Educator's Voice

NYSUT's Journal of Best Practices in Education Volume V, Spring 2012

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Assessment

Using Formative Assessment Data To Improve Instruction

In this issue . . .

Authors present a range of approaches to day-to-day assessment of students' progress. Teaching teams assess academic and social skills while students are engaged in producing exciting displays and books which will be shared with the wider school community of friends and families. We learn how middle school students are taught to analyze high quality writing, determine criteria for success, and use rubrics to assess their works in progress.

Other authors focus on systematic ways to determine student objectives, take baseline data, and graph student performance. Teachers examine students' understandings of science concepts through the use of Lesson Study, and explore the insights gained from science notebooks. The importance of ongoing daily assessments is highlighted by authors — whether using a structured partner approach to ensure frequent feedback or describing how assessment is interwoven into the fabric of math instruction. The International Baccalaureate approach to assessment is discussed as a powerful tool for developing critical thinking skills.

What each of these descriptions has in common is frequent and meaningful data collection, and changing teaching practice as an immediate outcome of data analysis. These authors give us greater insight into the cycles of the teaching process, and the fundamental importance of using varied assessment practices.

A Publication in Support of NYSUT's Initiative to End the Achievement Gap

Formative Assessment

"Formative assessments are used to guide instruction. Formative (classroom-based) assessments occur during teaching and are embedded in instruction. Results are received instantly, which allows teachers to adjust their instruction immediately. These are typically teacher developed and should be implemented based on teacher judgment."

— *American Federation of Teachers*

"Formative assessments offer one of the most effective ways of building the capacity of teachers to analyze student work, plan and adjust instruction that focuses on the progression of learning and student needs, and understand the nature of education goals."

— *National Education Association*

Important benefits for assessments tied closely to *day-to-day teaching:*

- **Timeliness of data, which helps teachers adjust their methods immediately**
- **Students are able to benefit from these teaching adjustments while they are learning**
- **Students can use the assessment results to improve their learning**

— *S. Chappuis and J. Chappuis*

American Federation of Teachers. (2008). *The appropriate use of student assessments* (p. 3). Washington, DC: Author.

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Dear Colleagues,

NYSUT continues to emphasize the complexity and importance of accurate assessment of student learning. Teachers are constantly assessing: observing what students are doing and saying, changing plans and approaches in response to that continuous flow of information, and recording or tracking the outcomes of those changes. Teaching requires complex, moment-to-moment decision-making.

Formative assessment is arguably the most important and essential of assessment practices since it can be systematically embedded in different stages of instruction and has a direct impact on teachers' next steps. Instructional decisions often occur on the spot, in the moment that the teacher receives new information about the student. The outcome may be a change in approach or materials for the individual student.

This is not the work of a technician who follows a flow chart from a manual, but rather, a skilled professional who is constantly looking at the ecology of the moment. Did that graphic organizer make a difference for Alex? How does Esteban's level of language development in English affect his ability to express what he has learned about a science concept? Do Emma's memory difficulties and impulse control alter how I measure her learning? Does Jorani need to move on quickly to a greater challenge or independent project? Which other team members will have insights and ideas about this student? What approaches can I use to teach student self-assessment? How can I share what I have learned about this young person with her parents or caregivers? How can they assist *me* with information? As a team of school personnel and parents, how can we make this a great year in this student's development?

Teachers can never truly implement every assessment option and instructional support that emerges from their professional knowledge, critical analysis, and creativity. There are limits to time and other resources, challenging class sizes, and often a range of constraints they must work around and mandates to which they must respond. Despite these barriers, a commitment to this work motivates teachers to share their successes with others who could benefit from what they have learned. We proudly present a small sampling of such teachers in this volume. They exemplify a commitment to the belief that students are more than standardized test scores.

Sincerely,

Maria Neira

Maria Neira
Vice President, NYSUT

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Educator's Voice

NYSUT's Journal of Best Practices in Education Volume V, Spring 2012

Assessment

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A Publication in Support of NYSUT's Initiative to End the Achievement Gap

"Wow!" ~ Project-Based Assessment

SUMMARY

This writing team describes a project for which the activities as well as the assessments are inherently differentiated — that is, designed to challenge students with a range of learner characteristics. Using both individual and cooperative group structures, students make progress in ELA, science and social studies through a long-term project on **Animals in the Brazilian Ecosystem**. This project highlights the power of teacher collaboration and culminates for the students in a presentation to family and friends at a *Science and Literacy Fair.*

The hum of productivity heard from the third floor of Lake Avenue Elementary School in Saratoga Springs came from the 27 third-graders eagerly occupied with their Animal Books — one product of a month-long project focused on integrating ELA, science, and social studies curricula. The focus of the project was **Animals in the Brazilian Ecosystem.** The 14 boys and 13 girls, a close-knit learning community, were culturally and economically diverse and demonstrated varying achievement levels. One parent commented that "the rainforest animal unit was a highlight of the year for my daughter." Indeed, all the children in the classroom seemed to truly enjoy this research project. The parent continued:

"She '*brought her work home.*' She continued her research both by searching websites at our house and by going to the public library. She talked about her progress and shared what she had learned with anybody who was willing to listen. My daughter also created a game based on her and her friends' rainforest animals; she and her classmates often played this game during recess."

The Project

This project had several components that were completed by students on their own, as well as in groups:

- ***Student Choice*** [**Individual** Activity] Students were asked to choose a rainforest animal from a list. They were then placed, according to a best effort at meeting preferences, in groups of three students per animal on the list. Our experience, as well as the research,

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Amy Shaw Elsworth, Saratoga Springs Teachers Association
Colleen Carroll, Saratoga Springs City School District

tells us that students benefit from task choice (Locke, Saari, Shaw, & Latham, 1981; Shapira, 1989).

- ***Dividing The Tasks*** [**Group** Decision] Students were asked to agree on who would write each chapter for their particular animal book. A chapter would be needed on (1) appearance, (2) habitat, and (3) living habits.

- ***Researching and Writing Book Chapters*** [**Individual** Activity with Group Discussion] Students worked on their chapters using the writing process (i.e., draft, revise, edit, conference with teacher, type final drafts). Chapters were later compiled into a book.

- ***Developing Essential Questions*** [**Individual** Activity with Group Discussion] Students were asked to develop a "deep" (or essential) question and to answer it in an essay (Jacobs, 1997; Wiggins, 2007).

- ***Creating Related "Word Art"*** [**Individual** Activity] Students were asked to develop an accurate and interesting poem or "word art" about their animal. "Word art" pictures are created by the imaginative positioning of words that students deemed significant in meaning and can be created using the help of online programs such as Wordle (*www.wordle.net*) and Word Clouds for Kids (*www.abcya.com*).

- ***Book Development*** [**Group** Activity and Product] Groups met frequently to discuss their research with one another and to create a group product: a book to share with multiple audiences. The power of collaboration proved tremendous, providing students with an opportunity to discuss facts and implications and share their discoveries with others prior to presentation of the final book project. Commenting on that design, a parent noted:

  "Not only did my child get to know her animal, but she also learned how to work with the others in her group."

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The power of collaboration proved tremendous, providing students with an opportunity to discuss facts and implications and share their discoveries with others.

Develop essential questions. Ask yourselves: What more do I want to know or understand now that I have some factual knowledge about this animal?

- ***3-D Representations*** **[Individual** Activity] Groups worked with the art teacher to create 3-D representations of their animal and its habitat to complement and enhance their display — ultimately to be viewed, along with their book, at the annual *Lake Avenue Elementary Science and Literature Fair*.

Students were given the following list of steps for the project:

Rainforest Animals Project

Your Task

1. Choose a rainforest animal from the list.
You will then be partnered with two other students who chose the same animal.

2. Meet with your group to divide the labor.
There are three factual chapters:

- appearance
- habitat
- living habits

Each of you will need to write ONE of those.

3. Begin researching. Use the websites we have shown you, books from the school and public libraries, and other sources you find. Take notes on the note pages you were given.

4. Meet again with your group to share notes and discuss ideas.

5. Develop essential questions. Ask yourselves: What more do I want to know or understand now that I have some factual knowledge about this animal?

6. Write. Each person will be responsible for three things:

1. A chapter of factual information.
2. An essay answering an essential question that you will ask after doing some research.
3. An extension: word art, Wordle, acrostic poem, or suggest an idea.

7. Draft, revise, edit, conference, type your final drafts.

8. Compile your finished work into a book to share with the class and the world at the Sci-Lit Fair.

- *Please note: You will also be creating a three-dimensional paper animal and habitat to accompany your book in art class.*
- *Throughout this process you will be asked to complete other tasks reporting on your progress and learning. You should feel welcome at any time to add questions, thoughts, and new understandings to the graffiti wall.*

HAVE FUN LEARNING!

Project guidelines and assessment strategies were developed by three third-grade teachers who implemented this project. In preparing for the project and designing the assessment plan, the teachers used a variety of instructional approaches (e.g., Dacey & Lynch, 2007; Fay & Funk, 1995; Fontas & Pinnell, 2006; Harvey & Goudvis, 2007; Tomlinson & McTighe, 2006). They found that performance tasks and drawing on student interests are great ways to create motivation and success. They also attended a BOCES workshop on The Inquiry Model WISE formula (Wonder, Investigate, Synthesize, Express) developed by Paige Jaeger and Mary Ratzer and named by librarian Maria Weeks (2010). The Inquiry Model includes cornerstone assessment, activates thinking, and promotes both information and media literacy in students. Most importantly, it focuses on learning skills rather than memorizing information. Twenty-first century skills, including the incorporation of various technologies and collaborative work, were included in the design. It was ***inherently differentiated*** so that students worked at their ability level at all times. It was open-ended, with no ceiling or limits for learners with unique talents.

To prepare students for success, the teacher initiated the unit with lessons on note-taking, searching for and evaluating sources of information (with emphasis on Internet resources), skimming and scanning, and how authors write to ***inform***. Students were introduced to multiple sources of information including non-fiction works as well as works of fiction which convey an important message (e.g., *The Great Kapok Tree* by Lynn Cherry). Graphic organizers were used to compare and contrast animals in various environments and explore the types of adaptations animals have made (i.e., protective adaptations for getting food).

The Inquiry Model includes cornerstone assessment, activates thinking, and promotes both information and media literacy in students.

Assessment Approaches

This project was designed to include a variety of assessment measures linked to current standards as well as new Common Core Learning Standards (see examples on page 10, at end of article). Students were evaluated on their chapters. Targeted outcomes included whether students:

1. reported factual information in paragraph form,
2. showed a main idea,
3. used detail, and
4. wrote concluding sentences.

For their essential questions, targeted outcomes included whether students:

1. analyzed factual information to ask and answer questions, and

continued on following page

2. expressed in writing and illustration an understanding of the interdependence of living and non-living things in the rainforest ecosystem.

In addition, students completed *Reflection Logs* to answer two of the teacher's essential questions posed for the unit prior to learning and again at the conclusion of the unit. These logs were assessed for growth of understanding. Students were asked:

- How do animals interact with the other living and non-living elements of their environment to form a dynamic ecosystem?
- What can we do to preserve the balance of world ecosystems?

An example of one tool for assessment of targeted outcomes was a rubric (*see below*). This relates to students' individual writing as well as an outcome on collaborative skills. In keeping with the Rainforest theme, the mastery level

Rubric for Rainforest Project

	4: Emergent Layer	3: Canopy	2: Understory	1: Forest Floor
Accurate Detail and Depth	Exceptional number of facts, vivid descriptions.	Substantial number of facts, good amount of detail.	Some facts are accurate, some detail.	Incorrect or few facts, hardly any detail.
Mechanics	Uses rich and imaginative language with 0-1 errors in grammar, punctuation, and spelling.	Appropriate choice of language with 2-5 errors in grammar, punctuation, and spelling.	Some appropriate choice of language with 5-8 errors in grammar, punctuation, and spelling.	Imprecise or inappropriate choice of language with many errors in grammar, punctuation, and spelling.
Number of Sources and Bibliography	Bibliography alphabetized and formatted correctly with at least 8 sources cited.	Bibliography alphabetized and formatted correctly (for the most part) with at least 5 sources cited.	Bibliography incorrectly alphabetized or formatted or fewer than 5 sources cited.	Bibliography missing or incorrectly formatted or fewer than 3 sources cited.
Creativity	Illustrations and word art show factual integrity, rich thought, and creativity.	Illustrations and word art are neat and colorful and reflect some fact knowledge, thought, and creativity.	Illustrations and word art are somewhat neat and colorful but reveal little evidence of fact knowledge or creativity.	Illustrations and word art are not neat and reveal inaccurate use of facts or little thought or creativity.
Growth	Reflections on pre- and post-journals show significant increase in depth of understanding of essential questions.	Reflections on pre- and post-journals show significant increase in understanding of essential questions.	Reflections on pre- and post-journals show some increase in understanding of one of the essential questions.	Reflections on pre- and post-journals show little increase in understanding in either of the essential questions.
Collaboration Skills	Worked cooperatively with each member of the group to create a cohesive, finished product with contributions from each member.	Worked cooperatively with group members most of the time to create a finished product with contributions from each member.	Needed assistance to work cooperatively with group members. Created a finished product with contributions from each member.	Struggled to work cooperatively with group members even with assistance. Created a finished product that lacked components.

is the highest layer of the rainforest: Emergent Layer. The rubric was a quick reporting tool that provided students with feedback about their performance and supplied data about areas of greatest need for individuals and the class as a whole. In response to this data, plans for review and re-teaching were made. For example, one area of need was in student understanding about the necessity for balance in order to have a dynamic ecosystem. The teacher decided to conduct a follow-up lesson in which the class explored the wolf population that had exploded in the West, the resulting imbalance, and the difficulties that caused other species.

A variety of other formative assessments were built into the experience and were designed to provide feedback for teacher and students and allow for constant progress and development. These included:

- ***Individual Conferences:*** Individual conferences were a powerful form of formative assessment. The Reflection Logs formed one component of the conference. Since not all students excel at expressing their knowledge through writing, this gave individuals an opportunity to explain their learning and add to their responses. In these conversations, the teacher was also able to answer a student's questions and clear up misconceptions. This one-to-one experience proved motivating for many students. During a conference, one student who struggles with writing exclaimed,

  "Wow! This is the best project. I have learned so much about the spider monkey, and now I want to help the rainforest."

- ***Posing Questions:*** Students posed their own questions to be answered by classmates. Questions triggered teacher and peer dialogue that not only provided important information, but also enhanced students' experience by allowing them to explain their developing understandings to one another in "third-grade language" (Nicol & MacFarlane-Dick, 2006).

- ***Tickets-to-Lunch:*** Formative exit assessments named "Tickets-to-Lunch" were used to capture student understandings following lessons and discussions. Students handed the teacher a "ticket" with the answer to a posed question as they exited for lunch. While students were at lunch, the teacher read their responses and prepared mini-lessons to complete when they returned from lunch. These lessons reinforced the new understandings of some and corrected the misconceptions of others.

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Individual conferences were a powerful form of formative assessment.

Formative assessments provided immediate feedback about student understanding.

- ***Online Bulletin Boards:*** Stixy (*www.stixy.com*) was used as a collaborative online posting site to give students a forum for explaining their understandings of the interdependence of life. Students could post their thoughts and ideas via the Web and add to it as their understandings grew. This online bulletin board motivated and engaged students, and the teacher could see growth in their learning. Posts provided a window into students' thoughts and prompted classroom discussion while encouraging students to delve deeper.

