ANNOTATED GUIDE TO THE CETP CLASSROOM OBSERVATION PROTOCOL

The CETP Classroom Observation Protocol (COP) should be used to record and rate observations of mathematics and science lessons or class/lab periods for the CETP Core Evaluation. *Terminology in the COP is intended to be used flexibly in order to fit <u>both</u> K-12 and higher education settings.* The function of this guide and accompanying videotape is to explain the items contained in the COP so that observers will provide consistent information and procedures.

Section I: Background Information
Record in this section the information about the classroom observer and the science/mathematics K-12 teacher or higher education institution faculty member.

In item I-B-4, the licensure/certification refers to the K-12 teachers, whereas college rank refers to the college or university course instructor/professor.

Section II: Classroom Demographics
This section contains questions relating to the numbers of students, their grade level, and the length of the class. It also asks about the presence of paraprofessionals or TAs.

Item II-C-1 is to be completed by observers of K-12 classrooms whereas item II-C-2 is intended for observations in institutions of higher education. The latter item (II-C-2) contains several choices: a) refers to students in teacher preparation programs, b) means students with liberal arts majors, and c) is self-explanatory.

The classroom observer will also conduct a short interview with the teacher/faculty member in order to obtain contextual information about the observed lesson (see IV-B). This interview may take place either prior to or immediately following the observation. See the teacher interview section of this handbook for suggestions about the interview process.

Section III: Classroom Context
Rate each element of the physical environment in terms of how adequately each facilitated student learning. For example, a college biology laboratory that had little to no equipment for student use would be rated “Sparsely equipped.” A K-12 classroom designed for 28 students with flexible seating and only 24 students in the class would “Facilitate interactions among students.”

Section IV: Class Description and Purpose

For Section A, it is important that you familiarize yourself with the definitions of the types of instruction prior to observing the lesson. The definitions are included below; please include other strategies or categories as needed by using the "Other" option. More than one code may be assigned for each 5-minute interval; SGD, HOA, and TIS often occur together.

Type of Instruction:

L *lecture/presentation*: Teacher talks almost all the time. If students participate verbally, their interaction is minimal with questions and responses that are either very short or obvious answers.

PM *problem modeling*: Teacher demonstrating or modeling how to solve a new problem.

SP *student presentation*: e.g., student lecture, demonstration.

LWD *lecture with discussion*: Teacher talks most of the time. This differs from lecture in that students participate by answering questions that generally require more than a one-word answer. This differs from class discussion in that there is almost no student-to-student communication.

D *teacher demonstration*: Teacher shows how something works or how to do something. This differs from Problem Modeling in that it involves the use of some type of equipment or materials.

CD *class discussion*: Almost all student-to-student talk in full class setting.

WW *writing work*: Writing individually on worksheets, lab write-ups, journal entries, or other writing assignments, or combined with SGD.

RSW *reading seatwork*: Reading their textbooks or other written material.

SGD *small group discussion*: Students (2 or more) engage in conversation with each other about subject matter in small groups.

HOA *hands-on activity/materials*: Students participate in an activity that involves manipulating materials.

CL *cooperative learning*: Structured SGD with individual roles, group accountability, and group processing.

LC *learning center/station*: Students working at various stations related to particular topics. This may occur in elementary classrooms or in laboratory classes.

TIS *teacher interacting with student(s)*: Teacher moving among individuals or groups of students and talking to them.

UT *utilizing digital educational media and/or technology*: e.g., unique use of computers, calculators, videotapes, or other types of technology, not adding, multiplying, viewing overhead projections, or word processing.

A *assessment*: e.g., quiz, think aloud, problem set. Specify type and how it is used.

AD *administrative tasks*: Teacher and students take care of nonacademic business, i.e., taking attendance, collecting homework, etc.

OOC *out-of-class experience*: e.g., field trips, interactions with other classrooms, concerts.

I *interruption*: e.g., visitor, unexpected announcements, student disruption.

OTH *other*: e.g., something not included in the above codes. This should be described.

Student Engagement: This asks for a subjective judgment as to whether:

- the percentage is somewhere between 20% and 80%.
- most (80% or more) are off-task
- most (80% or more) of the students are engaged in the task

Cognitive Activity:

1 ***Receipt of knowledge*** – Students are involved in the rote reception of information. This generally includes listening to a lecture, going over homework, or watching the teacher verify a concept through demonstration. The key feature of this category is that students are receiving information but not significantly doing anything with the information.

