College of Natural Science Response to Core Curriculum Assessment:

Mathematics and Science

From the Undergraduate Catalog (2006-08): UT Austin's Basic Education Requirements

The University strives to enroll exceptionally well-prepared, highly motivated students and to produce self-reliant graduates who are able to provide leadership and who do not simply react to events. The University must not only equip its graduates with occupational skills but also educate them broadly enough to enable them to adapt to and cope with the accelerated process of change occurring in business, professional, and social institutions today. Students must be exposed to a broad spectrum of arts and science, so that they may be educated beyond vocational requirements and thus be prepared for responsible citizenship in an increasingly complex world.

Every graduate of the University is expected to

- **have an understanding of some aspects of mathematics** and the application of quantitative skills to problem solving
- **have an understanding of some facets of science** and the ways in which knowledge of the universe is gained and applied

A more specific description of the outcomes to be assessed for the science requirement is derived from the Texas Higher Education Coordinating Board's core curriculum natural science exemplary education objectives:

MATHEMATICS

The objective of the mathematics component of the core curriculum is to develop a quantitatively literate college graduate. Every college graduate should be able to apply basic mathematical tools in the solution of real-world problems.

Exemplary Educational Objectives

1. To apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations.
2. To represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.
3. To expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments.
4. To use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.
5. To interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them.
6. To recognize the limitations of mathematical and statistical models.
7. To develop the view that mathematics is an evolving discipline, interrelated with human culture, and understand its connections to other disciplines.

NATURAL SCIENCES

The objective of the study of a natural sciences component of a core curriculum is to enable the student to understand, construct, and evaluate relationships in the natural sciences, and to enable the student to understand the bases for building and testing theories.

Exemplary Educational Objectives

1. To understand and apply method and appropriate technology to the study of natural sciences.
2. To recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry and to communicate findings, analyses, and interpretation both orally and in writing.
3. To identify and recognize the differences among competing scientific theories.
4. To demonstrate knowledge of the major issues and problems facing modern science, including issues that touch upon ethics, values, and public policies.
5. To demonstrate knowledge of the interdependence of science and technology and their influence on, and contribution to, modern culture.

The three-pronged strategy for the basic science education requirement will include assessment of:

Method 1: Minimum demonstration of core competencies by students completing UT Austin mathematics and science courses—QUEST, the College's course management program, will be used to evaluate content knowledge of students completing introductory majors and non-majors core science courses.

Method 2: Mastery of core mathematics and science competencies by students earning degrees in the College of Natural Sciences—QUEST, the College's course management program, will be used to evaluate mastery of content knowledge by students completing degrees in the core science areas.

Method 3: Mastery of core competencies by students engaged in experiential learning opportunities in the College of Natural Sciences—professional scientists attending the College of Natural Sciences Undergraduate Research Forum will assess oral and written presentations by students to determine mastery of core competencies applied to laboratory and real-world problem solving.

Science Core Competency Assessment Structure-CCAP.

The Dean's Office of the College of Natural Sciences will coordinate the science core assessment efforts. A committee made up of faculty and program staff associated with the core science content areas will assist the Dean's Office in creating, implementation and evaluation of assessment methods.

The College of Natural Sciences Committee on Core Curriculum Assessment assembled for the 2008-09 assessment includes:

David Laude, Associate Dean for Undergraduate Education, College of Natural Sciences
Sarah Simmons, Program Director for Honors, Research and International Studies
Cathy Stacy, Assistant Dean for Academic Initiatives and Associate Director of Statistics and Scientific Computing
Derek Will, Professor, Department of Astronomy
Pete Antoniewicz, Professor, Department of Physics
Kathy Davis, Professor, Department of Mathematics
Bruce Porter, Professor, Department of Computer Sciences
David VandenBout, Professor, Department of Chemistry and Biochemistry
Marty Shankland, Professor, School of Biological Sciences
Rose Ann Loop, Professor, School of Human Ecology

Method 1—Assessment of Minimum Core Course Competencies

Summary: As part of the general accreditation process at the University of Texas at Austin, an assessment plan to determine minimum competencies in the General Education Requirements is proposed. The College of Natural Sciences will implement an on-line core course-content assessment modality through Quest, its course management system. For the fall 2008 semester, CNS departments offering core mathematics and science courses will develop outcome-based assessment materials based on the THECB core-course learning objectives.