- ***Graffiti Wall:*** Students filled large sheets of paper hanging on the classroom wall with answers to essential questions. This is a collaborative process as all students are encouraged to post their thoughts, and the resulting "graffiti" remains in place throughout the project (Victoria Curriculum and Assessment Authority, 2009). The graffiti wall was also utilized by the students to ask new questions as a result of their research. The teacher used these questions to inquire with individual students about their facts, help them discover the answers, and scaffold their ability to ask questions.

Due to the age of the students, teachers were sometimes skeptical that they would understand the tasks fully or truly absorb the information. The ongoing assessments, therefore, were critical to informing teachers of student progress. Formative assessments provided immediate feedback about student understanding.

This assessment collection created a portfolio of student work throughout the project and presented an overall picture of each child's growth and ability over time. Dr. Barbara Messier, the principal at Lake Avenue Elementary, commended the project saying:

> "All in one unit, students were able to explore the many layers of academic rigor that often take an entire year to teach."

Assessment information was shared with parents in a variety of ways — including through the rubrics, as well as the displays at the Sci-Lit fair. As one parent put it:

> "Having the chance to exhibit the final product at the Sci-Lit fair is an added bonus. I know that my daughter is extremely proud of what she created."

Additional Accommodations

This project lends itself naturally to meeting the needs of learners at all achievement levels (and could also work well for English language

learners). Students worked independently and received support from an adult as needed. Each student was provided with differentiated reading and research materials. The use of various websites such as *www.Pebblego.com, www.Yahooligans.com,* and WorldBook for Kids (*www.worldbookonline.com/kids/Home*) supported all learners in the research phase and created age- and achievement-appropriate digital environments in which to do their research (e.g., materials matched to reading level). The librarian offered further assistance on an individual basis seeking and ordering materials for students. Students were assessed on both their independent and collaborative skills.

Accommodations for students with special needs included, but were not limited to:

- reading with an adult,
- underlining and highlighting pertinent information,
- working in heterogeneous groups,
- assistive technology — primarily Co-Writer, a software program that interprets spelling and grammar input and offers word suggestions.

The special education teacher and a grade-level assistant worked with the heterogeneous groups in which their targeted students were members. They also used pull-out writing time to assist students receiving Academic Intervention Services and students with Individualized Education Programs. The collaborative approach to this project was a great support for all learners. Exposure to the information as well as repetition each day through multiple modalities and different adults allowed all students to better assimilate the concepts.

What We Learned Along the Way

This project faced some real-world limitations. The major constraint was the need for additional computers for all students to use for greater lengths of time. Furthermore, it would be beneficial to expand the pool of appropriate reading-level resources for future projects. We also learned the importance of ensuring adequate resources for students in the initial stages of the project, and teaching the skills they will need for research.

Final Thoughts

Assessment is so much more than scores on standardized assessments. The strategies described here provide formative information that determines next steps — allowing the teacher to respond and expand instruction. This project also provides summative data on important knowledge and

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These learners identified the profound impact of humans on the rainforest environment and suggested ideas to help solve the problem.

Examples of NYS Learning Standards Addressed through this Project

Examples include standards in place at the time this was written, as well as connections to the *New York State P-12 Common Core Learning Standards for English Language Arts and Literacy (CCLS).*

Standards in Science and Social Studies:

- Students were encouraged to ask questions and seek greater understanding from multiple perspectives. They questioned the explanations they read about and heard from others. They developed relationships among observations to construct descriptions of objects and to form their own explanations and questions (NYS Math, Science and Technology [MST] Standard 1).
- Students used technology to access, evaluate, and transfer information (NYS MST Standard 2).
- The essential questions posed and pondered by the class as a whole as well as by individuals for their books delved deeply into the interdependence of plants and animals and their physical environment (NYS MST Standard 4).
- Through their experiences with this research project students demonstrated understandings of the role geography plays in the lives of people and animals in the interdependent world in which we live (NYS Learning Standards for Social Studies Standard 3).

Standards in English Language Arts and Literacy:

- Read to take notes using differentiated templates from a variety of media, using text features and search tools to locate relevant information (CCLS RI 3.5).
- Determined main idea and detail (CCLS RI 3.2).
- Critically analyzed and evaluated text (ELA Standards 1 and 3).
- Asked and answered questions to demonstrate understanding (CCLS RI 3.1).
- Built on others' ideas, expressed their own ideas clearly, and checked for understanding (ELA Standards 1 and 3, CCLS SL 3.1).
- Wrote informative texts, developed their topics, and performed research (ELA Standards 1 and 3, CCLS W3.2, CCLS W3.7, and CCLS W3.8).
- Used word processing and technology sources to publish their work (CCLS W3.6).

skills. As essays and responses revealed, these learners identified the profound impact of humans on the rainforest environment and suggested ideas to help solve the problem. Many even took the perspective of their animals when responding to their own questions. Most rewarding were the student responses to the final products — in particular, the books they created. As they clutched their finished animal books proudly under their arms, several students were overheard discussing how this book would be on their bookshelves for years to come. The skills they developed in creating it will, no doubt, last even longer.

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Collecting Practice-Based Evidence to Support Teaching and Learning

SUMMARY

Collecting systematic data on student progress is the optimal way to match instructional approaches to individual students as effectively and efficiently as possible. These authors discuss their use of mastery measurement — a method teachers can use to monitor their students' progress with specific skills. In this example, authors describe a process for collecting and analyzing data to monitor student learning and offer specific questions that guide instructional decisions.

Ms. Gardner was asked to work with Alex, a first-grader. The goal was for Alex to master all grade level-appropriate sight words. As she worked with Alex, Ms. Gardner realized that his limited sight word vocabulary was having a negative impact on his reading ability.

As part of the efforts by teachers at Madison High School to prepare students to take the Algebra Regents Examination, Ms. Baker was assigned to work with Carl, a 10th-grade student with a learning disability who was having particular difficulty factoring polynomials, a topic that Carl would encounter on the examination.

To guide their instruction and monitor their students' learning progress, Ms. Gardner and Ms. Baker created assessment probes directly related to learning standards and the skills they needed to teach in order for students to achieve targeted outcomes.

Ms. Gardner's probe involved having Alex read the 41 words on the Dolch sight word list for first grade within one minute. This learning goal was aligned with Grade 1 Literacy Competencies/Fluency: Sight-read automatically grade-level common, high-frequency words (*English Language Arts Core Curriculum: Prekindergarten–Grade 12*, May 2005) as well as Foundation Skills in the *New York State P-12 Common Core Learning Standards for English Language Arts and Literacy*.

Ms. Baker's probe asked Carl to factor 10 polynomials within 15 minutes, (e.g., factor $x^2 + 4x + 3$). This learning

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Spencer J. Salend, United University Professions
Arleigh Baker
Amanda Gardner

goal is aligned to the *New York State P-12 Common Core Learning Standards for Mathematics*, which indicate that high school students should learn to work with polynomials, including knowing their structures and how to rewrite them in equivalent forms. These topics are also specified in the Algebra: Seeing Structure of Equations domain of the high school mathematics standards (A-SSE 1-3).

Prior to beginning their instruction, the teachers administered their probes to obtain a baseline measure of their students' skill levels. Ms. Gardner and Ms. Baker used the baseline data to determine the progress expected of each student. They implemented research-based practices designed to foster Alex's sight word reading and Carl's factoring of polynomials. Ms. Gardner used strategies including guiding Alex in creating mental images to connect with a specific sight word, skywriting (i.e., writing the word in the air) and saying words simultaneously, and engaging in a series of memory-based activities presented in a game format. To improve Carl's factoring skills, Ms. Baker initially used index cards to review recognizing perfect squares and finding their square roots. To have Carl assume greater control over his learning and become an active participant in the lessons, Ms. Baker guided him in creating a mnemonic device for remembering when a factor should be negative and when it should be positive, and worked with him to show him how to use the mnemonic strategy consistently.

On a weekly basis, at the end of the instructional sessions, Ms. Gardner and Ms. Baker administered assessment probes, and graphed and analyzed the data to assess student progress and to make adjustments in their teaching. In analyzing the range of data she collected, Ms. Gardner noticed that Alex's error patterns showed that he either added or omitted vowels, so she decided to focus her instruction on vowels and vowel patterns within sight words. To simplify abstract concepts and to give Carl a procedure with explicitly delineated steps he could follow to solve more complicated problems, Ms. Baker showed Carl how to create a table to organize and choose factors to use in his answers, and taught him to use the "slide and divide method" for

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Teachers examine students' responses to identify areas of difficulty and ineffective patterns in the ways students approach a task and use this information to plan instruction to correct error patterns.

Thus, teachers examine the data collected to inform their teaching and make any necessary adjustments that will foster their students' learning.

factoring, which she found at *http://mrsgalgebra.pbworks.com* (Search: slide and divide).

Pleased with their success, Ms. Gardner and Ms. Baker shared their results with their students and other professionals. They also reflected on their teaching practices. Ms. Gardner felt that her error analysis was instrumental in guiding her instruction. Ms. Baker thought that using visuals helped her to make abstract concepts more concrete and understandable, and that the mnemonic devices and strategies provided Carl with an organizational framework for factoring polynomials.

Practice-Based Evidence

Throughout their careers, educators encounter students like Alex and Carl, who require the use of a variety of research-based strategies (Salend, 2011). For teachers, this means collecting and examining practice-based evidence to assess whether there is a relationship between their instructional strategies and positive changes in their students' academic, social and behavioral development (Detrich, Keyworth, & States, 2008; Maheady & Jabot, 2011).

One assessment strategy that teachers can use to collect practice-based evidence to monitor their students' learning progress and inform their instruction is curriculum-based assessment (CBA) (Salend, 2009). CBA is a progress-monitoring technique that involves use of ongoing, individualized, direct and brief probes of students' progress and proficiency in mastering content and skills directly related to the curriculum and classroom instruction (Foegen & Morrison, 2010). Because CBA probes are relatively brief, low stakes, used repeatedly, and relate to everyday instructional tasks, CBA is a practical and effective way to collect and analyze data over time to assess students' learning progress across the curriculum. A continuous evaluation of teaching effectiveness is also an integral part of CBA. Thus, teachers also examine the data collected to inform their teaching and make any necessary adjustments that will foster their students' learning.

Educators typically use two forms of CBA: curriculum-based measurement (CBM) and mastery measurement (MM) (IRIS Center for Training Enhancements, 2004). CBM involves the use of valid and reliable assessment probes related to multiple skills across the curriculum to systematically identify, compare, and predict student progress based on norms for growth rates across the curriculum (e.g., reading, writing, mathematics) and at various grade levels. Whereas CBM is implemented more systematically as an integral part of the response-to-intervention

(RtI) process, MM is used more informally by teachers to monitor their students' mastery of specific skills currently being taught.

Guidelines for Implementing Mastery Measurement

Using examples related to Ms. Gardner and Ms. Baker, this article presents an application and adaptation of a MM model previously presented by Salend (2009; 2011) to collect and reflect on practice-based evidence regarding the effectiveness of their interventions. While teachers like Ms. Baker and Ms. Gardner used MM to assess their students' learning progress and determine the efficacy of their teaching practices, these guidelines are used more systematically as part of norm-based CBM. The steps in implementing MM involve:

1. Identifying and defining the meaningful school-related tasks and learning objectives to be assessed.

Teachers begin the MM process by examining their curriculum and learning standards to determine the meaningful critical thinking, problem-solving, academic, or performance skills their students need to learn. In the case of students with disabilities, teachers also consult their students' Individualized Education Programs (IEPs) and Section 504 Accommodation Plans. The identified skills are stated as instructional objectives. For example, Ms. Gardner's objective targeted Alex's reading of sight words which were related to the school's literacy standards, and Ms. Baker's objective focused on Carl's ability to factor polynomials, which addressed the state's math learning standards and was an important topic assessed on the Algebra Regents exam.

2. Creating an assessment probe.

Teachers then develop an assessment probe that relates ***directly*** to their instructional objective. In creating the probe, teachers specify: (a) the number and types of items, making sure that the presentation and response modes of the items are consistent with the instructional objective; (b) the sample duration, which refers to the amount of time students will have to complete the assessment probe; (c) the conditions associated with the probe, such as what the teacher says and does, and the materials and resources students will be allowed to use to complete the probe; and (d) the criteria used to score the probe, including the response time for specific items and the acceptable level of precision. For example, Ms. Gardner's probe involved a typed worksheet that contained the 41 words of the Dolch first-grade word list. The words were typed into three columns and Alex was told that he had one minute to read the words aloud from top to bottom in a clear and calm voice. Alex was

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Teachers develop an assessment probe that relates ***directly*** to their instructional objective.

informed that if he came across a word he did not know he should say "skip" and move to the next word. Words were counted as correct when Alex read the word correctly, or when he self-corrected the word within three seconds. Words were counted as incorrect when Alex pronounced the word incorrectly or said "skip."

3. Administering the assessment probe to establish a baseline.

Teachers administer the probe to obtain a ***baseline***, a measure of students' performance on the assessment probe prior to commencing instruction. A baseline provides a level that allows educators to judge the subsequent effectiveness of their instruction.

4. Determining an aimline.

Teachers use the baseline data and the instructional objective to determine an ***aimline***, a dotted diagonal line on a graph that provides an estimate of a student's expected rate of progress from the baseline measures to the expected levels of mastery (see Figures 1 and 2). The aimline is individually determined based on the student's baseline data and learning strengths and challenges as well as the levels of mastery the student is expected to attain and the length of time devoted to instruction. It provides teachers and students with a visual way to determine learning progress and to judge the effectiveness of the instructional program.

5. Designing and delivering varied, research-based, motivating, acceptable, and differentiated instruction.

As Ms. Gardner and Ms. Baker did, teachers use the baseline data and the aimline as reference points to plan and implement varied, research-based, motivating, acceptable, and differentiated instructional strategies. Possible research-based interventions to consider can be identified by:

(a) observing and speaking with other professionals;

(b) attending professional development activities, conferences, and teacher education courses;

(c) participating in face-to-face and online professional learning communities; and

(d) consulting professional journals, books, websites, listservs, wikis and blogs (Huber, 2010).

In choosing research-based interventions, teachers examine the extent to which the research matches the characteristics of their students (e.g., specific disability characteristics, age, gender, socio-economic, cultural and language background), their classrooms (e.g., technology, materials,

scheduling and staffing requirements, group sizes), and the required instructional intensity (e.g., preparation required for implementation) (Jitendra, Burgess, & Gajria, 2011). Teachers also consider acceptability, the extent to which an instructional strategy is viewed by teachers and students as feasible to use, motivating, fair, appropriate for the setting, and consistent with their teaching style and philosophy.

6. Administering the assessment probe following instruction and graphing the data.

Following instruction, teachers administer the assessment probe and graph the data. In graphing the number, percentage, or rate of the correct responses, they use the following guidelines:

- Place the assessment probe skill on the vertical axis.
- Place the teaching sessions in consecutive order on the horizontal axis.
- Raise the zero point above the horizontal axis because it can be hard to see a point if it is directly on the axis.
- Label baseline and intervention phases and use solid vertical lines to separate them.
- Give the graph a title.

