

## **EVALUATING REFORM TEACHING IN COLLEGE COURSES—ACTION EVALUATION IS ACTION RESEARCH**

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### **Introduction**

“Why is the sky on Earth blue?” “What color would the sky be on the moon?” What color would the sky be on Mars?” How can college courses help tomorrow’s teachers be more confident in both answering such scientific questions and in helping their own students understand fundamental scientific concepts? The purpose of this paper is to present the results of an ongoing curriculum design and evaluation project to reform college science and math courses and educational methods courses taken by pre-service teachers. Faculty at seven Virginia higher education institutions have collaborated to develop courses that teach a broad-based core of essential knowledge consistent with the national standards reform movement. Elementary and middle school teachers have also been involved in the project on these course development teams and through serving as clinical faculty supervising the pre-service teachers.

After reviewing some historical background on the rationale for curriculum reform in math and science teaching, this paper will present a summary of what professors and their students say about “reformed” college courses in math and science. Interviews were conducted with professors who revised their courses using the fifteen Virginia Collaborative for Excellence in the Preparation of Teachers (VCEPT) Course Reform Guidelines (listed later in the Procedures and Data Collection section.) Class visits were made to observe these reform courses being piloted during summer school sessions. Course questionnaires were collected from students who took these reformed courses when they were offered during the regular academic year. Since the faculty interviews and class observations were done primarily to provide formative evaluation feedback to project participants, the primary emphasis of this paper will be on the analysis of student surveys from 36 different courses totaling more than 2,000 students. How consistently do students notice different teaching practices in these reform courses? How do these reform teaching practices influence the students’ learning? What are the implications of these

preliminary findings for future math and science course development and implementation in higher education?

### **Theoretical Background**

During the past five years, the National Science Foundation (NSF) has funded the Collaboratives for Excellence in Teacher Preparation (CETP) program to encourage educational institutions to reform the initial training of K-12 teachers to produce future teachers well prepared in science, mathematics, and technology. Typically each year, three collaboratives have received a three to five year grant to develop innovative ways to prepare future teachers in the areas of science, math, and technology. Consistent with the overall goal of the NSF Division of Undergraduate Education, this program promotes the use of best teaching practices to attract, instruct, and retain the most capable college students for teaching careers. One key aspect of this program is to encourage arts and sciences college faculty to work with education faculty and local school teachers to develop science and math instructional experiences that help students learn in-depth subject matter and essential teaching skills.

The theoretical framework for reform programs such as CETP can clearly be found in the science and math standards-based reform efforts of the past decade. Twelve years ago, the American Association for the Advancement of Science (AAAS) began Project 2061 with the explicit long-term goal to reform K-12 education to produce science literate graduates. Their 1989 report, *Science for All Americans*, identified what all students should know and be able to do in science, mathematics, and technology after thirteen years of schooling [1]. In 1993, Project 2061 published *Benchmarks for Science Literacy* that translates the literacy goals of *Science for All Americans* into explicit learning objectives by the end of grades 2, 5, 8, and 12 [2]. The *National Science Education Standards* [3] released in December 1995 provided a series of standards for: (1) science teaching; (2) professional development of teachers; (3) teachers' development of professional knowledge and skills; (4) science education assessment; (5) content standards organized by K-4, 5-8, and 9-12 grade levels; (6) school district science program standards; and, (7) the science education system beyond the school. Among the six science teaching standards presented in that report, the call for inquiry-based science programs, for the teacher to become a facilitator of student learning, and for ongoing assessment of teaching and student learning are especially important to reforming college science courses.

Other professional organizations have also been actively involved in promoting new ways to reform educational practice. When the National Council of Teachers of Mathematics (NCTM) published its *Curriculum and Evaluation Standards for School Mathematics* in 1989, it began an active discussion of how mathematics should be taught that continues today [4]. The discussion draft of the updated NCTM Standards, entitled *Principles and Standards for School Mathematics* [5], was released in October 1998. The final version of the revised “Standards”, released in 2000 is scheduled to be available soon on the newly updated NCTM website [6]. The National Council for Accreditation of Teacher Education (NCATE) has also released its draft elementary standards and assessment guidelines destined to become an integral part of NCATE 2000, NCATE's performance-based accreditation system now under development. These preparation standards identify what new elementary teacher candidates should know and be able to do.

