Assessing Student Scientific Expression Using Media: The Media-Enhanced Science Presentation Rubric (MESPR)

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Abstract

The current study evaluated an assessment designed to dually promote student understanding of the experimental method and student ability to include digital and visual qualities in their presentations of scientific experiment results. The rubric, the Media-Enhanced Science Presentation Rubric (MESPR) focuses teacher-student dialogue along the educational objectives of the science methods and science literacy required of students to be able to contribute to the scientific enterprise. The American Association for the Advancement of Science (AAAS) recently advocated for K-12 educators to re-emphasize inquiry-based science in the curriculum to better prepare students for the workforce. The MESPR was evaluated for in-class value and utility to enable teachers to meet AAAS goals of increasing student science content and science literacy knowledge. Results indicated that the MESPR contains face validity (n=5) for increasing science literacy and content validity for focusing teacher-student dialogue on science methodology. Implications point to the clear educational value of the rubric for enhancing classroom instruction and also identify the need for a large-scale technical evaluation of the reliability and validity qualities of the MESPR for a clear understanding of whether or to what degree results are suitable for informing science education policy-makers.

Introduction

The very notion of "writing" and "presenting" is increasingly being transformed by new digital media used daily in society in general and in homes, businesses, and schools. Today, one's ability to represent thought digitally with a variety of media is more important than ever. The extreme pace of transformation in society, represented by new technology, from PDAs to creative software applications for an assortment of devices, dictates that K-12 educators consider how to facilitate science education that supports students as they express themselves digitally in various environments in developmentally appropriate ways. This article addresses the curriculum, instruction, and assessment of students' digitally-enhanced science experiment results, and includes a rubric that supports teacher-to-student dialogue and student-to-student dialogue on the incorporation of text, audio, video, and graphics in science presentations. The Media-Enhanced Science Presentation Rubric (MESPR) is defined and its use is discussed with the goal of improving student understanding of both the scientific method and science literacy skills.

Rationale for the Need for a Science Presentation Rubric

As science and science literacy curricula and instruction continue to transform to include new digital communication and learning environments, educators must correspondingly develop and technically evaluate assessments for the new environments. Digital media represents a powerful electronic environment through which science literacy and expression can be facilitated by the manipulation of text, graphics, audio, and video elements, and this technology and integration are reflected in the latest science literacy and literacy K-12 standards [3], [7]. The qualities of digital media that support higher-level cognitive processes such as synthesis, organization, evaluation, and reflexivity have been well documented [13], [14], [22]. However, there is a glaring absence of methods and tools to assess students' media-enhanced products. To address this absence, a scientific method process was merged with a framework for digital media inclusion.

These terms are defined as follows:

- Digital media [10]: digital communication technologies that enable or facilitate user-to-user interactivity and interactivity between user and information. Media also refers to the mode of communication, and this can include any combination of digital and seamless connections between text and other meaning-based symbol systems.
- Digital media contains two main components: (1) digital: the ability to program electronic links, or hyperconnections, to connect information to any other Internet-based source or simply to link locally to an electronic device, and (2) media: the ability to manipulate multiple meaning-based symbol systems representing a variety of sources—text, graphics, audio, and video clips.

As students are increasingly required and expected to incorporate a variety of sources in a sometimes dizzying array of digital modes, never has it been more critical for educators to structure the manner in which students synthesize science experiment results and information to better yield convincing and organized science presentation result-products. This article does not address the presentation software due to the fact that educator preference usually reigns in terms of decision-making over authorware. Whether or not students author in PowerPoint, SmartNotebook, Dreamweaver, etc. has no bearing on how teachers separately and eventually assess student science experiment results. For assistance on authoring with digital media there are numerous sources available for teachers to separately teach skill-sets required to use Microsoft and other publisher materials (see [13] for further assistance).