The advantage of using Quest to manage this method of assessment is that once the content assessment materials are created or identified, departmental involvement is minimal and the assessment process will be transparent to the course in which it is conducted, in much the same way that on-line CIS evaluations are conducted outside the formal course structure. Specifically, at the end of the fall term, Quest will administer on-line multiple-choice surveys of content knowledge in selected majors and non-majors mathematics and science courses. Quest will then compile the assessment results for subsequent interpretation at the college level through the office of the Associate Dean for Undergraduate Education, which will be responsible for evaluation and dissemination of the assessment materials.

Instructions for CNS General Education Assessment committee. Each departmental representative to the college assessment committee is asked to generate content materials for core course assessment. The accompanying table provides a list of approved core CNS courses for 2008-09 as well as a list of exemplary objectives associated with each course. Specific materials to be provided to the College by August 15 include:

- Identification of two courses for assessment in a discipline, one each at the majors and non-majors level.
- Identification of three assessment outcomes for each core course that are based on the THECB educational objectives.
- Creation of a minimum of four questions per assessment outcome to be placed in the Quest data base.

Summarizing: each department representative will provide a minimum total of 24 multiple-choice questions (2 courses x 3 outcomes x 4 or more questions per assessment) that will be administered in an on-line post-course assessment by Quest.

CNS CORE COURSES for 2008-09

Mathematics Component (3hours)	**Exemplary Objectives Met**		**Science Component(6 hours/same area)**	**Discipline**	**Exemplary Objectives Met**
C S 301K	2, 3, 4, 6		AST 301	Astronomy	1. 2. 3. 5
M 302	1, 2, 3, 5, 6, 7		AST 301L	Astronomy	1. 2. 3. 4, 5
M 303D	1, 2, 4 , 5 , 6		AST 302	Astronomy	1. 2. 3. 5
M 305G	2, 4, 5, 6		AST 303	Astronomy	1. 2. 3. 5
M 316K	1, 2, 4, 5, 6		AST 307	Astronomy	1. 2. 3. 5
M 403K	1, 2, 4, 5, 6		AST 309	Astronomy	1. 2. 3. 5
M 408C	2, 3, 4, 5, 6, 7		AST 309N	Astronomy	1. 2. 3. 5
M 408K	2, 3, 4, 5, 6, 7		AST 309Q	Astronomy	1. 2. 3. 5
SSC 303	1, 2, 3, 4, 5, 6, 7		AST 309R	Astronomy	1. 2. 3. 5
SSC 304	1, 2, 3, 4, 5, 6, 7		AST 309T	Astronomy	1. 2. 3. 5
SSC 305	1, 2, 3, 4, 5, 6, 7		AST 309M	Astronomy	1. 2. 3. 5
SSC 306	1, 2, 3, 4, 5, 6, 7		AST 350L	Astronomy	1. 2. 3. 4, 5
SSC 309	1, 2, 3, 4, 5, 6, 7		MNS 307	GEO Sciences	1, 4, 5
			BIO 301C	Biology	1, 2, 3, 4, 5
			BIO 301D	Biology	1, 2, 3, 4, 5
			BIO 301E	Biology	1, 2, 3, 4, 5
			BIO 301L	Biology	1, 2, 3
			BIO 301M	Biology	1, 2. 3, 4
			BIO 309D	Biology	1, 2, 3, 5
			BIO 309F	Biology	1, 2, 3, 4, 5
			BIO 311C	Biology	1, 2, 3
			BIO 311D	Biology	1, 2, 3
			BIO 315H	Biology	1, 2, 3, 5
			BIO 416K	Biology	1, 2, 3
			BIO 416L	Biology	1, 2, 3
			BIO 325H	Biology	1, 2, 3, 4, 5
			CH 301	Chemistry	1, 2, 3
			CH 301H	Chemistry	1, 2, 3

An Introduction to QUEST

The Quest Learning & Assessment System uses an extensive knowledge bank of over 60,000 questions and answers covering Math, Biology, Chemistry, Computer Science and Physics. These questions can be used to determine a student's understanding of a given concept taught in class.

Quest allows students to access assignments from anywhere and get immediate feedback on the answers submitted online. Students can also see how well they're doing compared to the rest of the class.

Quest makes it easy for instructors to create assignments by drawing from an extensive list of pre-existing questions. Each question has many variations to ensure students come up with their own unique answers. Quest's automatic grading feature frees up more time for instructors so they can focus on teaching.

New to Quest? Please use the follow as a guide to getting started in creating your own questions. Contact Quest for assistance at quest@cns.utexas.edu

a) Quest web page: https://quest.cns.utexas.edu/instructor/ and a Quick tour for new instructors: https://quest.cns.utexas.edu/QuestTourInstructor.htm

b) Choose "My Courses" to see a list of your current courses. If you don't see any courses, choose "New course" from the left menu to create a course. As part of the course setup, you should see the "Set Grading Scheme" page which allows you to specify weightings for assignment types and your grading scale.

c) Once you have a course created, you can begin creating assignments. Click on the course title to see the list of assignments for your course. Click the "New assignment" button to create a new assignment. Add questions to your assignment, preview it then choose Publish to make the assignment available to students.