### **Purpose of Evaluation**

How can the impact of educational reform efforts on college courses and student teachers' K-8 classroom performance be evaluated in practical but effective ways? Throughout this project, data have been systematically collected to describe what actually happens in reform classes, how students and instructors respond to these “best teaching practices,” and how it affects students as they prepare for their student teaching experiences. Specifically, this evaluation research aimed to answer such questions as: (a) How do faculty and students actually spend their classroom time in a reform designed course? (b) How do students respond to reform-based course features? (c) What do college instructors conclude as they reflect on their reform teaching experience? (d) What influences do such reform college courses have on student teachers' K-8 classroom teaching preparation? (e) What kinds of evaluation strategies and findings best describe and communicate these educational reform efforts to various stakeholders?

### **Methods**

Data Sources — The Virginia Collaborative for Excellence in the Preparation of Teachers (VCEPT), established in May 1996, consists of four-year institutions (Virginia Commonwealth University, Norfolk State University, Mary Washington College, Longwood University, University of Virginia, Virginia Union University, and the College of William and Mary), two-year institutions (J. Sargent Reynolds Community College, Tidewater Community College, and Germanna Community College), community-based educational institutions (the Science Museum of Virginia and the Virginia Mathematics & Science Center), and local school systems. While

there are five key goals in that project, the focus of this paper is only on one of those goals: large-scale college course development, reform and adoption, and the resulting impact on students.

Course development teams from the various participating institutions spent the first year designing a variety of college math, science, and teaching methods courses. During the summer of 1997, the first group of reform courses was taught at Virginia Commonwealth University (VCU). Teams of two to four professors from the different participating institutions served as the instructors for each course. Students enrolled in the courses were generally non-science majors taking the courses to satisfy general education requirements and included prospective K-8 teachers. During the summers of 1998 and 1999, additional courses were team taught at Norfolk State University (NSU) and Mary Washington College (MWC), respectively. Introduction of these reform courses as part of the required general education coursework was also begun at various participating institutions during the regular 1998-99 academic year and continued into the 1999-2000 school year.

Procedures and Data Collection — The evaluation strategy in this project has focused on assessing the effects of educational reform on several different project efforts. During the first three years, formative evaluation was emphasized to provide ongoing feedback for project planning, monitoring, and administration purposes. Formative evaluation of the VCEPT reform courses was also carried out to provide systematic feedback to both course instructors, course development teams, and the project management team. In the fourth year of the project, evaluation efforts have begun to focus on college course implementation issues. Also, during the fourth year, pilot testing of evaluation procedures and instruments for follow-up impact studies was started.

Selected evaluation data from the first three years will be described to provide some background and context for the project accomplishments. However, this paper will emphasize the conclusions that have resulted from the fourth-year evaluation efforts on course implementation. Specifically, the following questions have guided the Year 4 data collection and analysis. To what degree do these college courses reflect the educational reform standards identified in the course development effort? What actually happens in the college classroom when faculty teach these reform courses? How do college students value the different instructional activities in these

reform courses? How do student teachers who have taken these reform courses teach math and science in K-8 classrooms?

Four sources of data have been used to evaluate the impact of the reform-based science and math courses: 1) instructors' description of course, e.g. syllabi, supporting course materials and Self Assessment instrument; 2) classroom observations throughout the summer school courses; 3) end-of-course student evaluation questionnaires; and, 4) individual interviews with course instructors. During Years 1-3, students in the team-taught summer session courses completed an end-of-course evaluation form. After the fall semesters of the third and fourth years, faculty teaching any reform courses in their home institution were also asked to distribute an end-of-course evaluation form.

The classroom observation instrument was designed by the project evaluator to focus on "best teaching practices" incorporated into the course by the individual development teams. It was intended to measure the instructors' whole class instructional behaviors, the students' whole class behaviors, the small group interactions, and individual student presentations and activities using 24 specific classroom behavior categories. College students were recruited to attend the courses as observers. These students were undergraduates with an interest or actual training in becoming certified teachers, but did not necessarily have expertise in the science or math course they were observing. The observers were initially trained by the project evaluator and a weekly meeting to resolve any observation questions was held throughout the summer session. The observers used a five-minute or one-minute time sampling technique to record what was happening in the course.