The MESPR

The Media-Enhance Science Presentation Rubric serves three purposes: (a) promote student understanding of the scientific method with the overall aim of empowering students to conduct inquiry-based hands-on science experiments; (b) empower students to logically incorporate digital media elements to further promote understanding of their scientific experiment results; and (c) foster communication skills and "habits of mind" in science. According to Project 2061, science, mathematics, and technology share certain thinking process skills essential for science literacy. "Habits of mind" in science incorporate these skills and in addition, consider value and attitudes toward science. (These goals have been articulated by AAAS in the science standards from Project 2061 in the "methods" and "technology" strands (http://www.project2061.org/publications/bsl/online/index.php) and in Chapter 12, "Habits of Mind" [3]. Thus, three core knowledge and processes areas addressed in the benchmark are holistically infused in the rubric to promote student activity that leads to their involvement in the scientific method and technological ability to express their work. The first, "enhanced media" deals with student understanding of the nature of technology and the need for dissemination as addressed in the standards:

> *…technology extends our abilities to change the world: to cut, shape, or put together materials; to move things from one place to another; to reach farther with our hands, voices, and senses. We use technology to try to change the world to suit us better… Anticipating the effects of technology is therefore as important as advancing its capabilities (3A-C).*

> *The dissemination of scientific information is crucial to its progress. Some scientists present their findings and theories in papers that are delivered at meetings or published in scientific journals 1C/H12 [3].*

The second core knowledge area holistically addressed across elementary and secondary grade ranges is the make-up of the scientific method. Project 2061 addresses this understanding from a developmental standpoint, in this example Grades 3-5:

> *They should be encouraged to observe more and more carefully, measure things with increasing accuracy (where the nature of the investigations involves measurement), record data clearly in logs and journals, and communicate their results in charts and simple graphs as well as in prose. Time should be provided to let students run enough trials to be confident of their results. Investigations should often be followed up with presentations to the entire class to emphasize the importance of clear communication in science. Class discussions of the procedures and findings can provide the beginnings of scientific argument and debate (1B-Grades 3-5) [3].*

The third core knowledge/skills area holistically addressed across K-12 is the "convention style" discourse where presenters, peers, and instructor engage in posing questions, analyzing and evaluating the scientific investigation, offering critique, and discussing extensions of the research. Through this process, "habits of mind" in science become another focal point around which to promote social values of science and technology and reflect on students' own ability to understand and analyze science content and processes. (http://www.project2061.org/publications/sfaa/online/chap12.htm).

The above examples of science goals for technology, dissemination and method/inquiry and "habits of mind" can be adapted for both emergent and advanced science students. Likewise, the rubric must be adapted to meet the developmental levels of students' science and literacy capabilities. The rubric contains the super ordinate concepts of the discrete stages of the scientific method across the top row with the media elements explicitly identified in the left column and embedded in the narrative descriptions in the cells. See Table 1.1. The Media-Enhanced Science Presentation Rubric. The text within cells is designed to promote discussion between student and teacher and between students along the educational objectives for science method and science literacy with media. The authors seek to promote classroom discussion based upon science goals versus merely along grade levels and "points" earned. The narrative quality of the rubric thus supports a deeper understanding of emergent-to-advanced goals for students as they conduct research and present their findings. Similar to holistic writing rubrics validated for collections of student narrative writing samples (see Novak, Herman & Gearhart, 1996), this rubric is thus a formative and performance-based tool that can guide teacher and student language and increase student meta-awareness of what a science presentation with media can accomplish.

