STEM CURRICULUM REVIEW RUBRIC
REVIEWER GUIDE

The STEM Curriculum Review Framework (SCRF) provides the components needed for a comprehensive review of STEM content and professional development resources to ensure that these materials are culturally responsive and can be integrated into high-impact instructional strategies that promote learning for all students. The following are the three components identified for the SCRF based on STEM education standards requirements, STEM education best practices and innovative approaches of the NASA EPDC.

Cultural Relevance: Respect for the culture and language of the learner. Kaser (2010) states that diverse learners need opportunities to make connections to STEM learning through their cultural beliefs and practices.

Alignment to Standards: NGSS and Math Common Core. STEM curricula should be aligned across disciplines from grades K-12 - integrating math, science and engineering process is as a way to improve STEM education (Dushl et al. 2007).

Instructional Strategies: Best practices on effective STEM instruction capitalizes on students' early interest and experiences, identifies and builds on what they know, engages them in STEM practices, and provides them with experiences to sustain their interest. Some key elements that contribute to effective STEM instruction include inquiry-based and collaborative learning, and creating sense of belonging (Duschl et al. 2007; Huang et al. 2008; Morrison et al. 2008).

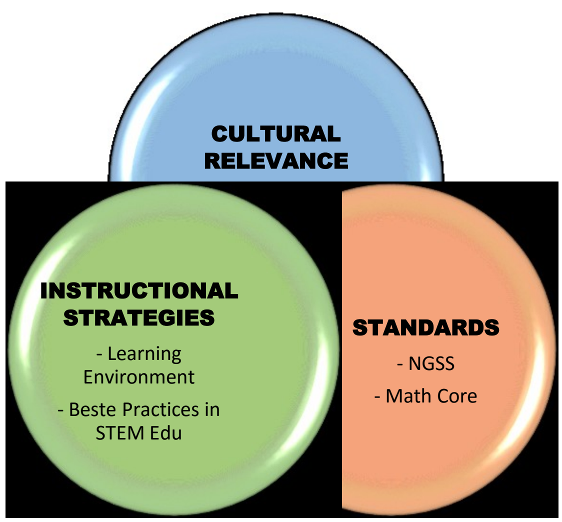

Figure 1: STEM Curriculum Review Framework (SCRF)

DIRECTIONS

The first step in the review process is to become familiar with the rubric, the NASA resource or activity, and the practices, disciplinary core ideas, and crosscutting concepts targeted in the lesson or unit. The three components in the rubric correspond to: alignment to standards, instructional strategies and cultural responsive teaching. Specific criteria within each component should be considered separately as part of the complete review process and are used to provide sufficient information for determination of overall quality of the resource or activity.

The rubric can be applied by an individual or as collaboratively effort with a team of reviewers from diverse disciplinary backgrounds.

Step 1 – Review of Resource

The first step in the review process is to become familiar with the rubric, the resource or activity, NGSS and the Math Common Core.

- Fill out the top of the SCRF rubric with your information and the activity identification number or code. For resources such as the NASA resources, usually there is a product number you can use.

Step 2 – Apply Criteria to Standards, Instructional Practices and Cultural Responsive Teaching

The second step is to evaluate the resource or activity using the criteria in the rubric components.

- Closely examine the resource or activity through the "lens" of each criterion in the component of the SCRF rubric.
- Check each criterion by clicking on the square in the form and give it a rating from 0-2.
- Provide written evidence on the rubric form for rating assigned.

Step 3 – Record Own Standards Assessment

The third step is to offer your own assessment on the appropriate coding of the resource or activity based on the NGSS or your state standards.

- Record your own assessment on the grade level appropriate for the resource or activity.
- Record your own assessment for the appropriate NGSS/state standards disciplinary core idea (DCI) coding for the resource or activity. This can include multiple DCIs.

Step 4 – Enhance Resource/Activity

The fourth step is to address any deficiencies in the resource/activity you reviewed.

- Any rankings of 0 or 1 in the rubric should be address in the resource/activity by incorporating your suggested changes in the last two columns.
- After resources/activities have been enhanced by addressing deficiencies the reviewer should consider completing the rubric summary and the CRT addendum forms.

Resources

Resources in this section provide the background for components/elements criteria selected for the NCRF rubric. Terminology and meaning among a disciplines differ and can challenge the work of a multi-disciplinary team. The resources below should provide some clarification on the meaning of the criteria and theoretical backgrounds. It is not meant to be a comprehensive literature review. For more resources refer also to the reference section of the rubric.

