Assessment Resources in Math and Science

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for the Virginia Math & Science Coalition
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This resource list was compiled for the Virginia Math & Science Coalition as a response to the need for the more classroom-based assessment tools for teachers that are consistent with the mathematics and science practices. A particular focus was given to formative assessment, project-based learning and problem-based learning for math and science. The review situates assessment in Virginia within the national context of assessment resources being developed in conjunction with national initiatives such as the *Common Core State Standards for Mathematics* and the *Next Generation Science Standards*.

Assessment Overviews

National Research Council. (2014). *Developing Assessments for the Next Generation Science Standards.* (Committee on Developing Assessments of Science Proficiency in K-12. Board on Testing and Assessment and, J. Pellegrino, M. R. Wilson, J. A. Koenig, & A. S. Beatty, Eds.). Washington, D.C.: The National Academies Press.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: National Council of Teachers of Mathematics.

Two consortia including multiple states are developing assessment for Common Core to be delivered in 2014-2015

- Partnership for Assessment of Readiness for College and Careers (PARCC - http://www.parcconline.org/)
- Smarter Balanced Assessment Consortium (Smarter Balanced - http://www.smarterbalanced.org/)

Formative Assessment

Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). *Assessment for learning: Putting it into practice*. Berkshire, England: Open University Press.

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education*, *5*(1), 7–74.

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, *80*(139-148).

Hammerman, E. L. (2009). *Formative Assessment Strategies for Enhanced Learning in Science, K-8*. Thousand Oaks, Calif: Corwin Press.

Heritage, M. (2010). *Formative Assessment and Next-Generation Assessment Systems: Are We Losing an Opportunity?* Council of Chief State School Officers. Retrieved from http://www.ccsso.org/Documents/2010/Formative_Assessment_Next_Generation_2010.pdf

Keeley, P. (2014). *What Are They Thinking? Promoting Elementary Learning Through Formative Assessment*. Arlington, VA: NSTA Press.
Wiliam, D. (2011). *Embedded formative assessment*. Bloomington, IN: Solution Tree Press.

Task Design

Grootenboer, P. (2009). Rich mathematical tasks in the Maths in the Kimberley (MITK) Project. In R. Hunter, B. Bicknell, & T. Burgess (Eds.), Crossing divides: Proceedings of the 32nd annual conference of the Mathematics Education Research Group of Australasia (Vol. 1). Palmerston North, NZ; MERGA
Kolmos, A. (2010). Premises for changing to PBL. *International Journal for the Scholarship of Teaching and Learning, 4*(1).
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New Basics Branch. (2001). *New basics: The why, what, how and when of rich tasks.* Retrieved online at http://www.education.qld.gov.au/corporate/newbasics
NRICH, (2007). *NRICH Mathematics Project*, www.nrich.maths.org retrieved from the world wide web on January 18, 2012.
Partnership for 21st Century Skills. (P21, 2012). Retrieved from http://www.p21.org/index.php on February 18, 2012.
Piggott, J. (2004). *Mathematics enrichment: What is it and who is it for?* NRICH Mathematics Project, www.nrich.maths.org
Queensland State Education. (2004). *The new basic research report.* Retrieved online from http://www.education.qld.gov.au/corporate/newbasics
Queensland State Education. (2006). *Rich tasks 2005: An analysis of the rich task reports data 2005 including comparisons 2003-2005*. Retrieved online from http://www.education.qld.gov.au/corporate/newbasics
REL Northwest. (2012). Retrieved from http://www.educationnorthwest.org
Rickard, A. (1995). Teaching with problem-oriented curricula: A case study of middle-school mathematics instruction. *Journal of Experimental Education, 64*(1). doi: 10.1080/00220973.1995.9943792
Ridlon, C. L. (2009). Learning mathematics via a problem-centered approach: A two-year study. *Mathematical Thinking and Learning, 11*, 188-225. doi: 10.1080/10986060903225614
UVA-SCPS, Office of Mathematics Outreach. (2011). *21st Century continuation grant project: Responding to Virginia's college and career readiness initiative in mathematics.* PowerPoint presentations used during the Summer Institute, June 27-30, 2011