Current question coverage in Quest

Area	# of questions	% with Answer variation	% with Explanations	Table of Contents
Biology	7,000+	5%	35%	
Chemistry	16,000+	12%	65%	
Mathematics	11,000+	78%	100%	
Physics	10,000+	72%	100%	
Physical Sciences	7,000+	30%	35%	
Computer Science	200+	35%	100%	

CNS General Education Committee Responsibilities—the 2 x 3 x 4 Rule

So what will the faculty committee charged with preparation and implementation of UT Austin's General Education Requirement assessment plan actually do?

Answer: Provide the Dean's Office with at least **24** multiple choice questions for the pilot fall 2008 assessment. The selected questions should be selected to discern a **minimum** level of competence expected by students who pass a core mathematics or science course.

How do the **24** questions break down: the 2 x 3 x 4 rule:

For **2** core courses in your discipline, one each for majors and non-majors

Identify **3** learning outcomes based on the THECB exemplary education objectives

For each outcome include a minimum of **4** multiple choice questions to be included in the Quest data base.

Instructions for Completing the Core-Course Assessment Question Form (attached pages)

1. Select two courses from your discipline, a representative majors course and a representative non-majors course, to which the core course assessment process will be applied.

2. Create a data bank of assessment questions for each course to be housed in Quest. These assessment questions should evaluate the exemplary objectives identified with each core course. In this pilot assessment effort, for each objective simply recommend four questions of a multiple choice nature to be included in the assessment data bank. You may suggest existing problems in the Quest data bank, or create new questions to be added to the data bank. In choosing your questions, do not select or create questions intended to discriminate between all levels of capability or achievement. Rather, select questions that you would anticipate that 75% of students passing the course would be expected to answer at the time the final exam for the course is administered. In other words, do not choose questions that you would expect only "A" students would correctly answer.

3. Once questions are selected, include the proposed question titles or unique identifiers on the attached form. Attached are forms specific to the mathematics core course outcomes and the science core course outcomes. If new questions are being created for the assessment pilot they must be added to Quest. If you will be using the question editor to create new questions for Quest and wish to add them yourself, simply include the name of the new question on the attached form. If you would like someone in the Dean's Office to add your new questions to the data bank, please complete the new question form for each question you would like to have placed in the Quest data bank.

Mathematics Course Core Assessment Questions—Course Name: ___________________________

From the THECB lists of seven mathematics objectives, choose three to be used as assessment outcomes. Write down the number of the objective and then provide a set of at least four questions to evaluate the outcome. If a proposed question is found in the Quest data base then provide exact question title or id. If a new question is being proposed for Quest to add to the data base, please complete the new question form and include the title of the question in the form below.

Mathematics Learning Outcome Number __________ (from list of Mathematics Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 2. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 3. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 4. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 5. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 6. Existing question: ____ New question: _____ Question Title or ID: ___________________

Mathematics Learning Outcome Number __________ (from list of Mathematics Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 2. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 3. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 4. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 5. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 6. Existing question: ____ New question: _____ Question Title or ID: ___________________

Mathematics Learning Outcome Number __________ (from list of Mathematics Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 2. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 3. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 4. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 5. Existing question: ____ New question: _____ Question Title or ID: ___________________

Question 6. Existing question: ____ New question: _____ Question Title or ID: ___________________

Science Course Core Assessment Questions--Course Name: ___________________________

From the THECB lists of five science objectives, choose three to be used as assessment outcomes. Write down the number of the objective and then provide a set of at least four questions to evaluate the outcome. If a proposed question is found in the Quest data base then provide exact question title or id. If a new question is being proposed for Quest to add to the data base, please complete the new question form and include the title of the question in the form below.

Science Learning Outcome Number __________ (from list of Science Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 2. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 3. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 4. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 5. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 6. Existing question: ____ New question: _____ Question Title or ID: __________________

Science Learning Outcome Number __________ (from list of Science Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 2. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 3. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 4. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 5. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 6. Existing question: ____ New question: _____ Question Title or ID: __________________

Science Learning Outcome Number __________ (from list of Science Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 2. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 3. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 4. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 5. Existing question: ____ New question: _____ Question Title or ID: __________________

Question 6. Existing question: ____ New question: _____ Question Title or ID: __________________

Mathematics Course Core Assessment Questions—Course Name: ___M303D_____

From the THECB lists of seven mathematics objectives, choose three to be used as assessment outcomes. Write down the number of the objective and then provide a set of at least four questions to evaluate the outcome. If a proposed question is found in the Quest data base then provide exact question title or id. If a new question is being proposed for Quest to add to the data base, please complete the new question form and include the title of the question in the form below.