The MESPR supports the National Science

MESPR: MEDIA-ENHANCED SCIENCE EXPERIMENT PRESENTATION RUBRIC						
Score / Criteria	**Problem/Question**	**Hypothesis**	**Material/Methods**	**Results/Analyses**	**Conclusions/Further Investigation**	**Communication Skills**
1	Either not present or incorrectly written; no connection to experiment. Does not connect with valid society and technology issue *Use of relevant media is marginal* *Hypertext:does not link to supporting texts*	Not present and/or incorrectly conveyed *Use of relevant media is marginal* *Graphics: designed to visually depict variables to support text are not present (when appropriate to the variable types…)*	Not included and/or incomplete. Mostly "cookbook" style project. No quantification of data *Minimal attempt to use relevant or contributory media:* *Hypertext:not used to link to additional material descriptions or methods used by other scientists* *Graphics:not present to visually portray materials and method steps* *Audio: supporting audio not present to provide additional description of materials and methods* *Video: supporting video (clips) not present to portray methods applied during the experiment*	Not included and/or incomplete. Use of relevant or contributory media is marginal. Details on data collection are not presented (examples from logbook) *Does not attempt to create an online logbook:* *Text: minimal or no use of text style to structure text elements of superordinate to subordinate concepts* *Hypertext: minimal or no use of links to support results and analyses* *Graphics: minimal visuals to support and model findings* *Audio: minimal or no audio to support and model findings (if appropriate to this experiment and this section)* *Video: minimal or no video to support and model findings (if appropriate to this experiment and this section)*	Incomplete – no connection with results and to further investigations. No connection with society or technology issues *Use of relevant or contributory media is marginal. Incorrect use of terminology and science e.g.my results "proved" I was right or "I didn't get the results I expected"* *Minimal use of text, hypertext, graphics, audio and video elements lead to summarizing findings across multiple meaning-based symbol systems to make complex information easier to understanding*	Demonstrates little depth or understanding of project, reads directly from notes, is unable to field questions and engage in critical dialogue. Demonstrates little interest or curiosity in topic. No mention of logbook or data collection details *Doesn't use media in a relevant or contributory way. No connections to society or technology*
2	One element is not present or is incorrectly written. Some connection with society and technology issue *Makes adequate use of media.* *Hypertext: links relate to and support the readers' understanding of the experiment problem* *Graphics, Audio and Video:Elements depict problem visually*	Present but incomplete connection between independent & dependent variables. No operational definition *Use of relevant media somewhat conveys concepts.* *Graphics: designed to visually depict variables to support text are present (when*	Both materials and methods included with some creativity Limited quantification of data *Some use of media to convey this step and methods processes:* *Hypertext: used to link to additional material descriptions or methods used by other scientists* *Graphics: present to visually portray materials and method steps* *Audio: supporting audio present to provide additional description of*	Both aspects included. Marginally complete content or use of relevant and contributory media *Some effort at creating online logbook:* *Text: adequate use of text style to structure text elements of superordinate to subordinate concepts* *Hypertext: adequate use of links to support results and analyses* *Graphics: visuals function to support and model findings* *Audio: functions to support and model findings (if appropriate to this experiment and this*	Both aspects included with adequate connection to result and analysis *Minimal connection to society or technology issues. Partially correct use of terms and science, "My results supported my hypothesis" but doesn't value unexpected observations* *Adequate use of text, hypertext, graphics, audio and video elements lead to summarizing findings across multiple meaning-based symbol systems to make complex information easier to understanding*	Adequate depth of understanding; fields some questions, Refers to logbook and data collection details demonstrates some curiosity or interest *Media is used marginally to contribute in a relevant manner. Some connections to society or technology*

Table 1.1. The Media-Enhanced Science Experiment Presentation Rubric (MESPR) .

3	Both problem statement and question are present correctly conveyed and relate to experiment. Clear connection to society and technology issue *Creative and clear use of media to enhance.* *Hypertext: links relate to and convincingly support the readers' understanding of the experiment problem* *Graphics, Audio and Video:Elements depict problem visually increasing audience understanding*	Correctly connects independent with independent variables. Operational definitions present. *Creative use of media to present concepts.* *Graphics: designed to visually depict variables to support text are present and convincingly aide reader understanding of variables and similarities/ differences between variables (when appropriate to the variable types…)*	Materials and methods included completely and creatively. Quantification of data appropriate to the methodology utilized *Media is fully utilized in a creative way convey the information:* *Hypertext: used to link to additional material descriptions or methods used by other scientists* *Graphics: present to visually portray materials and method steps* *Audio: supporting audio present to provide additional description of materials and methods* *Video: supporting video (clips) present to portray methods applied during the experiment*	Both aspects included completely. Excellent use online logbook with creative and illuminating use of media to present information and to engage audience. *Details on data collection are included and fully integrated into presentation:* *Text: aesthetically convincing use of text style to structure text elements of superordinate to subordinate concepts* *Hypertext: convincing use of links to support results and analyses to increase audience understanding of the project* *Graphics: support and model findings enabling the audience to scale down the complexity of the project* *Audio: convincingly support and model findings (if appropriate to this experiment and this section)* *Video: convincingly support and model findings (if appropriate to this experiment and this section)*	Both aspects included completely with excellent correlation to results and analysis. *Creative and illuminating use of media to present information and to engage audience. Correct use of terms and values unexpected observations* *Convincing use of text, hypertext, graphics, audio and video elements lead to summarizing findings across multiple meaning-based symbol systems to make complex information easier to understanding*	Good depth of understanding, enthusiastically fields questions and demonstrates curiosity and interest in topic. Integrates aspects of logbook confidently and appropriately, Engages audience and stimulates a lively discussion *Creative and relevant use of media to convey ideas. Good connections to society or technology:*

