2.6 Develops in students an understanding and use of: number systems and number sequences, geometry, measurement, statistics and probability, and functions and use of variables. (C: 2.1)

Note: The emphasis in this standard is understanding and applying pedagogical knowledge of teaching math (accurate content and teaching strategies). For K-6/secondary math teachers, it also focuses on demonstrating that students can teach the range of math skills listed in the standard. Standard 2.7 addresses using math to enhance an understanding of knowledge in other areas (e.g., summarizing information on growth of plants to understand the effects of light or drawing conclusions about symmetry in various drawings after measuring). Standard 2.8 addresses explicit instruction of math skill relevant to a content area.

	Basic (1.0 - 1.9)	Developing (2.0 - 2.9)	Proficient (3.0 - 3.9)	Advanced (4.0)
All Students	No evidence OR when content includes mathematics, errors occur which indicate a lack of understanding of math skills or processes (e.g., errors in responses to student questions, in instruction, in plans, or in grading)	When content in written plans includes math, no errors occur in the mathematics; students may not have the opportunity to implement these plans	When content during instruction includes math, no errors occur which indicate a lack of understanding of math skills or processes (e.g., errors in responses to student questions, in instruction, in plans, or in grading); at least one lesson with math content must be observed (for secondary math and elementary teachers, at least 3)	Meets criteria for "Proficient" and has depth of understanding of math areas to provide several different approaches to teaching (explaining, demonstrating, etc.) for more than one of the areas listed in the standard
	No evidence OR fails to plan and implement a lesson with mathematics from at least one of the math areas listed above	Plans a content lesson in which mathematics from one of the areas listed in the standard is incorporated; mathematics is developmentally appropriate for students and teaching strategies for explaining/demonstrating math are effective; lesson may not be implemented	Plans and implements lessons that incorporate math skills in at least one of the areas included in this standard (e.g., geometry); mathematics is developmentally appropriate for students and teaching strategies for explaining/demonstrating math are effective	
K-6/Math Ed Students	No evidence OR fails to demonstrate understanding of math processes/concepts by making errors in teaching math even when implementing published/basal plans	Develops detailed plans to teach different math skills appropriate to developmental level of students and district standards in at least 3 of the following areas: number systems and sequences, geometry, measurement, statistics and probability, functions and use of variables	Develops and implements own plans to teach different math skills appropriate to developmental level of students and district standards in each of the following areas: number systems and sequences, geometry, measurement, statistics and probability, functions and use of variables	Meets criteria for "Proficient" and has depth of understanding of math areas to provide several different approaches to teaching (explaining, demonstrating, etc.) all of the areas listed in the standard

K-6/Math Ed Students	No evidence OR fails to develop own lessons OR cannot deviate from lesson and all activities directly from commercial curricula with no modifications	Demonstrates understanding of common developmental needs/problems of students in planning math lessons and modifying basal curricula in all of the skill areas listed above but may not implement them	Demonstrates understanding of math and of the developmental and specific needs/problems of students with whom s/he works by planning and teaching own math lessons and/or modifying basal curricula in at least 2 of the areas listed in the standard	Demonstrates strong understanding of developmental needs/problems of students in routinely planning math lessons and modifying basal curricula in all of the areas listed in the standard
	No evidence of any or the following math strategies applied in teaching:	Demonstrates effective applications of all of the following in written plans but may not have the opportunity to implement them:	Plans and implements at least one effective example of each of the following strategies to teach the math skills listed in the standard:	Meets criteria for "Proficient" and demonstrates numerous examples of best practices listed below:
	a. Utilization of visuals and manipulatives to ensure understanding			
	b. Utilization of different active learning strategies to enhance practice (e.g., technology, centers, games, peer-mediated strategies such as peer tutoring)			
	c. Utilization of different strategies to teach different types of math skill ares (e.g., math concepts, fluency building, process skills/algorithms, applications)			
	d. Utilization of communication strategies (e.g., math journals, written "proofs")			
	e. Instruction at the appropriate level of concrete-to-abstract continuum fo ensure student understanding			
	f. Integration of literature and math (for K-6 students)			

Operationalization/Criteria:

Guidelines for Admission to Education: *Not evaluated at admission to education*

Guidelines at Admission to Student Teaching:

1. Benchmark at admission is: *Plans lessons that enhance students' understanding of mathematics.*
2. This benchmark requires a rating of "Developing" on all dimensions.
3. To evaluate, review all lesson plans and the unit included in the portfolio for this standard. The OVERALL rating is an average of the ratings on the dimensions.

Examples of Evidence: Portfolio exhibits of lesson plans and units, possible videoclips of teaching, field experience teacher evaluations

Guidelines for Program Completion/Student Teaching:

1. Required for program completion are ratings of "Proficient" on all required dimensions (these differ for different teaching areas).
2. Observe a variety of lessons in different content areas of responsibility and in math (if appropriate).
3. Observe the variety of strategies used to teach different math skills.
4. Observe for teacher consistency; interviews with others who have observed may be necessary (e.g., mentor, cooperating teacher).
5. Evaluate TWS/unit plans to determine sequencing of math planning and instruction.
6. Consistency = requires fluency/repetition, including documentation of competence in different content areas.
7. The narrative for the Inventory should specify an example of a skill/observation that led to the rating, e.g.: *In her TWS on "Nation Building, " she incorporated mathematics in several lessons (e.g., aggregation of economical data in various parts of the US, development of displays of data, and incorportion of summaries and analysis of data in written repoort).*

Examples of Evidence:

TWS, Portfolio exhibits of lesson plans and units, lesson plan book of daily lessons, direct observation of teaching, interview with cooperating teacher/mentor

Rationale:

Cathcardt, G., Pothier, Y.M., Vance, J.H., & Bezuk, N.S. (2010). *Learning mathematics in elementary and middle schools: A learner-centered approach,* 5th ed. Boston, MA: Allyn & Bacon.

Van de Walle, Kaarp, & Bay-Williams. (2009). *Elementary and middle school mathematics: Teaching developmentally,* 7th ed. Boston, MA: Allyn & Bacon.

Websites:

http://mathforum.org/

http://www.sedl.org/scimath/compass/v02n02/

http://www7.nationalacademies.org/mseb/ (Mathematical Science Education Board)

http://www.nwrel.org/psc/bestofnw/singleprac.asp?id=74&phrase=mathematics

http://www.learner.org/exhibits/dailymath/

http://my.nctm.org/eresources/article_summary.asp?URI=TCM1999-11-140a&from=B

http://www.proteacher.com/100000.shtml (lesson plans for content areas)

http://www.nctm.org