoided; technical terms are adequately defined.		
		<b>Persuasiveness:</b> Report is organized, presenting ideas using an appropriate and compelling context that supports the nature of the work and convinces the reader of its relevancy.		
		<b>Physical Format:</b> Document is well structured, helps readers find the information they need, and contains no visual distractions.		

## **APPENDIX B**

### **EXAMPLE FORMATIVE USE OF SINGLE POINT RUBRICS**

The examples of single point rubrics presented within this appendix are from the Spring 2015 offering of Programming 2 at Ohio Northern University. Please note that, in order to adhere to ASEE paper formatting requirements, the rubrics were reformatted to fit within the specified margin guidelines. These examples have been “sanitized” to remove identifying student information.

## EXAMPLE Client: Proposal Evaluation Rubric

Evaluator: Alan Apple

Team being evaluated: Team 1

*This rubric is used by the clients to evaluate the initial proposals and to provide constructive feedback before code development begins.*

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
	<b>Learning Objectives:</b> The proposal addresses at least one learning outcome / educational standard outlined in the lesson plan.		
	<b>Audience:</b> The audience of the application is age-appropriate with consideration of the student's stages of development.	Based on what's given, I can't confidently say that it is age appropriate yet.	
	<b>Concept:</b> The proposal outlines a workable concept with appropriate detail. Preliminary sketches or mock-ups may be presented in order to aid in communicating the idea.	Help students how? Your description is vague, which raises a few concerns.	
	<b>Student Engagement:</b> The proposal describes an application that will likely engage students beyond the knowledge level by possessing some form of interactivity.		Email me about stages of learning; this application does not exceed the knowledge level.
	<b>Context:</b> The proposal describes an application that is fundamental to the lesson plan either as an extension or in-class material.		

Talk to me about how we can move away from an application which is strictly informational to something with a form of interaction.

## EXAMPLE Judges: Software Application Evaluation Rubric

Evaluator: Barb Banana

Team being evaluated: Team 8

*This rubric will be used by each judge to evaluate the software applications from an educational and non-technical standpoint.*

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
	<b>Appeal:</b> The application is engaging and would likely be of interest to 4 <sup>th</sup> -6 <sup>th</sup> grade students.		
	<b>Innovation:</b> The application attracts attention by presenting a topic or concept in a creative way.	Too wordy at times	
	<b>Performance:</b> The application is polished (i.e. well developed and functional) and essentially free of noticeable errors.		
	<b>Intuitiveness:</b> The application is easy for a 4 <sup>th</sup> -6 <sup>th</sup> grader to use and understand.		
	<b>Appropriateness:</b> The application is supportive of the specified standards.	Would need thorough explanation	
Liked the sound effects	<b>Engagement:</b> The user experiences the gamification method of feedback (i.e. scores, achievements and/or badges)		
	<b>Intended Customer:</b> PowerPoint materials appropriately target 4 <sup>th</sup> -6 <sup>th</sup> grade teachers with a value proposition that properly addresses identified customer needs.	More an explanation of how the app works rather than value to customer	
	<b>Value Experience:</b> PowerPoint materials indicate the benefits resulting from adopting this application to address indicated student needs.	Need to clarify	
	<b>Value Qualification:</b> PowerPoint materials identify appropriate pros and cons that allows the customer to judge the merits of adopting this material.		Not given

Adapted from "Learning in Hand with Tony Vincent" Education App Evaluation Rubric and the University of Chicago 2015 UChicago App Challenge Criteria.

Additional Comments (if any):

## EXAMPLE Peer Evaluation: Teamwork and Effective Collaboration Rubric

Evaluator: Carl Cucumber

Student being evaluated: Doreen Durian

Definition: Teamwork constitutes behaviors under the control of individual team members (effort they put into team tasks, their manner of interacting with others on the team, and both the quantity and quality of the contributions they make when collaborating in team discussions).

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas needing Improvement</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
She did a very good job in coming up with the ideas for the application, especially the cannon section.	<b>Team Meeting Contributions:</b> Offers multiple ideas, solutions, or courses of action that build on the ideas of others.		
	<b>Team Meeting Facilitation:</b> Engages team members in ways that encourages their contributions through constructive means.		
She always completed what she should have had done, and occasionally she came with more done than what was asked of her.	<b>Completion of Tasks:</b> Completes all assigned tasks by deadline.		
The work that was done greatly contributed toward the completion of the program.	<b>Completeness of Tasks:</b> Work accomplished is thorough, comprehensive, and advances the project.		
	<b>Respectfulness:</b> Treats team members respectfully by being polite and constructive in all forms of communication.		
	<b>Attitude:</b> Coveys a positive attitude through such means as positive vocal and written tone, facial expressions, and body language.		
	<b>Motivation:</b> Expresses confidence about the importance of the task and the team's ability to accomplish it.		
She always helped her group members when they were having trouble or needed assistance even if she had his own work to be doing.	<b>Assistance:</b> Provides assistance and/or encouragement to team members.		
	<b>Response to Conflict:</b> Identifies and acknowledges conflict, addressing it in constructive ways.		

- Derived from the AAC&U Teamwork VALUE Rubric: <https://www.aacu.org/value/rubrics/teamwork>

## EXAMPLE Client: Program Evaluation Rubric

Evaluator: Eddie Eggplant

Team being evaluated: Team 7

*This rubric will be used by the client to evaluate the programs developed by the student teams.*

For each row, please provide feedback by either circling the listed standard for proficiency or by writing constructive comments in the appropriate column.

	<b>Mastery</b> <i>Evidence of Exceeding Standards</i>	<b>Proficiency</b> <i>Performance Standards</i>	<b>Developing</b> <i>Areas that Need Work</i>	<b>Lacking</b> <i>Areas that are Weak or Missing</i>
Client Interaction		<b>Collaboration:</b> The client was included in the development of the application during the allotted lecture/lab hours.	There could have been more collaboration. I think it would have benefited this application quite a bit, especially to avoid assessment pitfalls.	
	Thank you for sending the website early.	<b>Timeliness:</b> Deliverables went sent to the client by the stated deadlines.	Initial proposal was delivered late (4/18/2015 12:48 pm).	
Software Application		<b>Learning Outcomes:</b> The proposal appropriately focuses on the learning outcomes outlined in the lesson plan.	Assessment does not match the level of the learning objective. The instructor sent a handout to the class explaining that quizzes are rote assignments to be avoided.	
		<b>Audience:</b> The application is targeted towards the age group specified in the lesson plan.		
		<b>Comprehension:</b> The application conveys the material in an understandable fashion.	There's little from the activity that the student can hold onto and the language is too formal too often.	
		<b>Visualization:</b> The application is presented in a manner that provides clear graphics and a visual understanding.		
		<b>Usability:</b> The application is intuitive and has a clear objective.	While the informational slides are straightforward, the lack of a clear objective in the activity can lead to confusion.	There are no directions in the activity, which is just playing around with input/output relationships. The "Activity Intro" slide is blank.