Vanguard High School
Proposed Interim Mathematics Assessment System [July 2006]

The mathematics program at Vanguard High School will implement a series of interim assessments to document student's progress to inform students, parents, and teachers in instructional decisions. These will be used as formative assessments to improve instruction and student learning. The assessments are aligned with national and state mathematics standards.

Evaluation Criteria

Each student will be evaluated based on their proficiency with the National Council of Teachers of Mathematics and New York State Process Strands using the Dreyfus model of skill acquisition. The Dreyfus model designates the stages of skill acquisition as *novice, advanced beginner, competent, proficient,* and *expert.* (See "Assessment Continuum Proposal" for further explanation) The content used in interim assessments will be based on the NCTM/NYS Content Strands and NYS MST 3 Standards in Algebra, Geometry, Algebra 2, and Trigonometry.[1] Math and non-math teachers, fellow students, administrators and outside observers will evaluate students' performance on these interim assessments.

Because our school focuses on six Habits of Mind, we have aligned them with the appropriate NCTM/NYS Process Strands. Students will aim to move toward the *expert* level of each Habit of Mind and corresponding Process Strand.

1. Making Connections [*Connections*]
2. Using Evidence [*Reasoning and Proof; Representation*]
3. Considering Viewpoints [*Communication*]
4. Being Metacognitive
5. Seeking Significance [*Problem Solving*]
6. Asking "What if"/Conjecture [*Reasoning and Proof*]

Content

The content assessed will be based on NCTM/NYS Content Strands. Students will be taught using College Preparatory Mathematics www.cpm.org, a rigorous and comprehensive math program, which is aligned to national standards. The U. S. Department of Education designed CPM "an exemplary program" in October 1999, and CPM courses are accepted at every major college and university in the country. CPM students score 10-20% higher on standard multiple choice exams than students at the same school in traditional classes. On written response questions, CPM students score 30-40% higher.[2] Additionally CPM is aligned with our schools' focus on multiple instructional and assessment methods as well as development of students' Habits of Mind/NCTM Process Strands. Below is some information about the content for each grade level.

9th grade Algebra Connections:
Problem Solving
Graphing
Writing Equations
Solving Equations
Ratios
Symbol Manipulation

10th grade Geometry Connections:
Problem Solving
Graphing
Ratios
Geometric Properties
Algebra
Spatial Visualization
Proof (Conjecture and Explanation)

11th grade Algebra 2:
Problem Solving
Representation and Modeling
Functions and Graphing
Intersections and Systems
Algorithms
Reasoning and Communication

[1] New York State Learning Standard for Mathematics revised by NYS Board of Regents March 15, 2005
http://www.emsc.nysed.gov/3-8/guidance912.htm
[2] CPM website http://cpm.org/pdfs/2003_intro.pdf

12th grade Math Analysis:
Problem Solving
Concepts of Calculus
Analysis of Models

Trigonometry
Advanced Functions
Algebraic Fluency and Accuracy

Timing

Students will participate in these interim assessments three times per semester with ongoing teacher observations. Each semester a student will participate in a Written Assessment, Oral Defense, and Group Round Table.

Assessments

The following variety of assessments will be used throughout each student's four year high school career: 1) Written Assessments, 2) Oral Defense, 3) Group Round Table, 4) Teacher Observations, 5) NYS Math A Regents exam.

1) **Written Assessments** [2 times per year; once per semester]

The Written Assessment will consist of approximately 3 *open-ended* tasks that require students to defend their understanding through written explanation of their problem solving strategies. "Open-ended assessment tasks have many correct answers and many routes to getting those answers. They include tasks that require students to explain answers, solve non-routine problems, make conjectures, justify their answers, and make predictions."[3] These tasks pose real life situations that require students to use their problem solving skills to connect their mathematics knowledge to the real world.

Additionally the Written Assessment will contain approximately 5 *open-middled* tasks[4] which have one correct answer but many ways at arriving at the answer.

The Written Assessments will be evaluated using the a rubric along with the Dreyfus scale to measure students' proficiency in the Habits of Mind, which are aligned to the NCTM/NYS Process Strands.