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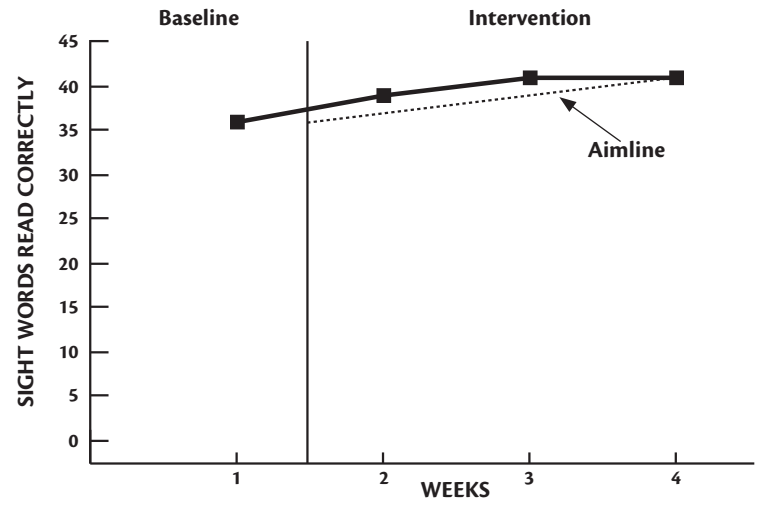
Figure 1

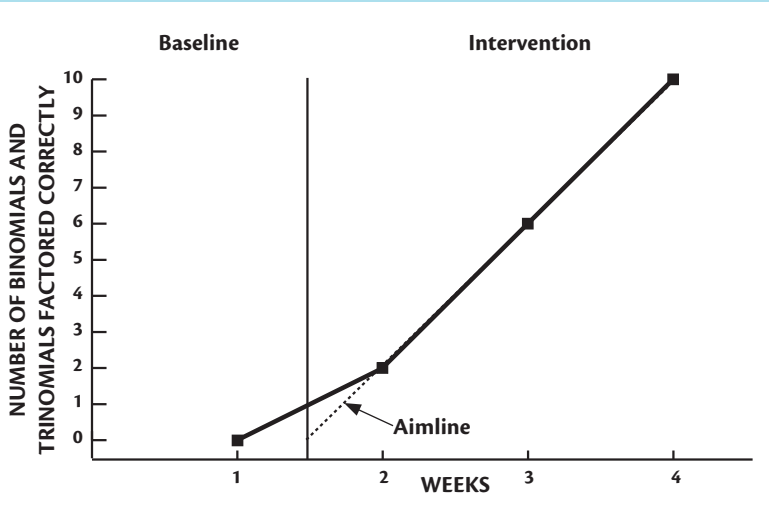
Alex's Sight Word Reading Progress



Ms. Gardner's graph is presented in Figure 1; Ms. Baker's graph is presented in Figure 2.

Figure 2

Carl's Progress on Factoring Polynomials



Students can be asked to offer their opinions about the interventions. Did they like the approach? Was there anything about it that they didn't like?

7. Examining the data to assess student learning progress and inform instruction.

Like Ms. Gardner and Ms. Baker, teachers examine the graph and the data by comparing it to the student's aimline to assess whether the student is making adequate learning progress. Teachers also use the data to make adjustments in their teaching practices. In examining the data, teachers determine whether the student:

- is making adequate progress and therefore instruction should be continued until mastery is established;
- has achieved mastery and is ready for more challenging instructional objectives; or
- is not progressing and therefore adjustments should be instituted related to the level of difficulty of the instructional objective and/or the teaching strategies being delivered.

Teachers also examine students' responses to identify areas of difficulty and ineffective patterns in the ways students approach a task and use this information to plan instruction to correct error patterns. As mentioned earlier, Ms. Gardner's error analysis showed that Alex added or omitted vowels, which caused her to target her instruction on vowels and vowel patterns within sight words. Ms. Baker's data analysis led her to provide Carl with more challenging instruction and to teach him a strategy for solving more complicated problems.

8. Soliciting feedback from students.

Although interventions may foster student learning, they may also have other consequences that need to be examined. For example, an intervention may make a student feel embarrassed or different from her or his classmates (Salend, 2009). Therefore, teachers can solicit feedback from students to view the interventions from their perspective and to understand the consequences associated with their use (Maheady & Gard, 2010). Students can be asked to offer their opinions about the interventions. Did they like the approach? Was there anything about it that they didn't like? For example, when asked which activity he enjoyed the best and why, Alex said, "Skywriting — because I like it and I'm really good at it."

9. Reflecting on the efficacy of the instructional strategies.

Teachers reflect on the data to assess and compare the efficacy of instructional interventions and make decisions about their instructional practices and students' educational programs. They reflect on:

- **Product:** What did my students learn?

- **Process:** How did my students learn it?
- **Reasons:** Were my instructional strategies successful? If so, why? If not, why not?
- **Impact on Students:** Was the intervention effective for all of my students? Some of my students? My students with disabilities? My students who are English language learners? Why? Why not?
- **Unanticipated Consequences:** Were there unanticipated consequences for my students (positive or negative) associated with using the intervention(s)? How about for me (e.g., too time-consuming in comparison to benefit for students)?
- **Improvements:** What steps can I take to enhance the implementation, effectiveness, and acceptability of my instructional strategies? What additional resources do I need and/or preparation tasks do I (or my students) need to do so my instructional strategies can be more effective and efficient?
- **Future:** What are future goals and possible strategies for use with my students?

10. Communicating the results.

Teachers use their graphs and reflections to share information about their students' learning progress with others. For students with disabilities, data can be used to document mastery of specialized goals listed on their IEPs. Teachers also can share their data and graphs with students, families, administrators, and colleagues to demonstrate their use of effective practices that support student learning.

Was the intervention effective for all of my students? Some of my students? My students with disabilities? My students who are English language learners?

Summary

Highly effective educators continually use assessment data to monitor student learning progress, and to plan and differentiate their instruction (New York State United Teachers, 2011). Curriculum-based assessment is one method for collecting evidence and reflecting on practice. In this way, educators are better able to identify and show their use of highly effective interventions that support their students' learning.

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Using *Lesson Study* to Assess Student Thinking in Science

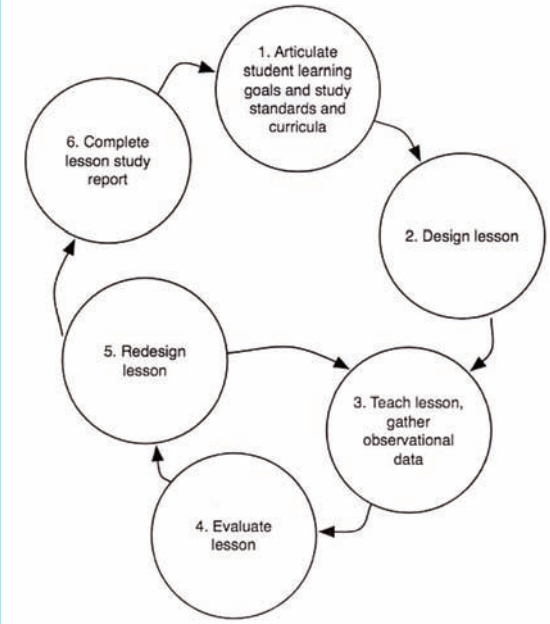
SUMMARY

Teachers examine fourth-grade students' understandings of magnetism through the use of science notebooks. Decisions about student learning outcomes, lesson design, and assessments are derived from the use of a Japanese lesson study approach. Lesson study leads the team through a process which includes a live research lesson with observers who gather extensive data on the lesson and outcomes. This forms a cycle of continuous improvement in all aspects of teaching.

Assessments are opportunities to study student thinking and analyze teaching practices to best develop students' ideas. Assessments, when tightly linked to standards and instructional design, provide information to evaluate: (1) student learning, (2) teaching practice, (3) the effectiveness of curriculum materials, and (4) the standards upon which the lesson is designed.

The purpose of this article is to describe our process for designing a formative assessment of fourth-grade students' ideas about magnetism through the use of science notebooks. The context for designing this assessment was the process of **Japanese lesson study** (Fernandez, 2002; Fernandez & Yoshida, 2004; Lewis, 2002; Lewis, Perry, & Hurd, 2004, 2009; Lewis, Perry, & Murata, 2006; Stigler & Hiebert, 1999). This process is outlined below.

Japanese lesson study process



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Lesson study begins as teachers work together to articulate goals for student learning. This begins with a broad, non-subject-specific goal that describes their students as learners. This broad goal can then be framed for a subject area, like science, then a unit, like magnetism, and finally a lesson. To complete this step, teachers study standards and curriculum to determine existing good ideas that use methods that align with their goals and help students learn. The team in this description is a group of two fourth-grade teachers, a special education teacher, and a science teacher educator.

In Step Two, the team writes a detailed plan to guide students' learning and specify what observers should look for when they attend the lesson. In this approach, observers are invited to view the lesson. Observers may be teachers and others who are invited. Examples of plans are available from sources such as Lewis and Hurd (2011).

Steps Three through Five occur as many times as the team decides are necessary or practical. Step Three begins with one educator from the team teaching the lesson to a class of students. The other members of the team attend this lesson and observe the students engaging in the task the group designed. This is called a "live research lesson" (Lewis, 2002).

Step Four occurs after the lesson implementation. The team meets as soon as possible to discuss the outcome. After this, they go to Step Five: redesigning the lesson based on the evidence of student thinking they gathered in Step Three and discussion they had in Step Four. The lesson can be re-taught to a new group of students, repeating steps Three through Five.

For Step Six, teachers create a report that documents their learning. They can discuss what they know about students' ideas, what they know about teaching that particular lesson in that particular unit, and how their understandings relate to teaching generally and the goals and standards upon which the lesson was based (see Lewis, 2010).

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Lesson study begins as teachers work together to articulate goals for student learning.

We needed to gather evidence in the live research lesson that students were engaged, learning core knowledge, problem-solving independently, and communicating with one another effectively, both orally and in writing.

Step One: Articulate Student Learning Goals and Study Standards

During our lesson study, we worked with other teachers in our school to articulate our broad goal:

> ***We will create an engaging environment to teach students a core body of knowledge to become independent problem solvers and effective communicators.***

Thus, we needed to gather evidence in the live research lesson that students were engaged, learning core knowledge, problem-solving independently, and communicating with one another effectively, both orally and in writing.

After establishing our broad goal, we studied the *Benchmarks for Science Literacy* (American Association for the Advancement of Science, 1994), the *National Science Education Standards* (National Academy of Sciences, 1996), and the *New York State Elementary Science Core Curriculum (Grades K-4)* to understand the indicators or outcomes of student learning for magnetism:

- Without touching them, a magnet pulls on all things made of iron and either pushes or pulls on other magnets (AAAS, 1994).
- Magnets attract and repel each other and certain kinds of other materials (NAS, 1996).
- Magnetism is a force that may attract or repel certain materials *(New York State Elementary Science Core Curriculum,* Standard 4, Key Idea 5, Performance Indicator 5.1).

These descriptions of what students should know about magnets are similar, but they are not identical. There are specifics within each one that informed our planning. For example, in the American Association for the Advancement of Science *Benchmarks for Science Literacy*, the effect of a magnetic force over a distance is stressed in the phrase "without touching." Also, they do not use the term "force"; instead they describe the force as a "push" or a "pull." This resource also distinguishes magnet-to-magnet interactions and magnet-to-iron-based object interactions. These distinctions are maintained in the *National Science Education Standards* as well, but not in the NYS *Elementary Science Core Curriculum.*

Step Two: Design Lesson

From our evaluation of these standards, outcomes, and performance indicators, we taught a series of lessons about magnets from the unit *Magnetism & Electricity* from the *Full Option Science System* (FOSS). FOSS was developed originally by the Lawrence Hall of Science at the University of California at Berkeley in

1993 and revised in 2001. (An overview of the unit can be found at *http://www.fossweb.com.*)

In the original unit, students were given magnets to investigate magnet interactions with objects in the classroom. Then, students would explore how the magnet interacted with a set of other items in the kit. The original lesson called for students to predict first by sorting these objects into two piles: one pile of objects that they predict magnets would attract and one that would not. Students were then asked to test the objects and re-sort them based on their tests. Teachers engaged students in a discussion of what they noticed. Students were then asked to construct an explanation for why a paper clip can stick to a nail that is already touching a magnet. In the original lesson, students were not asked to record their observations, only to generate an explanation of a phenomenon they might not have observed themselves.

We used many of the materials and strategies described above, but we decided to modify the original design by using *science notebook writing*. We think of science notebooks as tools to support students' thinking as they learn in science and as tools for assessment (Aschbacher & Alonzo, 2006; Gilbert & Kotelman, 2005; McQuitty, Dotger, & Khan, 2010; Ruiz-Prino, Li, Ayala, & Shavelson, 2004). Thus, we designed a notebook task in which students recorded this focus question:

What objects will stick to magnets?

We designed this question after studying the teacher's guide and discussing students' ideas from a previous lesson about magnets. We were also concerned that students were not recording their predictions or their observations. Therefore, we designed the notebook task asking students to record:

- their predictions about each object,
- the result of their test of that object with the magnet,
- a claim that identified a pattern in their data,
- support for their claim with evidence from their investigation,
- a conclusion in their notebook that began with the statement, "*Today I learned . . .*" and
- a reflection in their notebook to extend their ideas by beginning with the statement, *"I wonder what would happen if . . ."*

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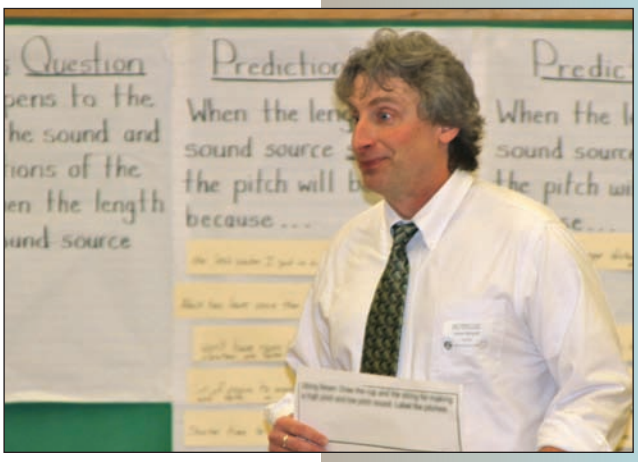


F. Kevin Moquin uses a range of visual supports to enhance student learning.

The science notebooks informed our understanding of students' thinking and, as a result, our lesson design for the future.

We taught the lesson to two other groups of students before we arrived at the final design we report on here. During these lessons, we noticed that as students recorded their ideas, they changed their predictions as they realized they were incorrect. Even though each student was given only one magnet, students shared magnets so they could play with magnet-to-magnet interactions.

Some students were unfamiliar with the names of the 19 objects in the kit. Thus, we made additional changes to our lesson design. In the final lesson, the teacher identified each of the objects in the bag.

The live research lesson was co-taught by a general education and a special education teacher to a class of 23 fourth-graders. All students were Caucasian, ten were female, three had an Individualized Education Program (IEP), four received Academic Intervention Services (AIS), and six received free or reduced-price lunch. Based on the needs of our students, we designed the following accommodations *within* the lesson:

- A typed list of objects to streamline the prediction and data recording process,
- Verbal cueing for the task,
- Individual whiteboards to assist students with spelling new terms, and
- Peer-to-peer discussion of ideas before, during, and after writing.