Table 1.1. The Media-Enhanced Science Experiment Presentation Rubric (MESPR) . (Continued)

Education Standards [15] teaching standards, as it encourages teachers to develop short term and long term goals facilitating students' skills of inquiry, "orchestrate discourse among students about scientific ideas…"(p. 32) and "guide students in self assessment" (p. 38). Through communicating their inquiry investigations, students can use the criteria developed in the MESPR to enhance self-directed and reflective learning. The NSES recommends that teachers "make the available science tools, materials, and technological resources accessible to students" (p. 44) and the MESPR is an effective evaluation tool to assess student competence in using these resources to enhance content, process, and attitude in an inquiry-based program.

Face Validity of Rater Judgments of Student Science Presentation Quality

Utilizing Messicks' [12], [11] holistic conception of validity, the degree to which an instrument measures what it purports to measure, the authors (five higher education science and literacy educators with doctorates) evaluated the face validity of the rubric. Face validity is a subcomponent of construct validity, which is the degree to which an instrument measures a uni- or multi-dimensional construct of a body of knowledge—in this case the scientific method and science literacy (cite here). For the current article, the authors/content-area experts assessed the face validity of the MESPR for the multi-dimensional construct of (a) scientific method and (b) digitally-enhanced science literacy. The science and literacy experts (n=5) qualitatively evaluated the rubric in three ways:

1. They analyzed the rubric for alignment with AAAS Project 2061 science education standards to discern the relationship between research-based goals articulated in the standards and their iteration with the rubric narrative descriptions;
2. They determined that the scientific method descriptions and levels were appropriate for an elementary and secondary audience and indeed addressed the structure of scientific inquiry; and
3. The rubric cell descriptions were open-ended enough to support a variety of scientific investigations and use of a wide array of digital media.

Results and Discussion

The MESPR provides a scaffold or tool that enables students to focus on presenting a science project where they must synthesize the scientific inquiry model and scientific processes into a coherent presentation using various media formats. Friedman [6] identifies eight roles that individuals will need to participate in the flattened world. Two of these roles are the synthesizer and adapter. The synthesizer is able to see relationships between unrelated phenomena to form one idea or entity. The other role, leverager, describes individuals who can self-monitor or self-assess in order to meet the continuously changing workplace demands by using an inquiry model (identifying a problem, analyzing, solving, and redesigning) to solve problems in ways that others can replicate.

Another set of benchmarks to which the rubric shows strong alignment is the nature of technology and the designed world. As students integrate digital technologies into the presentation, they are gaining valuable experience in using technology to communicate ideas in a responsible manner that follows scientific procedures. The rubric is also aligned with the AAAS Project 2061 benchmarks, common themes and habits of mind. As students complete the scientific inquiry process and report results, the rubric focuses students' attention on being able to explain some of the common themes found in the benchmarks and being able to develop those scientific habits of mind necessary for becoming productive members of the ever-changing society and workplace. Finally, as students choose their own inquiry topics, they will meet other benchmarks (e.g., the living environment, the human organism, human society) distinctive to their focus area.