2) **Oral Defense** [2 times per year; once per semester]

Of the two Oral Defense presentations at least one will be an individual presentation to a small committee consisting of teacher(s), students, parents, and outside evaluators. This individual Oral Defense will consist of the student's presentation of mathematics concepts and application, defense of understanding by committee questions, and reflection on learning strengths and weaknesses. The committee will provide the student with feedback after the presentation to assist the student's development in the content and Habits of Mind, or Process Strands. The other Oral Defense may be a group or individual presentation to the class or committee on a project or investigation. The teacher will use her/his discretion to determine the format of the second Oral Defense presentation.

3) **Group Round Table** [2 times per year; once per semester]

The Group Round Table provides an excellent opportunity to evaluate students' proficiency with all of the NCTM/NYS Process Strands. Students are given one *open-ended* task to solve as a team. The problems are extremely complex, have multiple methods, and multiple correct answers. Students must work as a group to communicate their thinking, justify their reasoning, connect their ideas to others', and employ their problem solving skills. Each student will be evaluated using the Dreyfus scale of their competency with each Habit of Mind/Process Strand.

4) **Teacher Observation** [ongoing throughout the year]

Teachers will document their observations of students' higher-order thinking and Habits of Mind throughout the year. Advisors will be invited to observe and document their advisees' grasp of the mathematics content

[3] Bush, Greer; Mathematics Assessment: A Practical Handbook for Grades 9-12: NCTM, 1999.
[4] Ibid.

and Habits of Mind. Samples of observation documentation are provided in "Habits of Mind Progress Observation Documentation."

Teachers may employ other means of ongoing formative assessment, such as interviews, student writing, in class presentations, questioning. Additionally, teachers will continue to use homework, classwork, exams, and projects/exhibitions to assess student learning.

5) **NYS Math A Regents Exam [~ once per semester]**
Students will continue to take the NYS Regents Exam. They will take it twice in their 10th grade year and aim for a minimum score of 75 to aid their university entrance, particularly for CUNY and SUNY schools. They will take it in their 11th and 12th grade years if necessary to achieve a score of 75. In our experience, many students take it multiple times and their scores improve over time.

many students will take it multiple times to earn this score and improvement will be shown in their increasing test scores.

Rationale

According to NCTM Assessment Standards, assessment should enhance mathematics learning. We believe that Vanguard High School's interim assessment system accomplishes this as well as the additional NCTM Assessment Standards.

- *Assessment should reflect the mathematics that all students need to know and be able to do*.[5]

All assessments will based on the content previously discussed that reflects national and state standards. Our curriculum and assessments are aligned with NCTM's suggestions that activities provide all students with opportunities to formulate problems, reason mathematically, make connections among mathematical ideas, and reason mathematically.[6]

- *Assessment should enhance mathematics learning*.

These assessments are aligned with our curriculum and in-class expectations, ie: student presentations, groupwork. Students will have the opportunity to reflect and receive feedback on their mathematics learning and higher order thinking skills. These interim assessments will serve as "check-ins" for each student, teacher, parent, and administrator to make sure that each student is progressing in her/his learning.

- *Assessment should promote equity*.

Students are presented a variety of different ways to demonstrate their understanding, including individual writing, presenting, working in a group, class participation, and standardized testing. Providing more ways to be successful will allow for the success of more students. Monitoring each students' progress will ensure that every student receives support and attention to reach high levels of accomplishment.

- *Assessment should be an open process.*

All students, teachers, and parents will be informed of expectations for each assessment. Students will have the opportunity to experience through participation, evaluation, or observation the assessments to ensure that each student understands how to be successful. Expectations will be communicated through the use of rubrics, sample assessments, and the Dreyfus scale of Habits of Mind. Outside observers will be invited to evaluate and provide feedback on our assessment process.

- *Assessment should promote valid inferences about mathematics learning*.

NCTM suggests that multiple sources of evidence are useful because they improve the validity of the inferences made about student learning. By examining students' work in a variety of contexts, modes, and

[5] NCTM; Assessment Standards for School Mathematics, p. 11; 1995.
[6] Ibid

settings we will be able to make more accurate inferences about student learning and make informed instructional decisions.

- *Assessment should be a coherent process*.

NCTM asserts that a coherent assessment process fits together, matches the purposes intended, and is aligned with curriculum and instruction. Vanguard's interim assessment plan corresponds to what is valued in the classroom ie: making connections, reasoning and providing proof, communicating as a whole class and in a group, etc. This range of modes of assessment match with the range of modes of learning that occurs in class. These different assessments fit together to provide a more diverse and informative picture of students' mathematics learning.