Step Three: Teach Lesson, Gather Data

In addition to the two teachers working together to teach the lesson, additional adults observed the lesson to gather data: the authors of this paper, other teachers in the building, undergraduate teacher education students, and district administrators. We:

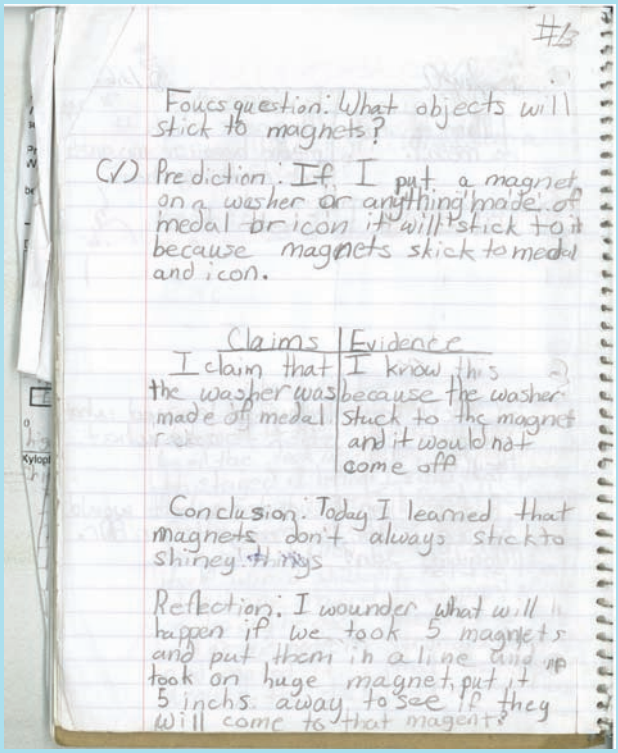
- gathered data regarding students' conversations with one another,
- described student use of materials,
- took photographs of student work and of their problem solving activities,
- videotaped the class, and
- collected students' science notebook entries.

We will focus the remainder of our discussion on the science notebook and how that informed our understanding of students' thinking and, as a result, our lesson design for the future.

An excerpt of a science notebook is shown in Figure 1.

Figure 1

Excerpt of a Science Notebook



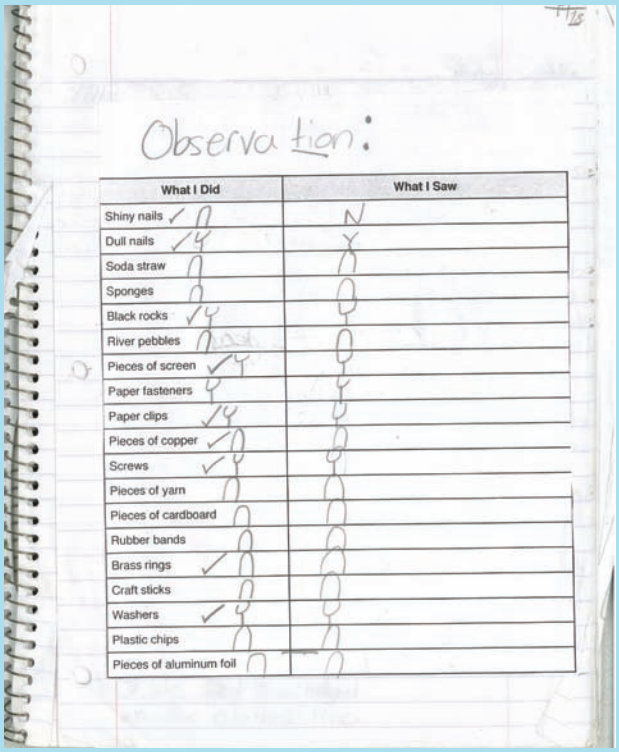
Focus question: What objects will stick to magnets?

(✓) Prediction: If I put a magnet on a washer or anything made of medal or icon it will stick to it because magnets stick to medal and icon.

Claims	Evidence
I claim that the washer was made of medal	I know this because the washer stuck to the magnet and it would not come off

Conclusion: Today I learned that magnets don't always stick to shiney things

Reflection: I wounder what will happen if we took 5 magnets and put them in a line and we took on huge magnet put it 5 inchs away to see if they will come to that magents?



Observation:

What I Did	What I Saw
Shiny nails ✓	N
Dull nails ✓	Y
Soda straw	N
Sponges	N
Black rocks ✓	Y
River pebbles	N
Pieces of screen ✓	Y
Paper fasteners	Y
Paper clips ✓	Y
Pieces of copper ✓	N
Screws ✓	Y
Pieces of yarn	N
Pieces of cardboard	N
Rubber bands	N
Brass rings ✓	N
Craft sticks	N
Washers ✓	Y
Plastic chips	N
Pieces of aluminum foil	N

Science Notebook Writing and The Common Core Learning Standards

Science notebook writing provides an excellent opportunity to engage students in content area writing that aligns with the College and Career Readiness Anchor Standards for Writing in the *NYS P-12 Common Core Learning Standards for English Language Arts & Literacy:*

"Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence" (p. 18).

It is important to note, however, that the science notebook is not a final product. It is a process tool that should be used to give students an opportunity to think and develop over time. Therefore, spelling, terminology, and sentence construction need not be perfect within the science notebook — much as early drafts of many authors' work.

We imagine several ways students could use their science notebook as a tool to develop a product so they could share what they've learned with others. They could create a webpage, a class newsletter, or a school bulletin board to demonstrate their learning using scientific language and traditional writing conventions.

We studied the claims and evidence in the students' notebooks.

Step Four: Evaluate the Notebooks and the Lesson

Our goal was for students to articulate a *pattern* in their predictions. Their actual predictions presented us with insights into students' prior knowledge. Five examples of students' ideas are below. They illustrate the range of responses from the 23 students in the class.

Student 1: ***If I stick a magnet to a brass ring, it will stick because brass is heavy and brass may be gold.***

Student 2: ***If I took a washer and put a magnet on it, I think it will stick because from looking at it, it seems to be meadle (metal) to me.***

Student 3: ***If I had a magnet, I would stick it to the opshons (objects) that they gave me and I would use it on the black rock and the river rock to see if it stuck to both of them.***

Student 4: ***If I put two magnets together then they would either separate or stick together because one of the sides has something different than the other.***

Student 5: ***If I put a magnet on a different magnet then it would stick because the magnetic pulse would pull them together.***

These examples show that the students focused on a singular object to make their prediction. They did not discuss a pattern such as *magnets will not stick to plastics*. We also noticed that Student 3 incorporates the procedure of the investigation into her prediction. Students 4 and 5 discussed the relationship between magnets in their prediction. They offer two different reasons for why the phenomenon might occur.

When we studied the claims and evidence in the students' notebooks, we noticed their claims were specific to individual data points, rather than providing a general rule for the phenomenon. For example, students wrote:

- "I claim that the yarn does not stick because it is soft,"
- "I claim that the washer was made of metal," and
- "If you stick the side of a magnet to another side, they have resistance."

In each of these cases, students made a claim about one of the objects, rather than a claim about a pattern among them. For example, we expected students would say "Objects that do not contain metals will not stick to a magnet. I know this because the yarn, plastic chip, and cotton ball did not stick to the magnet. None of these objects contain metals."

Step Five: Redesign The Lesson

In debriefing the lesson, we studied the teacher guide again (i.e., *Magnetism & Electricity*, 2001). We noticed that in the original lesson, there was wisdom in two distinct practices we had modified. One was the wording of the question. Our question had been: ***What objects will stick to magnets?*** The manual suggested that the question to open the lesson should have been a statement of a problem that pointed toward identifying patterns:

"I'm wondering if there is something that is the same about all the objects that the magnet sticks to."

We hoped students would recognize this pattern when constructing their claims. While a case can be made for both approaches, we now think the original statement would have provided the level of support that was appropriate to our goals.

Another element of redesign was related to the materials. If we had the students create groups of objects by sorting instead of marking a pre-made list in their notebooks, they would have had a group of objects to study to generate their claims. This may have helped them see the pattern more effectively than trying to pick like objects from a list they could not sort.

Step Six: Complete Lesson Study Report

While a lesson study report would address all aspects of the lesson, we will focus here on what we learned about the science notebook as an assessment tool. We feel it was an effective component in our assessment plan for the following reasons:

1. The structure of the notebook task was open-ended enough that we could attribute students' writing to their own ideas, rather than to prompts that may be embedded in directed questions.

2. The structure of the notebook was flexible and therefore able to accommodate the variety of needs and the strategies preferred by our students.

3. The notebook and the associated lesson were well linked to the standards, allowing us to assess students' learning in a way that linked the standards to our practices and then to their ideas.

4. Observing students engage in the task, we learned that the structure of claims and evidence was difficult for them and have begun further inquiry into how to help students improve this portion of their scientific thinking and writing.

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Through our examination of student ideas using science notebooks and lesson study, we were able to study student outcome data that was directly linked to our instructional design. This linkage gives us important information about how to improve our teaching, for this lesson and for other science lessons we will teach in the future. By studying the notebooks, we were able to determine future goals for student writing, particularly for claims and evidence. Through the lesson study process, we experienced true collaboration with colleagues. We advocate the use of science notebooks and lesson study in classrooms and hope other teachers will publicly share their notebook designs and what they learn from their use.

Author Note

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A Method for *All* High School Students: The IB Model

SUMMARY

With the introduction of *Common Core Learning Standards for English Language Arts and Literacy*, there is a renewed emphasis on critical thinking and analyzing texts. An educator who teaches International Baccalaureate (IB) classes describes a model of assessment based on a long-term project of the student's choice, and systematic instruction in the skills of judging sources and synthesizing information. He argues that projects of this nature can be used across the content areas and across the high school years — and can be beneficial for all students.

When assessing students on their academic growth in school, the field of education has often been divided into two camps. The first camp supports the style of "traditional assessment," where evaluation is based on the conventional methods of measuring a student's grasp of the concepts through multiple choice, true-false, fill-in-the-blank, or essay questions. The second camp embraces the concept of "authentic assessment." Authentic assessment has been defined by Grant Wiggins as an approach that engages the learner in:

> worthy problems or questions of importance, in which students must use knowledge to fashion performances effectively and creatively. The tasks are either replicas of or analogous to the kinds of problems faced by adult citizens and consumers or professionals in the field. (1993, p. 229)

Using the definition provided by Wiggins, it seems logical to apply authentic assessment to *any* area of school curriculum to better prepare students for the 21st century. One such program that has embraced this concept is the International Baccalaureate (IB) program. Founded in 1968 in Geneva, Switzerland, the International Baccalaureate Organization (IBO) has blossomed into a worldwide educational program that encourages students to think independently, become academic risk-takers, and to inquire and reflect in an attempt to acquire worldly knowledge. As the IB community has grown, so have the program's ideas regarding assessment. The IB embraces the concepts of assessing students through various formative approaches (i.e., means of improving a student's learning) and summative approaches (i.e., determining the success of a student's comprehension at the end of unit or course). However, the IBO insists that these two methods should not be viewed "as being mutually exclusive" and that "the two approaches should interact and be mutually supportive"

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(IBO, 2004, p. 3). One aspect of the IB program that incorporates both approaches while allowing the students to be authentically assessed is the Internal Assessment (IA) in the high school social studies classroom.

The IA is a historical investigation that "enables students to demonstrate the application of their skills and knowledge, and to pursue their personal interests" in the form of a research paper (IBO, 2008, p. 82). According to the IBO, the history IA allows students to demonstrate their research skills while working at their own pace. The teacher serves as a moderator of their progress and provides feedback to the students throughout the process. Using specific criteria related to each section of the paper, the students work independently over a predetermined timeline to fulfill the IB requirements.

As a high school history teacher, I have taught IB courses and worked with many students in completing IAs. While many districts do not offer IB courses, this does not mean that they cannot integrate a project similar to the IA into their curriculum. An IA is structurally different from a typical history paper. Whereas a history paper traditionally proposes a thesis that is proven throughout the work, an IA is a 1,500–2,000 word "problem-solving activity" (IBO, 2008, p. 84) that allows the students to demonstrate their own research skills and knowledge on a topic of their choice.

The topic that students choose for an IA does not have to be an essential topic covered in the curriculum. While enhancing the knowledge and understanding of the curriculum is imperative, the heart of the IA is focused on skills needed in the discipline of history. Virtually any topic that a student chooses to write about will align with one of the New York State social studies standards of US history, state history, world history, geography, economics, civics, citizenship, and government.

In addition, key skills used to write an IA transcend disciplines and incorporate many of the *New York State P-12*

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Key skills used to write an IA transcend disciplines and incorporate many of the *New York State P-12 Common Core Learning Standards for English Language Arts & Literacy.*

Common Core Learning Standards for English Language Arts & Literacy. According to David T. Conley (2007) of the Educational Policy Improvement Center, the basic skills used in the social studies include emphasizing the skills of "interpreting sources, evaluating evidence and competing claims, and understanding themes and the overall flow of events within larger frameworks or organizing structures" (p. 15). These skills, which are all key components for an IA, are delineated as an outcome for students who meet the *Common Core Learning Standards for English Language Arts & Literacy*; that is, students demonstrate "cogent reasoning and use of evidence that is essential to both private deliberation and responsible citizenship in a democratic republic" (p. 1). As stated in the *Introduction* to the standards, "to conduct research in order to answer questions or solve problems," is so important to being college and career ready that these skills are embedded throughout the standards (p. 2). One example standard (of many) for which the IB is clearly relevant is the following:

> Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (p. 79)

The IA makes it possible for a teacher to incorporate and evaluate a range of skills above (e.g., interpreting sources and evaluating evidence) by dividing the assessment into six different sections. These sections, in the order they should appear in the paper, are: (1) Plan of the Investigation; (2) Summary of Evidence; (3) Evaluation of Sources; (4) Analysis; (5) Conclusion; and (6) Sources and Word Limit.

Step One: Plan of the Investigation

The *Plan of the Investigation* is the opening section of the paper where the student will state what topic will be investigated. The student should explain what will be covered and what will be omitted in the paper. Usually, the topic will be presented in a

question format. By writing a logical *Plan of the Investigation*, a student is showing the ability to select a focused topic that can be researched and answered in a short paper. In my experience, the following types of questions have emerged:

- To what extent did Franklin D. Roosevelt's New Deal plan pull the United States out of the Great Depression?
- How did the music of the 1960s contribute to the growth of the countercultural movement in the United States?
- Did Adolf Hitler's handling of the 1936 Summer Olympics held in Berlin hurt his image as a world leader?

Step Two: Summary of Evidence

In the *Summary of Evidence* section, students attempt to answer their investigative question. The students will prove their research skills by properly citing various sources using a consistent and appropriate citation style. While the IB does not require it, using the *Chicago Manual of Style* or the Turabian *Manual for Writers* is most appropriate for a history paper. Both are often used in college-level history classes. It is important that students write their *Summary of Evidence* in the style that presents the material either thematically or chronologically. For example, a student who is asking, "To what extent did Franklin D. Roosevelt's New Deal plan pull the United States out of the Great Depression?" might approach it chronologically and address the following major events:

- The economic climate of the United States when Roosevelt was elected to office.
- Roosevelt's issuance of a bank holiday during his First Hundred Days in office.
- The Second New Deal of 1935.
- Roosevelt's understanding of Keynesian economics.
- The Roosevelt recession of 1937.
- The economic impact of the Second World War in Europe on the United States.

Step Three: Evaluation of Sources

In the *Evaluation of Sources*, students are asked to evaluate two of the sources they cited in their paper. This section is what makes the IA unique from other traditional history papers. In order to properly evaluate a source, the student must reference the origin,

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Students are learning how to pinpoint the positives and the drawbacks of a source and why a historian must be cognizant of these limitations when researching.

purpose, value and limitations of the source. In essence, the students are learning how to pinpoint the positives and the drawbacks of a source and why a historian must be cognizant of these limitations when researching. Below is an example of what a teacher could use as a model for evaluating a source:

Source:
Sidney Bradshaw Fay, *The Origins of the World War* (United States: Macmillan, 1928).