Standards

Alignment to Standards: NGSS

http://www.nextgenscience.org/next-generation-science-standards

http://www.nextgenscience.org/resources

Alignment to Standards: Common Core State Standards in Mathematics

http://www.corestandards.org/Math/Practice/

Instructional Strategies

Best Practices in Science and Engineering Teaching

Section A/iii and iv.

The table below describes the differences between problem-based and project-based learning. You can refer to this link http://archive.coe.uga.edu/epltt/images/pbl.gif for the source, complete list of differences and similarities, the list of references and the graph.

Problem-Based Learning	Project-Based Learning
Begins with a problem for students to solve or learn about.	Begins with an end produce or "artifact" in mind.
Problems can be framed in a scenario or case study format.	Production of artifact typically raises one or more problems for student to solve
Students present conclusion of problem-solving process.	Students use or present the product they have created.
Defined problem is driving force.	End product is driving force.

Source: http://archive.coe.uga.edu/epltt/images/pbl.gif

Section C - Argumentation

The skill of argumentation is recognized as a crucial factor for student success in school and beyond. The ability to integrate knowledge and ideas, delineate and evaluate claims and arguments, and assess the reasoning used in arguments is central to the Common Core State Standards (National Governors Association, 2010), particularly related to literacy in science and technical subjects. Indeed, scientific argumentation specifically (being able to develop and analyze scientific claims, supporting the claim with evidence from investigations of the natural world, and explaining and evaluating the reasoning that connects the evidence to the claim) is a critical component of both the Framework for K-12 Science and Engineering (National Research Council, 2012) and the Next Generation Science Standards (NGSS Lead States, 2013) which emphasize that science students must be able to engage in this process.

Source: http://ejse.southwestern.edu/article/view/14359/9672

Section D/ii

Criteria	Clarification of Meaning
☐ ii. The activities are embedded in some greater context that makes the work have a purpose.	Add to guidelines: The activities are complementary to and supportive of a contextual understanding of the world, especially as related to the lives of children.

Section D/iii

Criteria	Clarification of Meaning
☐ iii. The activities make STEM instruction a necessary means to designing an effective product or process.	The activities demonstrate how STEM instruction is very useful and even essential to designing effective products produces and processes.

Mathematics Teaching Practices

This section was adopted from the *Principles to Actions Executive Summary* document of the National Council of Teachers of Mathematics. Follow the link for the complete document.

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=https%3A%2F%2Fwww.nctm.org%2FuploadedFiles%2FStandards_and_Positions%2FPtAExecutiveSummary.pdf&ei=mX1oVfCBHMHzsAX4lIGoDw&usg=AFQjCNFwEp_P4YTFhgORxIHfxmvw5U6UQQ&sig2=Z_SQpEQGe5npUCvKPM72vg&bvm=bv.93990622,d.b2w

Cultural Responsive Teaching

The CRT component was based on the article "Developing Culturally Responsive Mathematics Teaching" by Dr. Julia Aguirre, Assistant Professor at the University of Washington Tacoma. For background information on the rubric criteria go to https://tracs.txstate.edu/access/content/group/1637ec41-ff01-4e65-bd9c-bebedf54b975/Annual%20Meeting%20Materials/Culturally%20responsive%20teaching/Aguirre_TODOSnewsletter_CRMT_CCSMS.pdf.

References

1. Duschl, R. A., Schweingruber, H. A., and Shouse A. W. (2007). Taking Science to School: Learning and Teaching Science in Grades K-8. Editors. National Academic Press, Washington, D.C. 404 pp.
2. Huang, W., Brizuela, B. M., & Wong, P. (2008). Integrating algebra and engineering in the middle school classroom. *Proceedings of the American Society for Engineering Education. Pittsburgh, PA.*

3. Kaser, J. S. (2010). Twelve recommendations for strengthening mathematics and science programs serving a diverse population. *NCSSSMST Journal*, 16(1), 18–19. Retrieved from http://www.eric.ed.gov/PDFS/EJ930655.pdf.

4. Morrison, K. A., Robbins, H. H., & Rose, D. G. (2008). Operationalizing Culturally Relevant Pedagogy: A Synthesis of Classroom-Based Research. *Equity & Excellence in Education*, 41(4), 433-452.