Implementation & Professional Development for Teachers & Principals

Bay, J. M., Reys, B. J., & Reys, R. E. (1999). The top 10 elements that must be in place to implement standards-based mathematics curricula. *Phi Delta Kappan, 80*(7).
Breyfogle, M. L. (2005). Reflective states associated with creating inquiry-based mathematical discourse. *Teachers and Teaching: Theory and Practice, 11*(2), 151-167. doi: 10.1080/13450600500083915

Clarke, D., Breed, M., & Fraser, S. (2004). The consequences of a problem-based mathematics curriculum. *The Mathematics Educator, 14*(2), 7-16.

Cwikla, J. (2002). *An interview analysis of teachers' reactions to mathematics reform professional development.* Presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Edwards, S. (2011). Managing a standards-based classroom: A specially designed professional development program supports quality instruction by novice teachers. *Mathematics Teaching in the Middle School, 17*(5), 282-286.

Loucks-Horsley, S., Stiles, K. E., Mundry, S., Love, N., & Hewson, P. W. (2010). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.

Manouchehri, A. & Goodman, T. (2000). Implementing mathematics reform: The challenge within. *Educational Studies in Mathematics, 42*, 1-34. doi: 10.1023/A:1004011522216

McCaffrey, D. F., Hamilton, L. S., Stecher, B. M., Klein, S. P., Bugliari, D., & Robyn, A. (2001). Interactions among instructional practices, curriculum, and student achievement: The case of standards-based high school mathematics. *Journal for Research in Mathematics Education, 32(*5), 493-517. doi: 10.2307/749803

Stein, M. K., Smith, M. S., Henningsen, M. A., & Silver, E. A. (2009). *Implementing standards-based mathematics instruction: A casebook for professional development (2nd ed)*. New York: Teachers College Press.

Taplin, M. & Chan, C. (2001). Developing problem-solving practitioners. *Journal of Mathematics Teacher Education, 4*, 285-304.

Trujillo, B. B. (2010). *Brokering mathematics reform: How principals in predominantly Hispanic-serving schools conceive of their leadership roles in the implantation of a district-wide mathematics reform initiative*. (Doctoral dissertation). Retrieved from ProQuest.

Wilson, M. R., & Lloyd, G. (1995*). High school teachers' experiences in a student-centered mathematics curriculum.* Paper presented at the Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, ED 389 603. Columbus, OH.

Zawojewski, J., Chamberlin, M., Hjalmarson, M., & Lewis, C. (2008). Designing design studies for professional development in mathematics education: Studying teachers' interpretive systems. In A. Kelly, R. Lesh, & J. Baek (Eds.), *Handbook of design research in education: Innovations in science, technology, engineering and mathematics learning and teaching* (pp. 219-245). New York: Routledge.

Project-based Learning

Buck Institute for Education (BIE). (2009). *Project based learning toolkit series: PBL starter kit.* Novato, CA: Buck Institute for Education.

Moylan, W. A. (2008). Learning by project: Developing essential 21st century skills using student team projects. *The International Journal of Learning, 15*(9), 287-292.

Rogers, M. A. P., Cross, D. I., Gresalfi, M. S., Trauth-Nare, A. E., & Buck, G. A. (2011). First year implementation of a project-based learning approach: The need for addressing teachers' orientations in the era of reform. *International Journal of Science and Mathematics Education, 9*, 893-917. doi: 10.1007/s10763-010-9248-x

Online Resources for Tasks

Mathematics Assessment Resource Service - http://www.mathshell.org/ba_mars.htm

WestEd Formative Assessment Task Banks for Science - http://www.wested.org/new-resources-making-sense-of-science-formative-assessment-task-banks/

Education Northwest, Assessing Mathematical Understanding - http://educationnorthwest.org/resources/assessing-mathematical-understanding

New England Common Assessment Program, Inquiry Tasks for Science - http://education.vermont.gov/assessment/necap/resources/practice-tests#science