2 ***Application of procedural knowledge*** – Students apply their knowledge. This typically involves students using what they have learned, doing worksheets, practicing problems, or building skills. The key feature of this category is that students are taking information and applying it or practicing.

3 ***Knowledge representation*** – Students manipulate information. This is usually a step beyond application. In knowledge representation activities students will typically re-organize, categorize, or attempt to represent what they have learned in a different way. For example, students might take the data from a lab activity and represent it graphically. The key feature here is the reorganization or representation of information.

4 ***Knowledge construction*** – Students create new meaning. This typically involves creating new understandings or making new connections. Students might be generating ideas, or solving new problems. For example, students might be using the results of three different labs and generating patterns that hold true in all three cases. The key feature of this category is that students generate new knowledge or meaning.

0 ***Other*** – This category includes activities not included above, e.g., classroom disruptions. These should be described.

Information in IV-B is to be obtained from two sources: a planning document and the teacher (see the teacher interview section of this document). The information from a lesson plan, syllabus, or course outline provides a context within which each lesson has a particular place. The description of the goal of the lesson and its fit within an instructional cycle or course syllabus should be obtained from an interview with the teacher/faculty member.

Section V: Ratings of Key Indicators

This section contains 12 questions to be rated by the observer. Do *not* feel that you have to complete these items during the actual observation period. However, you should be familiar with the questions so that you can jot down notes that will facilitate your rating at the end of the class. For most items, a valid interpretation can be rendered only after observing the entire lesson. Something occurring during the last five minutes of the lesson can change the interpretation of earlier observed events.

Each of the items is to be rated on a five-point scale ranging from 1 to 5. A number 1 indicates that characteristic *never* occurred. If it occurred at all, even once, a 1 should not be used. A rating of 5 means that the characteristic occurred to a great extent, whereas the numbers 2-4 indicate a continuum from a single event to frequent occurrence. Use DK when there is not enough evidence for you to make a judgment and N/A if you consider the indicator inappropriate given the purpose and context of the lesson.

The rest of this section provides clarification of the items. Although most observations will be of science and mathematics classes, some observations of science or mathematics teaching methods classes may also occur. You should consider the items broadly.

(1) This lesson encouraged students to seek and value alternative modes of investigation or of problem solving.
Divergent thinking is an important part of mathematical and scientific reasoning. A lesson that meets this criterion would not insist on only one method of experimentation or one approach to solving a problem. A teacher who valued alternative modes of thinking would respect and actively solicit a variety of approaches and understand that there may be more than one answer to a question. An example of a classroom situation rated 5 would be where the teacher and students identify exceptional characteristics of a problem and actively construct alternative methods for investigation. A 1 would be assigned where the teacher presents statements and problem solutions as absolutes.

(2) Elements of abstraction (i.e., symbolic representations, theory building) were encouraged when it was important to do so.
Conceptual understanding can be facilitated when relationships or patterns are represented in abstract or symbolic ways. Developing theories from data would also be an element of abstraction. Not moving toward abstraction can leave students overwhelmed with trees when a forest might help them locate themselves. An example of a 5 would be students developing a formula or describing what would happen in different situations, based on what they were learning in a specific context. A methods class example would be developing theories about pedagogical content knowledge. Identifying patterns would be a 2. For a rating of 1, patterns would not be pointed out or developed by the students.

(3) Students were reflective about their thinking.
Active reflection is a metacognitive activity that facilitates learning. It is sometimes referred to as "thinking about thinking." Teachers can facilitate reflection by providing time and suggesting strategies for students to evaluate their thoughts throughout a lesson. A review conducted by the teacher may not be reflective if it does not induce students to *re-examine* or *re-assess* their thinking. An example of a 5 would be where students explain how they came to believe something. A methods class example would be where students think about how they came to believe certain things about mathematics and science students. An example of a 1 would be where students say what they think but don't explain how or why they think it.