Origin:
- *The Origins of the World War* was written by American historian Sidney Fay.
- Originally published in 1928, a revised edition of the book was released in 1930.
- Fay received his Ph.D. in history in 1900 from Harvard University and then continued his studies at the University of Berlin.

Purpose:
- The general purpose of *The Origins of the World War,* as indicated by the book's title, was to explain the root causes of the First World War.
- Often considered a revisionist piece, Fay contradicted the traditional belief that Germany was to be blamed for causing the First World War. Rather, Fay believes that the war was a culmination of many different factors.

Value:
- Fay's work has tremendous value for those studying the causes of the First World War. Shedding light on a new interpretation of the causes, Fay believes that the war broke out because of five distinct underlying causes. They are (1) the system of secret alliances; (2) militarism; (3) nationalism; (4) economic imperialism; and (5) the newspaper press.
- The book's value goes beyond Fay's thesis. Fay demonstrates a high level of scholarship with the numerous sources he utilized in his research. The sources are a combination of primary and secondary sources from British, German, American and French archives.

Limitations:
- While Fay's research is outstanding and his thesis is convincing, one must question if this revisionist historian is simply a German sympathizer.
- As previously mentioned, Fay spent some of his time studying at the University of Berlin. It is possible that the daily interaction with the German people made him sensitive to the German plight.
- Fay seemingly dismisses the traditional "blank check" theory that argues that Germany gave Austria unconditional support to declare war on Serbia for the assassination of the Archduke Franz Ferdinand.
- Fay also downplays the roles of the

German hawks in government who felt that a war with Russia was inevitable and if the war began now (1914), Germany stood a better chance of winning.

Step Four: Analysis

The *Analysis* allows students to delve further into the research process by critically examining the findings from their *Summary*. The students are expected to bring forth key elements of their research and make historical connections by contextualizing their topic. As an extension activity, students can present alternative interpretations of their *Summary*. In a recent issue of *Social Education*, former NCSS President Gayle Thieman stated that a key component of authentic assessment is using "digital tools to interpret and evaluate complex information while considering multiple perspectives and alternative solutions" (2011, p. 129). The *Analysis* section fulfills Thieman's criteria. It allows students to not only improve their research skills, but to also become aware of multiple perspectives and understandings. Below is an example of what a teacher could provide for discussing multiple perspectives:

- Compare Fay's *The Origins of the World War* to Berghahn's *Imperial Germany, 1871-1914: Economy, Society, Culture, and Politics.* Whereas Fay argues that multiple factors contributed to the start of the First World War, Berghahn claims that Germany and its aggressive foreign policy is responsible for causing the war.

Students are instructed that by reading both sources, or even just parts of the sources, they will have to utilize their analytical skills to formulate a position. In addition, they will benefit from a more holistic understanding of the causes of the First World War.

Steps Five and Six: Conclusion and the Sources and Word Limit

The last two sections, the *Conclusion* and the *Sources and Word Limit,* bring the research to an end by highlighting the key findings and providing the reader with a complete, properly formatted "Works Cited" page. Students are encouraged to use websites such as RefWorks *(www.refworks.com*) or KnightCite Citation Service (*www.calvin.edu/library/knightcite/*) to help them generate the reference page.

As with all papers, an appropriate rubric must be generated for the IA. The IB bases its "Internal Assessment Criteria" on a scale of 0 to 25. Its rubric is broken down by the six sections of the paper and offers general descriptors that allow the teacher to respond to the unique topic chosen by the student.

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Administrators must realize that every student can write an IA, that they will all benefit from it, and that the key is to capture student interest in a particular topic.

Some administrators will be skeptical about implementing an IA into their curriculum because of the academic level of their students and the time commitment required of the students and teachers. In response to this, first, it is important to note that, as reported by Yazzie-Mintz (2010) in the 2009 *High School Survey of Student Engagement*:

- Only 48 percent of high school respondents claimed to have been challenged in "most" or "all" of their classes (p. 9).
- Only 39 percent of high school students spent between two and five hours a week doing written homework (32 percent spent one or fewer hours, and 7 percent spent no time doing homework) (p. 8).

In contrast,

- 38 percent spent two to five hours watching television or playing video games and,
- 35 percent were spending an equal amount of time chatting and surfing online (p. 8).

While it is admittedly difficult to compete with students' recreational and social interests, there are ways to raise interest in academic work completed during and outside of the regular school day. Administrators must realize that every student can write an IA, that they will all benefit from it, and that the key is to capture student interest in a particular topic. It is the belief of the IBO that every student can handle the rigors of writing an IA. The IB program is not geared toward advanced students but rather toward the enhancement of knowledge for students of all academic levels. Thus, the challenge is to use a process that engages the students in writing an IA — both during the school day and beyond. Some suggestions follow:

- Ask students to write down three things that interest them. These do not have to be historical topics. For example, if a student writes down that he or she is interested in rap music, the teacher should encourage the student to research and write an IA on the origins of rap music or a comparison between the influence of jazz music and rap music on black culture.
- Educate students about the various types of historiography. The IA does not have to be written purely through a political or diplomatic perspective. Cultural, feminist, economic, and military history are just a few of the other widely accepted historical lenses a student can use.
- Students who cannot decide what to write about because of multiple interests should list potential topics and then search for sources at the local library or online that might be helpful in completing the IA.

Topics for which there are a limited number of reliable sources for research are then eliminated.

Even with these suggestions, there will be some reluctant and disengaged students. As the teacher, you have the ability to change the format of the paper to keep the students interested in the process. Districts that do not offer the IB Program also have the luxury of altering the methodology.

For some districts, the IA can serve as a senior exit paper for students to demonstrate their historical skills and understanding of the discipline. However, the paper does not have to be introduced and concluded in the senior year. It is recommended that the different parts of the IA be taught to students throughout their high school experience. For example, 9th-grade teachers can implement the concept of evaluating sources for authenticity and bias. Building on this skill from 9th through 12th grade will enhance the quality of the *Evaluation of Sources* section of the IA. The 10th-grade teachers can continue working with source evaluation but can also introduce a small scale IA by having the students write all of the sections except for the *Analysis*. This will teach students the basic historical skills of: (1) selecting an appropriate topic; (2) writing a history paper; (3) properly citing their sources; (4) explaining the limitations of their research; and (5) generating a "Works Cited" page.

In the 11th grade, students should begin to work on a new IA that will be carried over into their senior year. (The major difference between the 10th- and the 11th-grade paper is the addition of the *Analysis* section.) By gradually introducing the various parts of the paper, much of the anxiety that comes with writing a paper will be quelled.

In my experience with this method, I have seen students who were completely disengaged by the discipline of social studies find a new interest in the subject. Students are being eased into the research and writing process on a topic that they choose. One student decided to research the economic impact of Operation Bootstrap on Puerto Rican society. This student had initially asked:

"Why do we have to study history? It's in the past and we can't change it."

He found writing the IA to be one of the most rewarding tasks he was asked to complete in high school. Acting as an economic historian, this student stated that,

"After every sentence I wrote, I kept asking myself 'why?' I wanted to get into the mindset of the economists of that time period."

If an IA can turn a reluctant teenager into a student with historical curiosity,

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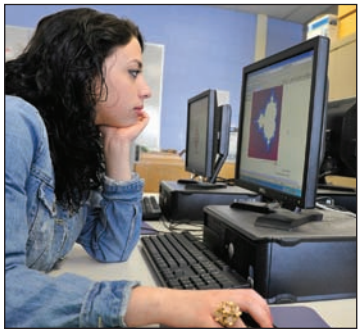
I have seen students who were completely disengaged by the discipline of social studies find a new interest in the subject.



the IA or a similar project should be seriously considered by all teachers. This student was clearly building critical thinking skills.

In a time when the teaching profession is the focus of national debate, it is imperative that the public better understand effective teacher practices. Authentic assessment can result in products that build understanding, not only on the part of students, but parents and community members as well. The IA lets students leave a social studies classroom with a well-researched history paper that not only demonstrates their ability to write, but accentuates their skills in reading, conceptualizing, and theorizing. One area of concern expressed by post-secondary teachers is that incoming freshmen do not have the reading and writing skills expected at the collegiate level. These concerns were justified when the ACT published its annual report showing that nationally, only 66 percent of high school graduates who participated in the English ACT and 52 percent in the Reading ACT were college-ready (see "The Condition of College & Career Readiness: 2010", p. 8). In New York, only 37 percent of students who entered high school in 2006 left four years later adequately prepared for college — that is, they met the state's college-ready standard of scoring a 75 on the English Regents and an 80 on the math Regents (Otterman, 2011, p. 23). While the IA cannot guarantee improved literacy skills for all, it would be a step in the right direction in acting on the concerns of college educators.

In 2006, educational theorists McCarthy and Kuh noted that "the more students practice a skill, such as reading, writing, or problem solving, the more adept they become at the activity, especially when they get feedback about their performance" (p. 665). By correctly implementing an IA into the curriculum and providing ongoing feedback, schools will be launching a new initiative toward building critical skills in reading, writing, and research and will better prepare students for college and beyond.

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Beyond "I Give Myself an A"

SUMMARY

Students take responsibility for improving their academic skills by analyzing models, developing criteria for success and using rubrics to create, assess and revise their work — whether it be a persuasive essay or a mathematics challenge. In this way, students learn how to recognize and define excellence and use tools to achieve it.

Research has shown that feedback tends to promote learning and achievement (Bangert-Drowns et al., 1991; Butler & Winne, 1995; Crooks, 1988; Hattie & Timperley, 2007), yet most students get little informative feedback on their work (Black & Wiliam, 1998). The scarcity of feedback in most classrooms is due, in large part, to the fact that few teachers have the time to respond as often as they would like to each student's work. Fortunately, research also shows that students themselves can be useful sources of feedback via self-assessment (Andrade, Du & Mycek, 2010; Andrade, Du, & Wang, 2008; Ross, Rolheiser, & Hogaboam-Gray, 1999).

Self-assessment is a process of formative assessment during which students reflect on the quality of their work, judge the degree to which it meets explicitly stated goals or criteria, and revise accordingly. The emphasis here is on the word *formative*.

Self-assessment is done on drafts of works in progress in order to inform revision and improvement; it is not a matter of having students determining their own grades. Given what we know about human nature, as well as findings from research regarding students' tendency to inflate self-evaluations when they will count toward formal grades (Boud & Falchikov, 1989), we subscribe to a purely *formative* type of student self-assessment.

Self-assessment meets the criteria of high-quality formative assessment practice outlined by Wiliam (2007):

1) clarifying, sharing, and understanding learning intentions and criteria for success by discussing model assignments and co-creating rubrics;

2) engineering effective classroom discussions, questions, and tasks that elicit evidence of learning;

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3) providing feedback that moves learners forward, in this case self-generated feedback;

4) activating students as instructional resources for themselves; and

5) activating students as the owners of their own learning by empowering them to think about the quality of their own learning and work and how to make improvements to both.

Features of Self-Assessment Using Rubrics and Checklists

Thoughtful self-assessment is often scaffolded by a rubric. Rubrics have become popular with teachers as a means of communicating expectations for an assignment, providing focused feedback on works in progress, and grading final products (Andrade, 2000; Jonsson & Svingby, 2007; Moskal, 2003; Popham, 1997). Although educators tend to define the word "rubric" in slightly different ways, a commonly accepted definition is a document that articulates the expectations for an assignment by listing the criteria, or what counts, and describing levels of quality from excellent to poor (Andrade, 2000).

Rubrics are often used to grade student work, but many authors argue that they can serve another, more important role as well: Rubrics can *teach as well as evaluate* (Arter & McTighe, 2001; Quinlan, 2006; Spandel, 2006; Stiggins, 2001). Rubrics become a teaching tool when students use them to understand the goals of and standards for an assignment, compare their work-in-progress to those goals and standards, and determine how to fill in any gaps. Rubric-referenced self-assessment is a process of formative assessment in which students use a rubric (or checklist) to guide their judgments about the quality of their own work. The self-assessment process typically involves the following steps:

- Students are presented with one or more *models* of the activity/assignment.
- Teachers and students discuss the *model's strengths and weaknesses.*
- Students *co-create the rubric* or contribute to rubric criteria with teachers.

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If students produce it, they can assess it; and if they can assess it, they can improve it.

Students:

View a Model

Critique the Model

Contribute to Rubric Criteria

Create a Product

Self-assess with Rubric

Revise and Improve the Product

After the teacher produces a rubric based on the discussion held previously with students and distributes it in a form that individuals can use:

- Students *complete the learning activity/assignment* with the rubric as a guideline.
- Students *self-assess* the outcome using the rubric in a systematic, step-by-step process.
- Students *revise and improve* their work actively referencing scoring criteria.

Andrade and her colleagues (i.e., Andrade, Du, & Mycek, 2010; Andrade, Du, & Wang, 2008) have shown that reviewing a model, generating criteria, and using a rubric to self-assess can help middle-level students improve their writing. In the ELA and social studies classes that were the focus of research, the instructional targets were related to writing a persuasive essay. These targets were drawn from NYS *Learning Standards for English Language Arts* in effect at the time (Standard 3: Students will read, write, listen, and speak for critical analysis and evaluation. See *New York State P-12 Common Core Learning Standards for English Language Arts and Literacy* for new standards).

Students in the groups using self-assessment discussed a model essay and generated criteria for their writing assignments by identifying the qualities that made the model effective. Before the students began the essays, the rubric, which included the criteria generated by these students during the previous class, was handed out and explained. The rubric specified the following criteria: content, organization, voice, word choice, sentence fluency, and conventions. At right, see an example of a persuasive essay rubric.

The purposes and features of the self-assessment process were discussed and demonstrated, and any questions and concerns were addressed. Students used class time to work on their essays. The teacher then guided them in assessing their work according to the rubric. This self-assessment process was highly scaffolded (i.e., students were given a high degree of support in learning and completing the process). Students were asked to:

1. **Underline** key phrases in the highest achievement column of the rubric with colored pencils in order to highlight the characteristics they were to self-assess, one at a time (e.g., underline in blue the phrase "clearly states an opinion" in the rubric).

2. **Underline** or circle in their drafts the **evidence** of having met the particular criterion. For example, students would underline in blue the statement of their opinion.

Persuasive Essay Rubric

	4	3	2	1
Ideas and content	The paper clearly states an opinion and gives 3 clear, detailed reasons in support of it. Opposing views are addressed.	An opinion is given. One reason may be unclear or lack detail. Opposing views are mentioned.	An opinion is given. The reasons given tend to be weak or inaccurate. May get off topic.	The opinion and support for it is buried, confused and/or unclear.
Organization	The paper has an interesting beginning, developed middle and satisfying conclusion in an order that makes sense. Paragraphs are indented, have topic and closing sentences, and main ideas.	The paper has a beginning, middle and end in an order that makes sense. Paragraphs are indented; some have topic and closing sentences.	The paper has an attempt at a beginning and/or ending. Some ideas may seem out of order. Some problems with paragraphs.	There is no real beginning or ending. The ideas seem loosely strung together. No paragraph formatting.
Voice and tone	The writing shows what the writer thinks and feels. It sounds like the writer cares about the topic.	The writing seems sincere but the writer's voice fades in and out.	The paper could have been written by anyone. It shows very little about what the writer thought and felt.	The writing is bland and sounds like the writer doesn't like the topic. No thoughts or feelings.
Word choice	The words used are descriptive but natural, varied and vivid.	The words used are correct, with a few attempts at vivid language.	The words used are ordinary. Some may sound forced or clichéd.	The same words are used over and over, some incorrectly.
Sentence fluency	Sentences are clear, complete, begin in different ways, and vary in length.	Mostly well-constructed sentences. Some variety in beginnings and length.	Many poorly constructed sentences. Little variety in beginnings or length.	Incomplete, run-on and awkward sentences make the paper hard to read.
Conventions	Spelling, punctuation, capitalization, and grammar are correct. Only minor edits are needed.	Spelling, punctuation and capitalization are usually correct. Some problems with grammar.	There are enough errors to make the writing hard to read and understand.	The writing is almost impossible to read because of errors.