Mathematics Learning Outcome Number ____1_____ (from list of Mathematics Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: FinM1a54
Question 2. Existing question: ____ New question: _____ Question Title or ID: _FinM2a09
Question 3. Existing question: ____ New question: _____ Question Title or ID: _FinM1b11
Question 4. Existing question: ____ New question: _____ Question Title or ID: _FinM1a74

Mathematics Learning Outcome Number _____2____ (from list of Mathematics Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: _FinM1c05
Question 2. Existing question: ____ New question: _____ Question Title or ID: _PreC001-3
Question 3. Existing question: ____ New question: _____ Question Title or ID: _PreC3a13b
Question 4. Existing question: ____ New question: _____ Question Title or ID: _PreC2aO2b

Mathematics Learning Outcome Number _____5____ (from list of Mathematics Exemplary Objectives)

Question 1. Existing question: ____ New question: _____ Question Title or ID: __PreC4f05a
Question 2. Existing question: ____ New question: _____ Question Title or ID: __PreC2a12a
Question 3. Existing question: ____ New question: _____ Question Title or ID: __PreC1c17n
Question 4. Existing question: ____ New question: _____ Question Title or ID: __PreC2a11a

CS307, Foundations of Computer Science

Core questions

1. An algorithm is O(N^2). The algorithm on a given computer takes 2 seconds to process a data set of 10,000 item. (N = 10,000). What is the expected time for the algorithm to process a data set of 20,000 items on the same computer?

A. 2 seconds
B. 4 seconds
C. 6 seconds
D. 8 seconds

2. Assume you are writing a program that tracks purchases on a electronic store. You want to add an undo option so that when a customer selects that option the item most recently added to their shopping cart is removed. Which data structure would be the best choice to track the selections and remove the most recent one?

A. a binary search tree
B. a regular queue
C. a stack
D. a priority queue

3. Which sorting algorithm picks a pivot value, divides the data into two groups (values less than or equal to the pivot, and values greater than the pivot), and then performs that same algorithm on the two smaller groups of data?

A. selection sort
B. merge sort
C. quick sort
D. insertion sort

4. What is the prerequisite to perform a binary search on a list of ints?

A. The integers must be in sorted order.
B. The integers must all be positive.
C. The integers must all be greater than or equal to 0.
D. There cannot be any duplicates values in the list.

5. Consider the following pseudo code algorithm. What is the Big O of the algorithm given that N is equal to the number of elements in the list? Choose the most restrictive correct answer

```
function find(array)
        var count := 0
        for i := 0 to array.length
                for j := i + 1 to array.length
                        if( array[i] == array[j] )
                                count := count + 1
        return count
```

A. O(N)
B. O(N^2)
C. O(logN)
D. O(N^3)

6. Which mathematical function does the following algorithm implement?

```
function fun(integer N)
        var result
        if(N == 0)
                result := 1
        else
                result := fun(N-1) * N
        return result
```

A. N!
B. logN (base 2)
C. logN (base 10)
D. N raised to the Nth power

7. Which mathematical function does the following algorithm implement?

```
precondition: N >= 0, M >= 0
function fun(integer N, integer M)
        var result
        if(N == 0)
                result := 0
        else
                result := fun(N-1, M) + M
```

return result

A. N!
B. N * M
C. N + M
D. M raised to the Nth power

8. The following values are inserted into a binary search tree in the order shown.

5, 10, 3, 12, 7

Which sequence will the result of an in-order traversal of the tree yield?

A. 5, 10, 3, 12, 7
B 3, 5, 7, 10, 12
C. 5, 3, 10, 7, 12
D. 3, 7, 12, 10, 5

9. What is the average case Big O of the selection sort algorithm? Pick the most restrictive correct answer.

A. O(N^3)
B. O(N)
C. O(NlogN)
D. O(N^2)

10. Which of the following underlying data structures is the best choice to implement a Stack?

A. a binary search tree
B. a priority queue
C. a hash table
D. a linked list

11. What is a generic algorithm?

A. The algorithm works on DNA data.

B. The algorithm is essentially the same regardless of data type.
C. The algorithm works on only one data type.
D. The algorithm involves an array.

12. A hash table lowers access time by setting aside lots of extra capacity and resizing when the hash table is 70% - 80% full. This is an example of what?