(4) The instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein.
A cornerstone of reformed teaching is taking into consideration the prior knowledge that students bring with them. The term "respected" is pivotal in this item. It suggests an attitude of curiosity on the teacher's part, an active solicitation of student ideas, and an understanding that much of what a student brings to the mathematics or science classroom is strongly shaped and conditioned by their everyday experiences. A rating of 5 would be given where the teacher elicits the students prior conceptions and makes the students aware that these are prior conceptions. Then the teacher uses these conceptions as the basis for the lesson. A rating of 1 would be given where the teacher is unconcerned about the students pre-existing ideas, doesn't ask about them nor deal with them when they come up in class discussions.

(5) Interactions reflected collaborative working relationships among students (e.g., students worked together, talked with each other about the lesson) and between teacher/faculty member and students.
A lesson where a teacher does most of the work or most of the talking is not reformed. In contrast, a lesson where students work together cooperatively, exchanging ideas related to the activity, and where the teacher/faculty member moves among the groups in a facilitative manner reflects reformed teaching. An example of a 5 would be where students are working in true cooperative groups where they engage in intellectual discussions which are assisted at times by thought-provoking questions from the teacher. There is also clear rapport and respect among the teachers and students. An example of a 1 would be classrooms where there is no group work or it is individuals sitting next to each other perhaps sharing equipment but working independently. Some sharing of ideas would move the rating to a 2.

(6) The lesson promoted strongly coherent conceptual understanding.
The word "coherent" is used to emphasize the strong interrelatedness of mathematical and/or scientific thinking. Concepts do not stand on their own two feet. They are increasingly more meaningful as they become integrally related to and constitutive of other concepts. Strongly coherent conceptual understanding could also be representative of a methods class that shows the relatedness of pedagogical understandings. An example of a 5 would be when a concept is presented in a variety of ways so all aspects can be understood and also when it is related to other topics (from previous class periods or other subjects) and to real world settings. An example of a 1 would be when a teacher describes a concept without including relationships or connections.

(7) Students were encouraged to generate conjectures, alternative solution strategies, and/or different ways of interpreting evidence.
Standards-based teaching shifts the balance of responsibility for mathematical or scientific thought from the teacher to the students. An informed teacher actively encourages this transition. An example of a 5 would be where the teacher encourages students to find more than one way to solve a problem and the lesson is devoted to discussing and critiquing these alternate solution strategies. An example of a 1 would be when a teacher allows only a single way to think about or solve a problem.

(8) The teacher/faculty member displayed an understanding of mathematics/science concepts (e.g., in her/his dialogue with students).
This indicates that a teacher could sense the potential significance of ideas as they occurred in the lesson, even when articulated vaguely by students. A solid grasp would be indicated by an eagerness to pursue students' thoughts even if seemingly unrelated at the moment. The grade-level at which the lesson was directed should be taken into consideration when evaluating this item. For a methods class this could mean displaying an understanding of pedagogical content knowledge as well. A rating of 5 would be assigned when a teacher facilitates a student's understanding of a fine point within a concept or about a relationship of the concept to other areas of knowledge. The teacher understands the concept so well that any path students take to or from that concept would be recognized. A 1 would be assigned when a teacher presents information algorithmically or makes mistakes.

(9) Appropriate connections were made to other areas of mathematics/science, to other disciplines, and/or to real-world contexts, social issues, and global concerns.
Connecting mathematical and scientific content across the disciplines and with real world applications tends to generalize it and make it more coherent. An example of a 5 would be a physics lesson on electricity that connects the role of electricity with biological systems or with the wiring systems of a house. Another example would be a mathematics lesson on

proportionality that is connected with the nature of light by referring to the relationship between the height of an object and the length of its shadow (see also #6). An example of a 1 would be a lesson where no connections are made and topics are just presented as separate entities.

(10) Students' understanding of mathematics/science as a dynamic body of knowledge generated and enriched by investigation.
Mathematics and particularly science knowledge changes as new information becomes available through investigation and experimentation. New technological developments can change what we are able to perceive, e.g., electron microscopes compared to simple magnification. Therefore what is accepted as fact at one point in history may not hold true in more recently accepted paradigms of thought. An example of a 5 would be a lesson that supports the idea that knowledge is tentative, and encourages "out-of-the-box" thinking and active investigatory activity. An example of a 1 would be a lesson that presents concepts as factual and never changing and where information is not presented for critical scrutiny and where no "investigation" is allowed. It is possible that a methods class could be designed to accomplish this and then the session should be rated. If it is not a purpose of the class, N/A should be chosen.