The final criteria for determining face validity focuses on whether descriptions are open-ended enough to support a variety of scientific investigations and use of a wide array of digital media. The descriptions within the rubric are open-ended to the degree that the scientific inquiry model allows. There are certain characteristics inherently necessary to be included within the descriptors that characterize this model. The rubric also allows students flexibility in using a wide array of digital media to communicate their projects to a specific audience in a professional manner. In thinking about the aforementioned roles described by Friedman [6]), students are afforded the opportunity to use digital media to enhance their science presentations that will better prepare them to live in the *flat world* described by Friedman.

Teaching and Learning Value and Utility of the MESPR

The value of an assessment is the degree to which it enhances the minute-by-minute interactions in the classroom by aligning learning goals with discussions pointed to achieving those goals. The utility of an assessment relates to the extent to which results correlate with science experiment learning goals. As teachers search for creative ways to engage students in the learning process, the MESPR contains value for facilitating science inquiry in the following ways: (a) it provides a formal document where teachers are able to communicate their expectations for the presentation; (b) it provides the necessary information so that students understand the criteria for designing a presentation that meets the standards; (c) it provides a framework for students to assess their own performance focusing the locus of control and ownership of work on the student.

Nicol and Macfarlane-Dick [16] describe five principles that support the use of formative assessments like the MESPR. The assessment: helps clarify what good performance is (goals, criteria, expected standards)

1. Facilitates the development of self-assessment (reflection) in learning
2. Delivers high-quality information to students about their learning
3. Encourages teacher and peer dialogue around learning, and
4. Provides information that teachers can use to help shape teaching" (p. 205).

These principles certainly apply to teacher and peer feedback that can be given using the MESPR, as well as self-assessment and reflection.

National and state standards incorporating technology are increasingly required and the MESPR incorporates novel digital media as a tool for motivating students to engage in the learning process. This alignment with standards provides evidence of assessment utility. When students are given opportunities to use out-of-school literacies (e.g., web development, wiki, blog, social networking) that use digital media, they are more engaged and motivated in the learning process [2], [8], [9], [19], [21]. In addition to fostering connections to out-of-school literacies, the rubric serves as a scaffold where students are able to make choices about the media included in their presentation.

Promoting Literacy (and Science Literacy)

The MESPR provides students with a myriad of ways to highlight their literate lives. Students are engaged in many literate activities outside of school that promote literacy competency. Too often, in-school literacy tasks do not mirror the ways that students use literacy in their everyday lives [5]. Thus, the MESPR allows students to demonstrate their out-of-school expertise in their science courses. Another way that the MESPR highlights students' literacy is that it allows students to build on their multiliterate communication abilities using an array of digital media. Designing presentations described in the MESPR, students showcase their technological, visual, media, and information literacy skills. Using these multiliteracies, a term coined by the New London Group [20], students "discover voice, confidence, and structure in their writing" [20]. The MESPR also provides an avenue through which students can collaborate with peers as they seek peer feedback related to the creation of their presentation. This collaboration captures high levels of literate discussion related to the multiliteracies cited above. Students' experiences may foster a new "respect for classmates and their opinions, understanding work team dynamics, and using them for high-quality outcomes, taking turns, recognizing the different learning that can occur in the collaborative and cooperative context" [1].

In considering how the MESPR aligns with National Council of Teachers of English (NCTE) and International Reading Association (IRA) Standards for the English Language Arts [7], several connections are evident. Specifically, standards one, three through eight, eleven, and twelve most parallel with MESPR and the literacy processes required to design and implement the presentation. The Standards [7] are listed below.

Standard One: Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.

Standard Three: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).

Standard Four: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

Standard Five: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

Standard Six: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.

Standard Seven: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

Standard Eight: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

Standard Eleven: Students participate as knowledgeable, reflective, creative, and critical members of a variety of literacy communities.

Standard Twelve: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information). [7]

In addition, the Partnership for 21st Century Skills [18] identifies learning skills relevant for students who will job-search with individuals in a highly competitive global society, or flattened world, as described by Freidman [6]. The Partnership describes three discrete categories of skills: information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. The MESPR supplies a structure for designing the presentation that fosters students' development in these key skills identified as crucial for student success in the global workplace.