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3. If they could not find evidence of having met the standard, students would **write a specific note** at the top of their draft related to necessary improvements for their final drafts (e.g., "Add opinion" or "Make opinion more clear").

4. **Repeat** this process for each criterion and sub-criterion on the rubric.

5. **Revise** their work according to their analysis.

The authors are currently developing a similar process of self-assessment in a seventh-grade mathematics class. In the mathematics class, the instructional target was to solve extended response problems requiring the use of the Pythagorean Theorem to find the length of the hypotenuse or a leg of a right triangle.

This target was drawn from NYS Learning Standards in effect at the time (NYS Mathematics Standard: 7.G.8 Use the Pythagorean Theorem. See *New York State P-12 Common Core Learning Standards for Mathematics* for new standards).

For this research project, students are given extended response questions and told they will be asked to solve them, to self-assess according to a partially co-created checklist, and to revise their work as needed. The self-assessment checklist will include both process and product criteria.

The ***process*** criteria involve students in:

- Checking their understanding of the task
- Explaining what is known
- Planning an approach
- Solving the problem
- Explaining their solution
- Checking their solution

The ***product*** criteria are co-created with students:

- Appropriate formula
- Diagram with clear labels
- All work shown and connected to final answer
- Correct calculations
- Final answer clearly identified
- Answer labeled with units, if appropriate

See checklist at right.

Mathematics Checklist

	√		
1		**Understand the task**	I can clearly state what the problem is asking me to find.
2		**Explain what is known**	I can clearly explain the given information (what I know from the problem). I use words, numbers, and diagrams as appropriate.
3		**Plan an approach**	I can clearly describe my chosen strategy, which is efficient and sophisticated (e.g., "I will make a table," "make an organized list," "draw a diagram").
4		**Solve the problem**	I use my plan to solve every part of the problem. If my strategy doesn't work, I try a new one. I write out all the steps in my solution so the reader doesn't have to guess at how or why I did what I did. I use words, numbers, and diagrams/charts/graphs, as appropriate. My work is clearly labeled.
5		**Explain the solution**	I clearly explain my solution and why I believe it is correct using precise and correct math terms and notations. I check to make sure my solution is reasonable. I check for possible flaws in my reasoning or my computations. If I can, I solve the problem in a different way and get the same answer.
6		**Check the solution**	I check my solution according to the scoring criteria. **Scoring Criteria:** ___ Appropriate formula ___ Diagram with clear labels ___ All work shown and connected to final answer ___ Correct calculations ___ Final answer clearly identified ___ Answer labeled with units, if appropriate If my solution is incorrect, I find my mistake, determine a new plan, solve the problem, and justify my new answer.

WHAT DOES THE RESEARCH SAY?

Rubric-referenced self-assessment was associated with higher scores on significant, meaningful aspects of writing.

Formative Self-Assessment Leads to Gains in Student Learning

The steps of self-assessment described here have been associated with improvements in learning. For example, improvements have been shown in elementary and middle-level students' writing (Andrade, Du & Mycek, 2010; Andrade, Du, & Wang, 2008). In these and other studies (Ross, Rolheiser, & Hogaboam-Gray, 1999), students improved not just in terms of mechanics, but also in their ability to handle sophisticated qualities such as content, organization, and voice. The fact that rubric-referenced self-assessment was associated with higher scores on important qualities like ideas and content testifies to the potential of such processes to help students master significant, meaningful aspects of writing — at least when the rubrics emphasize those important qualities and when students are actively involved in using them (Andrade, 2006). The improvements in the quality of student writing had practical as well as statistical significance. For instance, when the findings of the 2008 study by Andrade, Du, and Wang were translated into typical classroom grades, the average grade for the group that engaged in rubric-referenced self-assessment was a low B, whereas the average grade for the comparison group was a high C.

Similar results have been found in mathematics. After teaching some educators to implement self-assessment in their fifth- and sixth-grade math classes, Ross, Hogaboam-Gray and Rolheiser (2002) found that students in the group using this approach outperformed students in the comparison group. Self-assessment has also been shown to be associated with student achievement in social studies (Lewbel & Hibbard, 2001), science (White & Frederiksen, 1998), and even on external national examinations (MacDonald & Boud, 2003). Self-assessment can be useful in any subject. If students produce it, they can assess it; and if they can assess it, they can improve it.

Because the purpose of student self-assessment is to engage students in critiquing their work with an eye for possible improvements, the information collected via self-assessment in both the writing and math projects was used only by the students. It was not collected or used in any way by the teacher. This process avoids the grade inflation phenomenon noted in self-evaluation research (e.g., Falchikov & Boud, 1989), perhaps because students tend to give themselves higher evaluations when they believe that their response will influence their grade for the assignment.

Students can be honest in their assessments of the strengths and weaknesses in their work if the outcome of the assessment is private. However, while no formal report on the self-assessments is given to the instructor, it

would be appropriate, even conscientious, of the teacher to solicit feedback voluntarily from the students based on their self-assessment results. This feedback can be used (with other forms of assessment) to inform future instructional content and practices.

One of the major benefits of rubric-referenced self-assessment is that the process is the same for all student populations and can help all students to become more self-directed. Students with disabilities, when necessary, can be given adapted rubrics and/or additional time to assess their work if needed. Any accommodations delineated on a student's Individualized Education Program (IEP) or Section 504 Accommodation Plan (for students with disabilities that do not meet the eligibility criteria for an IEP) can be provided during the self-assessment process.

Limitations of this method of assessment include the time necessary to instruct students in the process of rubric-referenced self-assessment and to co-create criteria. However, practice has shown that the additional time is not substantial (e.g., Andrade et al., 2009). In addition, there is limited research in some content areas. Surprisingly, perhaps, students' accuracy in self-assessment has not been shown to be a limitation; it appears that the process of critiquing one's own work is of benefit regardless of accuracy.

Final Thoughts

We encourage educators and researchers to take advantage of what we now know about the conditions under which self-assessment is likely to lead to higher achievement. Students have reported that they were more likely to self-assess when they knew what their teachers expected, and that their self-assessments were typically followed by serious attempts to revise and improve their work. The process of student self-assessment through rubrics can be further enhanced with peer assessment and teacher feedback (Andrade & Du, 2007). Ross (2006) recommended the following: define the criteria by which students assess their work; teach students how to apply the criteria; give students feedback on their self-assessments; and give students help in using self-assessment data to improve performance.

We recommend two additional conditions:

- provide sufficient time for revision after self-assessment, and
- do not turn self-assessment into self-evaluation by counting it toward a grade.

The implications for classroom practice that emerge from this research seem relatively straightforward: Students ought to be actively engaged in critiquing sample pieces of work, in

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Rubrics become a teaching tool when students use them to understand the goals and standards for an assignment, compare their work-in-progress to those goals and standards, and determine how to fill in any gaps.

thinking together about the criteria by which their work will be evaluated, and in self-assessment of their works in progress. By involving students in the assessment process in these ways, teachers can blur the distinction between instruction and assessment. This can transform many activities in the classroom into a seamless flow of analyzing models, creating products, and continuously evaluating and improving products. These are habits or routines that can have a lifelong positive effect — well beyond the content of a particular curriculum.

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Ongoing Student Assessment: Approaches in Mathematics

SUMMARY

The importance of continuous assessment using varied methods is described by this middle school mathematics teacher. She advocates for a flexible approach — particularly for students with unique needs.

As a middle-level mathematics teacher with more than 50 years of experience, including serving as department chairperson for mathematics and computer instruction, I have seen tremendous change in assessing the results of our teaching. During the early years of my career, frequent quizzes supported by unit tests were the primary tools for assessing students. Today, teachers use a range of classroom assessment strategies to inform and critique their teaching and respond to student needs. Examples of such assessments include projects (Yetkiner, Anderoglu, & Capraro, 2008), journals (Burns & Silbey, 2011), both oral and written exams, and "do now" questions upon entering a classroom. My approach is to use multiple tools in a continuous and flexible process. I have found that this approach improves learning outcomes, especially when working with students who have disabilities or other students who have difficulty mastering mathematical concepts.

Establishing a Safe Environment for Learning

My first priority at the beginning of the school year is to administer and analyze the results of a mathematics pre-test. My next priority is to create an encouraging and supportive learning environment for my students (Dorman, 2002). With students who have difficulty with mathematics, I seek to enhance student engagement with the content. At the outset of the school year, the "I hate mathematics" student may immediately say "I don't know" when asked a question. Therefore, over the years I have learned to start off the school year by addressing the entire class for a choral response: ***"Class, what is the answer?"*** This simple approach reduces apprehension for the majority of the students. The students begin to

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feel comfortable speaking aloud in class. Once students actively engage in class discussions, I can successfully assess their progress through more direct questions to individuals.

Other ways to create a safe environment for students are providing them with behavioral guidelines and maintaining positive interactions. Taking a cue from a television quiz show, I sometimes ask a struggling student if he or she would like to "phone a friend" to receive some assistance or have a peer act as a "lifeline."

Examples of Ongoing Formative Assessment

On a daily basis, I incorporate ongoing flexible formative assessments into my teaching:

> Formative assessments are used to guide instruction. Formative (classroom-based) assessments occur during teaching and are embedded in instruction. Results are received instantly, which allows teachers to adjust their instruction immediately. These are typically teacher developed and should be implemented based on teacher judgment. (American Federation of Teachers, 2008, p. 3)

The following examples will illustrate how ongoing flexible formative assessment can be incorporated into mathematics instruction.

Polynomials

A polynomial is an algebraic expression that is made up of one term or the sum or difference of two or more terms consisting of the product of numbers and/or variables. Adding polynomials is a skill drawn from the *NYS Mathematics Core Curriculum* Standard 8.A (8.A.5: Use physical models to perform operations with polynomials; 8.A.7: Add and subtract polynomials). In the *NYS P-12 Common Core Learning Standards for Mathematics*, this is represented in High School Algebra (A-APR1).

I use **Warm Up problems** to assess students' knowledge of the key concepts which are foundations to this

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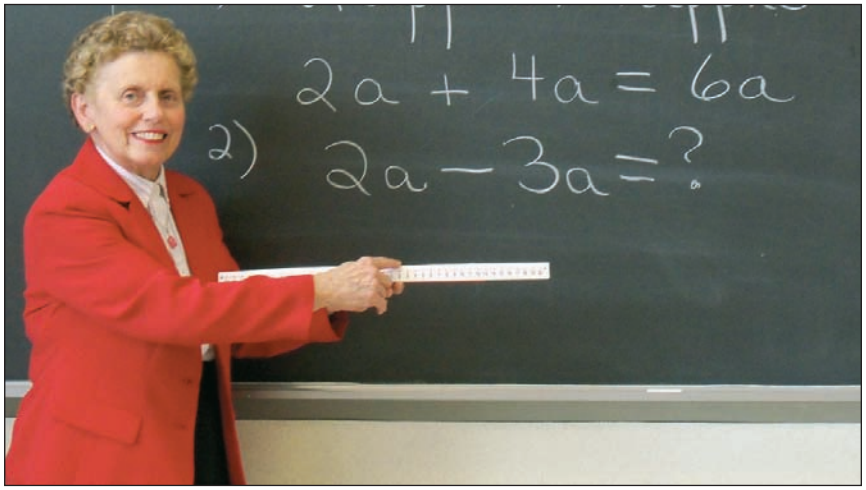
Adding Polynomials

Add:

$$\begin{array}{r} 5s + 6t - 2v \\ 7s - 2t + 3v \\ \hline \end{array}$$



Martha Strever uses a number line to assist students in reviewing math concepts.

particular skill. I have introduced the concept of "like" and "unlike" terms to the students during the previous day's lesson. The Warm Up problems draw on that lesson and require students to successfully classify specific terms as "like" or "unlike."

"Like" terms would be the ***same*** variable raised to the ***same*** power. For example, $2x^2$ and $3x^2$ are like terms.

"Unlike" terms have ***different*** variables or the ***same variable with different exponents***.

At times, using associations can make the concept more concrete. For example, I might tell students:

"Let's look at **like** terms."

"4*b* and 5*b* are **like** terms."

"Imagine that *b* stands for bananas."

Pointing to 4*b*: "The variable in ***this*** term is **b**ananas."

Pointing to 5*b*: "The variable in ***this*** term is **b**ananas."

"It's **all** about bananas! 4*b* and 5*b* are **like** terms."

"Let's look at **unlike** terms."

"4*b* and 5*g* are **unlike** terms."

"Imagine that *g* stands for grapes."

Pointing to 4*b*: "The variable in ***this*** term is **b**ananas."

Pointing to 5*g*: "The variable in ***this*** term is **g**rapes."

"Bananas and grapes. Not the same! Not alike. So… 4*b* and 5*g* are **unlike** terms."

I walk around the room to observe/assess students' work on their Warm Up problems to determine who has mastered this foundation concept. Students struggling with the Warm Up problems receive individual attention. This formative assessment information directly informs what I do next, such as giving more problems or altering my assignment. As we move on to adding polynomials, each student is asked to create and solve her or his *own* problem, which can be presented at the end of class. This allows me to quickly assess students' understanding of the particular skill/concept.

Polyhedrons

Projects can be an effective method of assessment. To assess students' knowledge regarding a component of curriculum related to measurement, angles, and constructions, I use a project entitled "polyhedron creations."

A polyhedron is a three-dimensional geometric solid with flat faces and straight edges.

I begin with the tetrahedron, composed of four triangular faces, three of which meet at each vertex. Student are provided with a lab sheet similar to a handout they might receive in a science lab. This includes:

- the objective,
- a list of required materials, and
- the process for arriving at the end result.

I start out by assessing students' use of the ruler and protractor. After any needed instruction, students apply this knowledge to draw angles of predetermined measures. Once the design is completed, the students fold and glue the figure together. Upon completion, the students:

- analyze their own creation by viewing a sample,
- evaluate and critique each other's design for accuracy — through peer review, and
- create a more difficult model with less support.

They are evaluated according to:

- angle accuracy,
- line measurement accuracy,
- neatness, and
- following instructions correctly.

Additional Assessment Techniques

Quick Quiz

Once or twice a week students are given a "quick quiz" to check for understanding. I allocate 5 to 10 minutes, during which time I am walking up and down the aisles analyzing student work. At the conclusion of the quiz, I can initiate alternative approaches because my observations have immediately informed my actions.