(11) Students' understanding of important mathematics/science concepts.
A 5 rating would be assigned to a lesson that presents important or key concepts in a variety of ways. The teacher encourages student questioning that allows in depth understanding and assesses student understanding frequently in both formal and informal ways. A 1 would be given where the concepts are taught only in a didactic fashion or the concepts covered are below the level of the student and trivial (or unconnected to major ideas in science and mathematics), and where student understanding is rarely assessed or assessed inappropriately. It is possible that a methods class could be designed to accomplish this type of understanding, in which case the session should be rated. If it is not a purpose of the class, N/A should be chosen.

(12) Students' capacity to carry out their own inquiries.
A lesson that promotes frequent interaction among students and where that interaction results in planning and performing inquiry independently would be rated a 5 for this item. A 1 would be assigned to a situation where the teacher planned all activities and the students just followed detailed instruction, i.e., where no inquiry occurred. A methods class would be rated highly if the lesson increased to a great extent students' capacities to be reflective practitioners.

Section VI: Capsule Description of the Quality of the Lesson

Synthesize all the available information about the lesson and select a capsule rating that best describes the overall quality of the lesson you observed. Provide a brief rational for the selected capsule rating as well. If a methods class is observed, you should interpret the terms within the descriptions broadly. For example, the lesson might be rated as to its likelihood to enhance students' understanding of mathematics or science pedagogy. The rest of this section provides detailed explanations of the capsule ratings.

Level 1: Ineffective Instruction

There is little or no evidence of student thinking or engagement with important ideas of mathematics/science. Instruction is *unlikely* to enhance students' understanding of the discipline or to develop their capacity to successfully "do" mathematics/science. The lesson was characterized by either (select one below):

Passive "Learning"

Instruction is pedantic and uninspiring. Students are passive recipients of information from the teacher/faculty member or textbook; material is presented in a way that is inaccessible to many of the students.

Activity for Activity's Sake

Students are involved in hands-on activities or other individual or group work, but it appears to be activity for activity's sake. Lesson lacks a clear sense of purpose and/or a clear link to conceptual development.

Level 2: Elements of Effective Instruction

Instruction contains some elements of effective practice, but there are *substantial problems* in the design, implementation, content, and/or appropriateness for many students in the class. For example, the content may lack importance and/or appropriateness; instruction may not successfully address the difficulties that many students are experiencing, etc. Overall, the lesson is *quite limited* in its likelihood to enhance students' understanding of the discipline or to develop their capacity to successfully do mathematics/science.

Level 3: Beginning Stages of Effective Instruction (Select one below.)

Low 3 *Solid 3* *High 3*

Instruction is purposeful and characterized by quite a few elements of effective practice. Students are, at times, engaged in meaningful work, but there are *some weaknesses* in the design, implementation, or content of instruction. For example, the teacher/faculty member may short-circuit a planned exploration by telling students what they "should have found"; instruction may not adequately address the needs of a number of students; or the classroom culture may limit the accessibility or effectiveness of the lesson. Overall, the lesson is *somewhat limited* in its likelihood to enhance students' understanding of the discipline or to develop their capacity to successfully do mathematics/science.

Level 4: Accomplished, Effective Instruction

Instruction is purposeful and engaging for most students. Students actively participate in meaningful work (e.g., investigations, teacher/faculty member presentations, discussions with each other or the teacher/faculty member, reading). The lesson is well-designed and the teacher/faculty member implements it well, but adaptation of content or pedagogy in response to student needs and interests is limited. Instruction is *quite likely* to enhance most students' understanding of the discipline and to develop their capacity to successfully do mathematics/science.

Level 5: Exemplary Instruction

Instruction is purposeful and all students are highly engaged most or all of the time in meaningful work (e.g., investigation, teacher/faculty member presentations, discussions with each other or the teacher/faculty member, reading). The lesson is well-designed and artfully implemented with flexibility and responsiveness to students' needs and interests. Instruction is *highly likely* to enhance most students' understanding of the discipline and to develop their capacity to successfully do mathematics/science.