A. recursion
B. a sorting algorithm
C. a time - space trade off
D. debugging

CS307 Answer Key to Core Questions

1. D
2. C
3. C
4. A
5. B
6. A
7. B
8. B
9. D
10. D
11. B
12. C

Student Learning Outcomes at the PROGRAM level

Program Outcome: Have an understanding of some facets of **science** and the ways in which knowledge of the universe is gained and applied

Performance Criteria	Procedures	Method(s)	Standard of Performance	Timeline	Assessment Coordinator	Evaluation of Results
The specific skills that students will be able to demonstrate are …	The data (course/ source and artifact) will be collected from ….	The method, instrument, or tool that will be used is ….	As a sign of success the target will be …	The data will be collected during this semester …	The person or group responsible for collecting this data is …	The person or group responsible for reviewing the data is …
To understand and apply method and appropriate technology to the study of natural sciences	Method 1: Demonstrate minimum competencies in completing core science courses Method 2: Demonstrate minimum science knowledge and skills of CNS graduates Method 3: Demonstrate mastery of science	End of term on-line Quest assessment will be given to all students in representative majors and non-majors CNS science core courses Quest-generated exit assessment administered to all graduating seniors in CNS Oral examinations by academic and industry scientists administered at CNS Undergraduate		Assessments conducted during the last two weeks of fall and spring semesters Assessment conducted at the time students apply to graduate Examinations occur during April of the academic year at	CNS Core Curriculum Assessment Team (CCAT) chaired by David Laude CNS Core Curriculum Assessment Team chaired by David Laude Sarah Simmons, Program Director of CNS OHRIS	QUEST generated spreadsheet results will be evaluated by CCAT QUEST generated spreadsheet results will be evaluated by CCAT Judging sheets will be evaluated by CCAT

	knowledge and skills in experiential learning environments	Research Forum		the CNS URF		
To recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry and to communicate findings, analyses, and interpretation both orally and in writing.	As above	As above		As above	As above	As above
To identify and recognize the differences among competing scientific theories.	As above	As above		As above	As above	As above
To demonstrate knowledge of the major issues and problems facing modern science, including issues that touch upon ethics, values, and public policies	As above	As above		As above	As above	As above
To demonstrate knowledge of the interdependence of science and technology and their influence on, and contribution to, modern culture	As above	As above		As above	As above	As above

Results (date):

Actions (date):

Second-Cycle Results (date):

Student Learning Outcomes at the PROGRAM level

Learning Outcome: Have an understanding of some aspects of **mathematics** and the application of quantitative skills to problem solving.

Performance Criteria	Procedures	Method(s)	Standard of Performance	Timeline	Assessment Coordinator	Evaluation of Results
The specific skills that students will be able to demonstrate are …	The data (course/ source and artifact) will be collected from ….	The method, instrument, or tool that will be used is ….	As a sign of success the target will be …	The data will be collected during this semester …	The person or group responsible for collecting this data is …	The person or group responsible for reviewing the data is …
To apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations	**Method 1:** Demonstrate minimum competencies in completing core math courses **Method 2**: Demonstrate minimum mathematics knowledge and skills of CNS graduates	End of term on-line Quest assessment will be given to all students in representative majors and non-majors CNS math core courses Quest-generated exit assessment administered to all graduating seniors in CNS		Assessments conducted during the last two weeks of fall and spring semesters Assessment conducted at the time students apply to graduate	CNS Core Curriculum Assessment Team (CCAT) chaired by David Laude CNS Core Curriculum Assessment Team chaired by David Laude	QUEST generated spreadsheet results will be evaluated by CCAT QUEST generated spreadsheet results will be evaluated by CCAT

	Method 3: Demonstrated mastery of mathematics knowledge and skills in experiential learning environments	Thesis committee including research director and readers will assess mastery of learning outcomes		Ongoing throughout academic year at the time the honors thesis is submitted	Calvin Lin, Turing Scholars OHRIS and Alan Cline, Director of Dean's Scholars	Written comments by thesis readers will be evaluated by CCAT members
To represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.	As above	As above		As above	As above	As above
To expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments	As above	As above		As above	As above	As above
To use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.	As above	As above		As above	As above	As above
To interpret mathematical models such as formulas, graphs, tables and schematics, and draw	As above	As above		As above	As above	As above

inferences from them.						
To recognize the limitations of mathematical and statistical models	As above	As above		As above	As above	As above
To develop the view that mathematics is an evolving discipline, interrelated with human culture, and understand its connections to other disciplines.	As above	As above	As above	As above	As above	As above

Results (date):

Actions (date):

Second-Cycle Results (date