Conclusions

In the current paper, the authors have identified several attributes inherent to the MESPR as a tool for promoting teacher-student and student-student interaction along science methods and science literacy understanding. The National Science Education Standards [15] has made the call for science educators to address these under-utilized educationally important areas:

> *Everyone needs to use scientific information to make choices that arise every day. Everyone needs to be able to engage intelligently in public discourse and debate about important issues that involve science and technology. And everyone deserves to share in the excitement and personal fulfillment that can come from understanding and learning about the natural world.*

The importance for our future democracy of educating students literate in science cannot be underestimated:

> *Scientific literacy also is of increasing importance in the workplace. More and more jobs demand advanced skills, requiring that people be able to learn, reason, think creatively, make decisions, and solve problems. An understanding of science and the processes of science contributes in an essential way to these skills. Other countries are investing heavily to create scientifically and technically literate work forces.*

Therefore, the need to address technology at all grade levels is crucial. Technology "involves the purposeful application of knowledge, experience, and resources to create products and processes that meet human needs" (Curriculum Corporation, 1993). Many times, children take technology for granted, or they may not be aware of what constitutes technology or a tool. When design and technology are incorporated into the science curriculum, students are more likely to become natural explorers. The students can channel their creative impulses to express ideas, solve problems, and present their findings to others in creative ways as they integrate digital media into their presentations. Using the Media-Enhanced Science Presentation Rubric (MESPR) will promote creative expression and problem-solving by having the students model scientific thinking and share observations through the use of technology that will better prepare them for the workforce.

As teachers use the MESPR, they will have the opportunity to observe and question students about their work. Teacher guidance will help students consider what is reasonable and possible. According to the American Association of Science [3], the discussions necessary to make decisions are part of the design process and teach students about the '*constraints*' involved whenever a project is to be undertaken" (p. 49). Teachers will be able to observe the learning process, and through these observations, the teacher's knowledge about students and what they are learning will be richer and more comprehensive.

Dodge, Jablon, and Bickart (1994), in *Constructing Curriculum for the Primary Grades*, stated that giving students a chance to apply knowledge they have gained during a study by building a model, making a presentation, or building an exhibit helps them synthesize what they have learned and feel proud of the work they have done. Media-enhanced science presentations are perfect for sharing their knowledge about a topic with family members and members of a larger community.

The MESPR rubric cell descriptions were open-ended to support a variety of scientific investigations. According to the *National Science Education Standards* over the course of grades K-4, student investigations and design problems should incorporate more than one material and several contexts in science and technology. Experiences should be complemented by observation and analysis skills using a sequence of stages—stating the problem, designing the approach, implementing the solution, evaluating the solution, and communicating the problem, design, and solution. The MESPR would serve to further enhance communicating the problem, design, and solution. The students could include text, hypertext, graphic, audio, and/or video to accentuate their experiences. Furthermore, students can incorporate and explore many different forms of technology and tools that scientists use to enhance their knowledge and broaden their inventive energy in school and later in the workforce!

Further research is recommended to technically examine the presence of other validity qualities of the MESPR for assessing student science presentations and determining the degree to which high performance on the MESPR is correlated with other high performance on science literacy tasks. Significant results might bridge the divide between instruments with high classroom value and utility for teaching and learning to norm referenced measures used to advise science education policy makers.

Student Responses to the MESPR

In an effort to incorporate feedback about the use of the MESPR from students, the authors gathered responses from teacher education candidates from their use of the rubric in an undergraduate science methods course, to better understand how to communicate with in-service teachers in professional development efforts. Selected comments from students are paraphrased:

1. The rubric columns are easy to figure out as the scientific method components are clear and straightforward.
2. The media elements seem very high-level and would require training to accomplish 3s.
3. Students in all probability would require extra technology training in addition to having to learn about the scientific method.
4. Younger students may not have the competencies to convey ideas at the top levels of the rubric.
5. The rubric "helps me to understand what to teach and to talk to the kids about…" and seems like it would be appropriate for science fair projects developed over time.
6. Experiencing the rubric would be valuable for preparing presentations along expectations of fully developed components.

The overall consensus of the undergraduate teacher education students in the science methods course suggests the need to promote science literacy in the classroom with a technology component, together with other traditionally understood aspects of science literacy such as the scientific method.

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