Math Notebooks

Student notebooks can also be used as a means to assess student learning. At the outset of the semester, I work with the students to establish an organizational structure in their notebooks, so their accumulated notes may serve as a learning log of the semester's activities. In addition to helping assess student mastery, learning logs are also a useful literacy strategy (Friedland, McMillen & del Prado Hill, 2010-11). Students' notes are reviewed to determine whether they have accurately captured the

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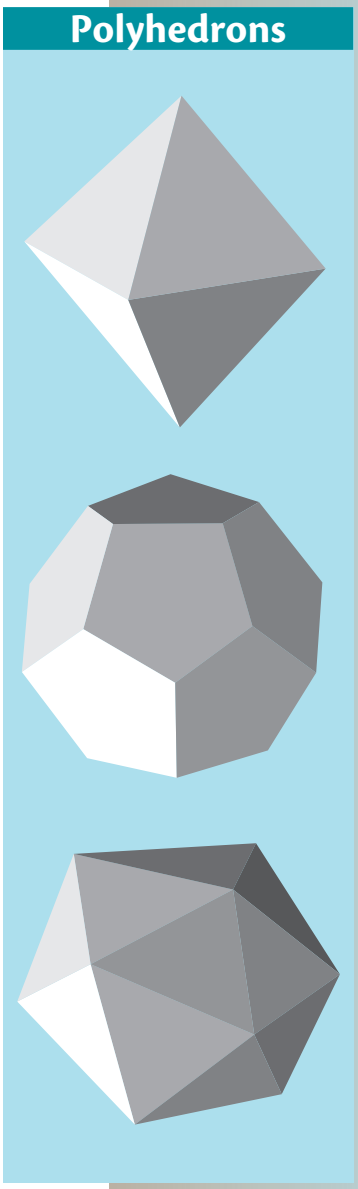

Assessment should enable an educator to be more effective with each individual student. This requires frequent use of various tools, well beyond the standard test or quiz format.

class objectives and key concepts. I assess based upon organization, neatness and completeness. The completeness not only means copying notes from the blackboard but also showing all steps in solving problems.

Segmenting Unit Exams

Over time I have developed a unique approach to designing unit exams for students who struggle with mathematics. In classes with students with disabilities who have the accommodation of extended time, but do not require a separate setting, a unit exam that is segmented (i.e., broken into sections over the course of a week) is helpful. (This practice appears to work better for all students.) Students still receive their accommodation, but due to this design, often finish with peers. I design the tests/quizzes so every concept will be assessed in the initial 10 questions. I can analyze each of those problems to see if sufficient understanding has occurred or whether more support or reteaching is required. This practice appears to lead to better outcomes. Some students find mathematics overwhelming. Long assessments often frustrate and discourage students, which can lead to poor performance. A carefully designed brief assessment can often provide the information the teacher needs.

Homework as an Assessment Tool

Teachers have varied opinions about assessing their students through homework assignments. I find lengthy homework assignments quite unreliable and not helpful for students who are struggling. If a teacher assigns 20 problems related to a particular skill and the student has not mastered the skill or concept, he or she may be repeating the same mistake 20 times. A homework assignment of this nature reinforces an incorrect technique. Once an incorrect technique is learned, it is very difficult to unlearn (Sousa, 2006, p. 99). An alternative is to ask students to demonstrate their understanding through three or four problems.

Changing Attitudes and Building Skills

Assessment should enable an educator to be more effective with each individual student. This requires frequent use of various tools, well beyond the standard test or quiz format. Good assessment practices lead to more effective teaching and increased student learning. It is particularly rewarding when a student who struggles with mathematics recognizes the joy and satisfaction of mastering a new and difficult concept. I want my teaching and assessment approaches to contribute to that outcome. I want to hear my students say, “Math is fun and I love it!”

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Daily Formative Assessments in Second Language Acquisition

SUMMARY

Brief partner activities are not only a great way to increase student engagement, but can also be a valuable strategy for providing students and teachers with frequent feedback on student growth. This author advocates a partner approach for daily speaking assessments to provide focused practice and ongoing information on skill development.

Teachers in all content areas can use frequent formative assessments to improve student learning. This article will focus on how establishing daily routines can increase student engagement and provide students with the feedback they need to make progress on a daily basis. The content area for this example is learning a second language, and the particular skill area is "building speaking skills."

> **Standard 1:** Students will be able to use a language other than English for communication (New York State Education Department, *Learning Standards for Languages Other Than English,* 1996).
>
> > **Performance Indicator 4:** use appropriate strategies to initiate and engage in simple conversations with more fluent or native speakers of the same age group, familiar adults, and providers of common public services. (Modern Languages, Standard 1, Key Idea 1)

Although the American Council on the Teaching of Foreign Languages (1999) identifies five aspects of language (i.e., communication, cultures, connections, comparisons, and communities), most students and their parents focus on the speaking dimension of communication (Bailey, 2005). Speaking is the least developed of students' skills, and their inability to express themselves has a negative impact on their confidence and enthusiasm (Office for Standards, 2008). Multiple speaking assessments with immediate feedback can assist students in becoming successful speakers of a second language. For purposes of this article, we will use the example of a Spanish course that may be offered in the middle grades or high school.

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Harry Grover Tuttle
NYSUT Retiree Council 45

Spontaneous Speaking Assessments

Early in the Spanish course, students complete several spontaneous speaking assessments as pre-tests to establish a speaking skill baseline. In this activity, students are not provided preparation time. They are presented with a topic or an image and are asked to begin speaking in Spanish. For example:

- Lily is shown a picture of a party and talks about it in Spanish for one minute while her partner, Rowan, counts the number of sentences she says that are "meaningful, appropriate, and comprehensible." The teacher has modeled the difference between meaningful and non-meaningful, appropriate and not appropriate, and comprehensible and incomprehensible, and the students have practiced discerning these criteria for success.

- Students reverse roles, and Rowan is shown a picture of a restaurant. Lily counts the number of sentences he says that are meaningful, appropriate, and comprehensible.

As would be expected in a diverse classroom, there is a range of skill levels. Lily starts the year with a response of three simple sentences related to the topic of a party, such as:

> "There is a boy. There is a girl. The boy talks."

Rowan is not able at this point to speak spontaneously about the picture he is shown. This provides the teacher with important information to guide further instruction.

The teacher sets the following Instructional Target:

> "Students will speak spontaneously about an unexpected (but familiar) topic for one minute using sentences that are meaningful, appropriate, and comprehensible."

In order to help students meet the instructional target, the teacher has the students practice different "language functions" that cross topics and situations. NYSED *Learning Standards for Languages Other Than English* (1996) include language functions in Standard 1 for Modern Languages (Key Idea 1 under Checkpoint A):

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When students complete these in-class formative assessments, they receive immediate feedback. They do not have to wait until the unit exam (two weeks away) or until the mid-semester exam, to know how well they can speak.

More importantly, since the listening partners are not thinking about what they will say next in the conversation, they can focus carefully on the speakers' sentences.

- socializing,
- providing and acquiring information,
- expressing personal feelings and opinions, and
- getting others to adopt a course of action.

To assist them in building their skill with these functions, students are asked to use them across multiple topics. For example, students may explain their ***preference*** for a certain store in the mall (**topic**). Likewise, they may ***ask for information*** about a new store (**topic**).

Even though this activity is designed for partners, a back-and-forth conversation is not the goal at this point. The teacher has the students speak individually on a topic so their partners do not limit their practice opportunity (Tuttle & Tuttle, 2012). In a conversation, the responding partner's speed of response, inappropriate answer, or incorrect grammar usage can cause the original speaker to lose focus. For example, when Roberta and Tom have a conversation about movies, Tom is not able to quickly answer Roberta's question: "What type of movie is [Choice A]?" She waits, then asks a different question. If Roberta were not waiting and losing focus, she may have expressed herself with greater detail regarding movies. Therefore, although students work with a partner, only one student speaks during each part of the oral assessment.

More importantly, since the listening partners are not thinking about what they will say next in the conversation, they can focus carefully on the speakers' sentences. The partners record the number of spoken sentences that met the criteria of being meaningful, appropriate, and comprehensible. After the first student in each pair speaks for a minute, the partner tells them how many sentences meet the criteria and offers additional sentences or topics to talk about. For example:

- James narrates about his family vacation.
- Kim responds with formative feedback: "You said five sentences. You describe the lake. ***Where is the lake? What is the weather like? What else do you do at the lake?***"
- James records these suggestions. As an improvement strategy, James answers these questions so that he increases not only the quantity but the quality of what he can narrate about his family vacation.
- Students reverse roles, and Kim talks about a different situation while James counts Kim's sentences.
- James reports the number of sentences to Kim and provides her with suggestions for expanding on her topic.

When students complete these in-class formative assessments, they receive immediate feedback (Tuttle, 2009). They do not have to wait until the unit

exam (two weeks away) or until the mid-semester exam, to know how well they can speak. Using this process, the students complete speaking assessments during each class (albeit informal and at times imperfect) and they also receive feedback on how to improve. Their speaking abilities can grow on a ***daily*** basis.

Through the use of peer assessment, the teacher can multiply the number of students assessed during each class (Tuttle & Tuttle, 2012). If the educator were to spend 1 minute on assessing each student's speaking skills and a half minute providing feedback to each of his or her 26 students, the teacher would spend 39 minutes of the class. However, if students assess each other, the assessment takes only *3* minutes for each student in a pair to speak and to receive feedback. In 3 minutes, all 26 students have been assessed.

Since each speaking assessment only takes 3 minutes of class, the teacher has the students complete more than one speaking assessment during a class. Within a 6-minute time period, the teacher can involve the students in two different speaking assessments. For example, during a unit on ***free time activities,*** the teacher has the students complete an assessment focusing on:

- ***Asking questions*** about an upcoming concert, and
- ***Explaining their opinion*** regarding why the local team will or will not win the championship.

In this way, the teacher is able to assess different language functions during each class. Within the time frame of four classes, the teacher can assess eight different language functions. At specific intervals, the teacher can record these data by language function, and enter the data into a spreadsheet for analysis. This allows the opportunity to review student strengths and weaknesses. As the teacher looks over the data from the students' formative assessments, she or he can then modify instruction to address specific language functions that require reteaching or additional practice.

During this reteaching, the teacher focuses on instructional strategies that will directly and immediately address specific functions. Students select which new strategy or strategies they want to use. For example, they can select from the following strategies for "elaborating on a topic" (Tuttle & Tuttle, 2012):

- **Fill in the Blank:** Student is asked to use the following guide to create detailed sentences by substituting different words in each slot. For example:
  - ☐ "At (time)_____,
    I (action)_____
    in (place)_____."

continued on following page

- ☐ "At six o'clock, I wash in the bathroom."
- ☐ "At seven o'clock, I eat in the kitchen."

- **Ask the 5 Ws — Plus Which and How:** Student is directed to address a topic and ask: Who, What, Where, When, Why, Which, and How. For example, the topic is "the neighborhood":
  - ☐ (Who?) The tall man lives here.
  - ☐ (What?) He drives a blue car.
  - ☐ (How?) He goes fast.
- **Use a Different Action (Verb) in each Sentence:** Student is asked to think about as many actions as possible related to the topic, and then develop sentences. For example, the topic is "the neighborhood":
  - ☐ drive
  - ☐ play
  - ☐ paint
- **Zoom In:** Student is asked to start broadly with a topic and then pick something or someone to "zoom in on" to give focus and details.

After the students select a strategy, they practice it with a partner. For example:

- Sarah selects the strategy of *zooming in* and practices this strategy for the topic of describing her family. Sarah brings a family picture to class or uses her phone to show a picture of her family.
- She *zooms in* on one family member, her father, and provides basic information about him such as his physical description, age, household activities, favorite foods, sports or physical activities.
- She *zooms in* on another family member, and repeats the above.

After several practices, she feels comfortable using this strategy for elaboration. She increases the amount and breadth of information she can offer for different topics.

Planned Speaking Assessments

Speaking skills are assessed in multiple ways. Students also engage in ***planned speaking*** assessments. Here, they receive a topic and a function, plan out what they want to say and practice speaking before the assessment. For example, the student is asked to complete the following steps:

- Describe what they used to do to celebrate their birthday at age 5.
- Go to the Voki site (*http://voki.com*). Voki is a program to create speaking avatars (i.e., a graphical representation of the user, such as a businessperson or a dog). They record their voice. Students report that they often re-record themselves several times to improve their quality of speaking.

- Put a link to their recording on their own class wiki page. (At the Voki site they can copy the computer code to embed their speaking on their wiki page.)

Other students listen to this recorded speech and give feedback to the speakers.

The class wiki page serves as an e-portfolio for the students' planned and spontaneous speaking. They record their speaking for each unit. Toward the end of the course, they go back and listen to themselves to hear how much more fluent they have become. They usually hear fewer pauses between sentences and hear a higher number of sentences which meet the criteria for success. They hear more connected sentences, and these sentences focus on the topic. The students can share these e-portfolio recordings with whomever they wish such as parents and friends. In some situations, recordings can be helpful to share with potential employers or college admissions personnel in order to demonstrate their language skill.

The teacher facilitates multiple assessments on multiple language functions in multiple ways (spontaneous or planned) and has students provide each other with a significant amount of feedback. In this way, the teacher helps the students improve on a ***daily*** basis. The students go from speaking just a few simple sentences to being able to speak fluently about a range of topics.

These approaches can be used in any area of the curriculum that calls upon the students to develop their speaking abilities, to consider strategies offered by the teacher, and to practice those strategies in a systematic and frequent way (Tuttle, 2009). While the students are also involved in more formal assessments, there can be great benefit to daily formative assessments which not only provide valuable information to teachers, but also engage students directly in their own monitoring of — and reflection on — their learning. In the end, this is our long-term goal.

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Glossary

Acronyms and Terms

Aimline
An aimline on a graph represents the expected rate of growth for a student. It can serve as a visual reminder or reference for comparison when graphing student progress on targeted skills.

Baseline data
Initial collection of data which serves as a basis for comparison and is often used for evaluating the impact of a teaching intervention.

Common Core Learning Standards
The Common Core State Standards (CCSS) Initiative is a joint effort by the National Governors Association Center for Best Practices and the Council of Chief State School Officers. An outcome of this work is a core of learning standards in English language arts (ELA) and mathematics. The adoption process requires states to adopt the CCSS and allows up to 15% more standards based on an individual state's needs. This has resulted in the *NYS P-12 Common Core Learning Standards for English Language Arts & Literacy* and the *NYS P-12 Common Core Learning Standards for Mathematics*. The goal is that by 2012-13, classroom instruction will be aligned to the new standards.

Curriculum-based Measurement (CBM)
Direct assessment of student skills which usually involves brief and frequent assessments to measure specific skills that are targets of instruction for the student. CBM is often used in the elementary grades to assess basic skills in reading, math, written expression, and spelling.

Differentiated instruction
An approach to teaching that actively addresses diverse student characteristics in the planning phase as well as the teaching phase.

Dolch sight word list
A list of 220 commonly used English words, compiled in 1948 by Edward William Dolch, who believed children needed to recognize them in order to achieve reading fluency, as many of the words on the list cannot be "sounded out" and must be learned by sight.

Essential Questions
Questions that "lie at the heart" of a subject or curriculum, promote inquiry and produce different plausible responses. See Wiggins and McTighe (2005). *Understanding by design.* Alexandria, VA: Association for Supervision and Curriculum Development.

Formative assessment
This type of assessment is used to immediately determine whether students have learned what the teacher intended. Formative assessments help instructors identify content that needs to be clarified or re-taught and decide whether learning activities need to be modified. Changes can be made during the class session or before the next session. Formative assessment strategies provide feedback to students, and some tools can be used directly by the student for self-assessment purposes (e.g., rubric).

Full Option Science Systems (FOSS)
Full Option Science Systems is a research-based K-8 science curriculum developed at the Lawrence Hall of Science at the University of California at Berkeley. FOSS is also an ongoing research project with the goal of improving the learning and teaching of science. FOSS emphasizes critical thinking, inquiry, investigation, and analysis.

Individualized Education Program (IEP)
A plan developed by teachers, other school staff, and parents/caregivers to meet the needs of a student who is eligible for special education services and/or programs. Examples of components include the student's strengths, the results of evaluations and assessments, and descriptions of unique needs and goals. The IEP guides the delivery of special education supports and services.

Inquiry-based learning
An instructional style based on the idea that learning may be facilitated by giving students the opportunity to explore an idea or question on their own. To arrive at an answer or to better understand the concept, students often collect and analyze data.

Internal Assessment (IA)
A form of assessment that is implemented by the teacher in an International Baccalaureate program —for example, fieldwork in geography, laboratory work in the sciences, investigations in mathematics, and theory of knowledge essays in history. The IB program also includes External Examinations using formats such as essays, short-response questions, and case-study questions.

International Baccalaureate (IB)
International Baccalaureate is a non-profit educational foundation founded in Geneva, Switzerland, in 1968. The goal is to develop intellectual, personal, emotional and social skills in students. IB programs are found in 141 countries. Three programs are offered: a Primary Years Program, a Middle Years Program, and a Diploma Program. The Diploma Program is a two-year curriculum leading to final examinations. IB describes its qualification as one that is welcomed by leading universities around the world.

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Glossary

Lesson Study
Also known as Japanese Lesson Study, this is a professional development process used by teachers to systematically examine their practice. This is a collaborative approach which focuses on planning, teaching, observing, critiquing and revising.

Mastery Measurement (MM)
The teacher identifies a sequence of objectives for the student and monitors progress on each of the objectives.

Outcome
A specific goal the teacher has targeted for a student, or students, often stated in terms of an instructional objective.

Portfolio
A purposeful collection that represents a student's work. It may be used as documentation of how the student's work has developed over time and is often evaluated using a rubric. Achievements may be in one or more areas of the curriculum.

Response to Intervention
Use of scientifically based interventions designed to provide early and effective assistance to students who are having learning and/or behavioral difficulties. Interventions are matched to student needs, and there is an emphasis on frequent data collection and analysis. Supplemental intervention is delivered in a multi-tier format, with each tier representing an increasing level of instructional intensity.

Rubric
A tool that describes what learner proficiency looks like. It typically lists the criteria as well as descriptions of different levels of performance in a continuum.

Scaffolding
Structuring a task in a systematic way so that the student is given the proper amount of support to be successful at each step. The level of support is reduced as the student builds the necessary skills.

Science Notebooks
A tool to help students develop and refine their understanding of science. Students are encouraged to use the notebooks as a scientist might. Examples of activities include formulating questions, making predictions, recording data, and communicating findings.

Section 504 Accommodation Plan
Section 504 is a federal law designed to protect the rights of individuals with disabilities in programs and activities that receive federal financial assistance. A Section 504 Accommodation Plan outlines instructional supports and accommodations for a student with a disability who may not meet eligibility criteria for an Individualized Education Plan through special education.

Skywriting
The technique of having students use their index finger to create letters in the air. Skywriting can help students gain control over some motor planning that can be applied to writing the letters on paper.

Standardized test
A test that is designed to be given under specific and standard conditions — that is, the same test is given in the same way to all students. The test is designed to obtain a sample of what the student has learned so that results can be compared across test takers. Scoring is completed in a standard predetermined fashion.

Summative assessment
An assessment that is designed to measure the extent of student learning at certain end points (e.g., end of year) relative to content standards.

Voki
An online tool that allows the user to create a personalized speaking avatar (i.e., a graphical representation of the user or of a character). An avatar can then be used in forms of communication such as emails and blogs.

Wiki
A website that includes the collective work of many authors. Can allow a person to edit and comment on the work of others.

Wordle
An online tool for creating "word clouds" from passages of text. The more frequently a word appears in the text, the larger it shows up in the word cloud.

Resources

Additional Resources on Formative Assessments

25 Quick Formative Assessments for a Differentiated Classroom
by Judith Dodge (2009). NY: Scholastic.

This is a collection of brief flexible assessments to help teachers take a "snapshot of student learning." This resource includes grade-level modifications and student samples.

CAST (Center for Applied Special Technologies)

CAST is an educational research and development organization which focuses on Universal Design for Learning. UDL "provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone"—with an emphasis on flexible approaches that can be customized and adjusted for individual characteristics. All students can benefit from UDL, particularly learners with diverse characteristics (e.g., physical, sensory, and learning differences; those considered gifted). See *http://www.cast.org/index.html.*

Checking for Understanding: Formative Assessment Techniques for Your Classroom
by Douglas Fisher and Nancy Frey (2007). Alexandria, VA: Association for Supervision and Curriculum Development.

The authors maintain a focus on the "student's point of view" in describing approaches that allow teachers to continuously check for understanding. Examples of approaches include varied student response techniques that increase engagement and ideas for integrating projects and performances into daily classroom practice.

Classroom Assessment for Student Learning: Doing It Right - Using It Well (2nd Edition, 2011)
by Jan Chappuis, Rick J. Stiggins, Steve Chappius, and Judith A. Arter. Assessment Training Institute, Pearson.

Increasing student motivation and learning through improving strategies of classroom assessment is discussed through real-world examples. This work focuses on accurate classroom assessments of all types and their integration into day-to-day classroom activities. Determining clear learning targets, involving students, and communicating results are keys to success.

Data and Assessments. National Education Association.
http://www.nea.org/home/39078.htm

The characteristics of effective assessment systems are explored including the importance of formative assessments that "provide detailed information about student learning directly and clearly to both students and teachers. These assessments allow for re-teaching and redoing of instructional tasks." Formative assessment is discussed as important in planning and adjusting instruction.

Effective Classroom Assessment: Linking Assessment with Instruction by Catherine Garrison, Dennis Chandler and Michael Ehringhaus (2009). Westerville, OH: National Middle School Association and Measured Progress.

Translating standards into meaningful targets is one of the challenges addressed in this resource. The standards, curriculum, instruction, and assessment cycle is described. Authors address the importance of gathering information from multiple sources and understanding the nature of the feedback loop.

Formative Assessment Strategies for Every Classroom: An ASCD Action Tool (2nd Edition, 2010) by Susan M. Brookhart. Alexandria, VA: Association for Supervision and Curriculum Development.

The formative assessment process and tools in this guide can be used with every grade level and subject. Ideas for both individual assessment as well as group work assessment are included. Tips on how to provide useful feedback to students are offered.

How Classroom Assessments Improve Learning by Thomas R. Guskey (2003). In *Educational Leadership (Using Data to Improve Student Achievement)*. Volume 60, Number 5, pp. 6-11.

Author argues that assessments designed for ranking are generally not effective for helping teachers modify their instruction and respond to students. Focus is on useful assessments, corrective action, and giving students multiple opportunities to succeed.

Ideas on Assessment for EL Students: AccELLerate! *The Quarterly Review of the National Clearinghouse for English Language Acquisition & Language Instruction Educational Programs.* Winter 2011,Volume 3, Issue 2.

This issue emphasizes various factors that should be considered when designing and implementing ELP and content-area assessments. These papers provide a national context for discussing assessments. Examples of topics include insight into how long it takes to reach English proficiency, linguistic accommodation support, and Universal Design (UD) principles in computer-based formats.

National Clearinghouse for English Language Acquisition

See NCELA for a broad range of research and resources in support of an inclusive approach to high quality education for students who are English language learners. *http://www.ncela.gwu.edu/assessment/*

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Resources

New York State Teacher Centers Network

The New York State Teacher Centers Network continues to be recognized as an important and effective vehicle for professional development. Teacher Centers have re-tooled their professional development offerings to help teachers make connections among the State Education Department initiatives related to "College and Career Ready Students": Data-driven Instruction, Common Core State Learning Standards, and Teacher/Leader Effectiveness. Learn more about professional development opportunities that integrate classroom-based assessments with the CCLS and teacher evaluation/development requirements at *http://www.nysteachercenters.org/*.

School Tips: Quality Classroom Assessment Techniques. (2011). American Federation of Teachers. *http://www.aft.org/yourwork/tools4teachers/assessments.cfm.*

Quality classroom assessments are described as the best tools to determine what students know, what they need to know and whether they are on track to reach instructional goals. Assessment techniques such as using anecdotal records and asking well-designed questions are described. Communicating with students about specific instructional outcomes is highlighted as well as the importance of specificity when giving feedback.

Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning by Page D. Keeley (Editor). (2008). Thousand Oaks, CA: Corwin Press.

This work addresses the different considerations when choosing assessment strategies and explores tools such as concept card mapping, directed paraphrasing, first word-last word, explanation analysis, and justified list. While focused on science, many of the strategies can be used across content areas.

Test Access & Accommodations for Students with Disabilities: Policy and Tools to Guide Decision-Making and Implementation (2006). The University of the State of New York. The State Education Department Office of Vocational and Educational Services for Individuals with Disabilities.

This guide is a necessary component of every NYS teacher's professional library. It "provides policy and guidelines for documenting and implementing testing accommodations for classroom, districtwide and State assessments." Testing accommodations provide "an opportunity for students with disabilities to demonstrate mastery of skills and attainment of knowledge without being limited or unfairly restricted due to the effects of a disability." Examples of accommodations include changing the way in which test items are presented to the student and altering the student's method of responding.

Call for Article Proposals for Educator's Voice, Vol. VI

Implementing the NYS Common Core Learning Standards

English Language Arts & Literacy (P-12)

Instructional Shifts

Educator's Voice is NYSUT's Journal of Best Practices in Education — a series dedicated to highlighting research-based classroom and school/district-wide strategies that make a difference in student achievement. The theme for our next volume, to be published in spring 2013, is Implementing the *NYS P-12 Common Core Learning Standards for English Language Arts & Literacy*. As New York state moves into full implementation of the Standards, we seek descriptions of exemplary standards-based teaching practices to share with the field. Tell us what you have designed and implemented in relationship to the Standards, and specifically, the "Six Shifts" in ELA/Literacy.[1]

- Balancing Information and Literary Texts (PK-5)
- Building Knowledge and Literacy in the Content Disciplines (6-12)
- The concept of "Staircase of Complexity" (i.e., students read the central, grade-appropriate text around which instruction is centered—while teachers provide scaffolding and supports for students as needed)
- Focus on teaching students to develop "Text-Based Answers" (i.e., offer evidence from the text in speaking and writing)
- Writing from Sources
- Continuous building of Academic Vocabulary to access complex texts

[1] For more information on Instructional Shifts, go to *NYSED.gov* and search: Instructional Shifts, or go to *http://engageny.org/resource/common-core-shifts/*

Call for Article Proposals for Educator's Voice, Vol. VI

Implementing the NYS Common Core Learning Standards

English Language Arts & Literacy (P-12)

Editorial Guidelines

Authors: Authors must be active or retired members of NYSUT or an affiliate (e.g., United University Professions, Professional Staff Congress). If there are multiple authors, at least one author must be a current or retired NYSUT member. The Editorial Board encourages articles by individual authors, teams of teachers, and higher education faculty working with teachers in P-12 schools.

Grade and Content Area: Author(s) can represent any area of the curriculum and any P-12 setting. For example, a fourth-grade teacher and special education teacher may address their literacy approaches as a teaching team; a high school social studies, math, or health teacher may discuss incorporating the ELA Learning Standards into instruction.

Audience: Classroom teachers, school-related professionals, union leaders, parents, administrators, higher education faculty, researchers, legislators and policymakers.

Deadline for proposals: June 8, 2012.

Article length: Approximately 2,000 words (or 7-8 double-spaced pages plus References).

Writing style: Authors are encouraged to write in a direct style designed to be helpful to both practitioners and to others committed to strengthening education. Education terms (i.e., jargon) should be defined for a broad audience.

Manuscript: American Psychological Association (APA) style with references at end of article. (Graphics/photographs may be submitted — with permissions as necessary. Please do not submit copyrighted material unless you obtain permission from the publisher.)

Rights: Acceptance of a proposal is not a guarantee of publication. Publication decisions are made by the Editorial Board. NYSUT retains the right to edit articles. The author will have the right to review changes and if not acceptable to both parties, the article will not be included in *Educator's Voice*. NYSUT may also retain the article for possible use on the NYSUT website (*www.nysut.org*) or for future publication in *NYSUT United*.

Implementing the NYS Common Core Learning Standards

English Language Arts & Literacy (P-12)

Editorial guidelines and submission form are on: *www.nysut.org/educatorsvoice*

Click on *Submission Guidelines.*

CONTENT GUIDELINES

Authors are asked to describe:

- The context for the reader (area of curriculum, grade, class composition).
- The standards you targeted for instruction, and which of the Instructional Shifts are represented in your description (may be several).
- The research-based practice(s) you chose and materials you used or developed.
- Outcomes your students achieved, and a description of how you collected assessment information.
- How you accommodated students with disabilities, students who are English language learners, or other students with unique learning needs.
- Why you view your instructional design as successful in addressing the Common Core ELA Standards, and what you might modify in the future.
- A description of how you brought parents and caregivers in as partners in ensuring that students achieve the new Learning Standards — or a description of how you plan to in the coming year.
- A variation of the above related to the new Learning Standards (e.g., description of professional development program at your school/district/BOCES).

Implementing the NYS Common Core Learning Standards

English Language Arts & Literacy (P-12)

Name of Author(s) _____

If multiple authors, please list all names, and identify one author as primary contact person _____

_____

Article working title _____

_____

Please check all the categories of affiliation with NYSUT that apply to the primary author/contact person:

- ❑ 1. I am an active teacher member of the following local _____
- ❑ 2. I am an active SRP member of the following local _____
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Please provide a statement/outline describing how you plan to address each specific "Content Guideline" and any additional information that you intend to incorporate in your manuscript. Also, please provide:

Current position of author(s), including district, grade(s) and content area: _____

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Information can be submitted electronically by June 8, 2012, to:

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Deadlines for Volume VI:

June 8, 2012	Proposal submission deadline
June 30, 2012	NYSUT responds to proposal
Aug. 31, 2012	Completed article submission
April 2013	Publication

NYSUT Education & Learning Trust

The Education & Learning Trust is NYSUT's primary way of delivering professional development to its members. ELT offers courses for undergraduate, graduate and in-service credit, partnership programs that lead to master's degrees and teaching certificates, and seminars as well as professional development programs for teachers, school-related professionals, and members from the health care community.

Examples of graduate courses offered by ELT include:

Bullying: Preventing the Problem

Cyber Bullying: The New Age of Harassment

Integrated Co-Teaching: Strategies Enhancing Student Achievement

Methods and Materials for Students with Disabilities

Middle Level Education

Educators Taking the Initiative for Change

Showing Evidence: Teacher Performance and Student Achievement

Student Engagement and Standards Based Learning

The Role of Data, Assessments and Instruction
to Raise Student Achievement

For information on ELT, go to *www.nysut.org/elt*;
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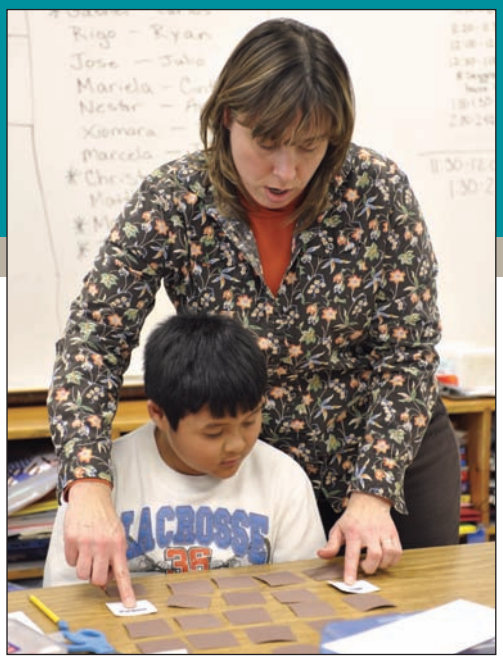

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