The primary information sources for the Year 4 evaluation came from two main sources. All VCEPT instructors were asked to complete a Course Quality Assurance Self-Assessment. The purpose of this effort was to use the six VCEPT course development guidelines (identified on the Self-Assessment form included at the end of the paper) as an assessment rubric for judging the VCEPT courses. VCEPT instructors completed this task and shared the results during November on-site visits by the project's external oversight committee, the National Visiting Committee (NVC). Individuals on this committee were mathematics and science content experts selected in consultation with the NSF. In addition to providing the NVC member with helpful information about the course being observed, the completed Self-Assessment forms provided a record of what changes instructors have made in their courses.

Instructors at all the participating institutions teaching VCEPT reform courses were provided with a two-page questionnaire to distribute to their students at the end of the course. Students were given fifteen items reflecting the VCEPT course development guidelines and asked to judge how frequently those characteristics took place in class and to rate the importance of those elements to their own learning (see Appendix A). There were 2,045 student responses representing 36 separate courses from seven higher education institutions. While eight of these courses have multiple sections, all courses were developed to be taught according to the reform practices regardless of instructor.

The course questionnaire asked students to rate fifteen course characteristics representing the essential project guidelines for course reform. These fifteen course development criteria are:

1. active student learning
2. up-to-date teaching technologies
3. connections to other related disciplines
4. connections to the natural world
5. mixture of breadth and depth in coverage
6. interesting and intellectually involving concepts
7. critical thinking about current events
8. practical applications to students' own lives
9. effective interactions among students
10. opportunities to collect pertinent information
11. opportunities to organize information
12. opportunities to analyze information
13. opportunities to communicate conclusions and ideas
14. ethical and social implications in the world
15. assessment of student performance in different ways

Students were asked to indicate the frequency of the VCEPT course characteristics using a five-point scale that included these choices: "Systematic use (100% of classes); Customary use (75%-99% of classes); Frequent use (50%-74% of classes); Moderate use (25-49% of classes); Occasional use (0-24% of classes)." Students also indicated the importance of these VCEPT characteristics in helping them learn in this course by using a five-point scale that included: "Very Important"; "Important"; "Unimportant"; "Detrimental to your learning"; or, "Not Applicable or No Opinion."

### **Results of Selected Findings from Years 1-3**

Summer School Student Questionnaires — The summer school course evaluation data indicated that students were most satisfied with the use of active learning strategies and real life examples of math and science. On the item, “This course increased my ability to relate math/science concepts to ‘real world’ applications,” the range of course means was 2.74 to 3.44 with a median of 3.30. [The end-of-course evaluation form used both four-point “strongly disagree” to “strongly agree” rating scale items and open-ended questions.] The most problematic characteristic of the courses for students was the team teaching. The students’ open-ended answers revealed their concern was due to differences in faculty teaching style and how those differences affected course assessment activities. While the course evaluation data showed most students agreed with the in-class participatory activities, between 16% and 23% of the students expressed some dissatisfaction with various aspects of these more active learning approaches. In addition, the course evaluation results clearly showed that a large majority of students planning to teach agreed these courses increased their understanding of both math/science content and math/science teaching strategies.

Summer School Observations — During summer session courses, an attempt was made to assign a student observer to every class. For example, during the 1997 summer session, six of the seven courses had a student observer. Typically, the observers attended a majority, but not all, of the classes. The range was 14 to 21 observation days with a median of 17 and there was no systematic pattern to “missing observation days.” Analysis of the data reveals much heterogeneity among the faculty’s use of different instructional strategies. For example, the use of classroom lecture varied from 19% to 51% of class time among the six courses. The use of small group student activities varied from 0% to 28% of the observed classes. Student participation during whole class instruction (such as asking and answering questions, providing information or reactions, etc.) varied in the courses from less than 1% to a high of 13% of observed class time. Group or individual problem solving activities varied from 0% to 20% of class time among the six courses. While class size did influence some of these variations, all courses had been developed to stress active learning within an expected class size of ten to fifty students.

Faculty Interviews — Interviews with most faculty were conducted via telephone by the project evaluator. Faculty members were consistently positive about their summer teaching experience with the team teaching element frequently identified as one of the best aspects of the summer

course. Since the purpose of the team teaching experience was to encourage professional development among faculty, the reform courses seem to have accomplished that objective. However, some faculty did mention that the unique context, objectives, and class size of the summer school courses were very different from their regular teaching experiences. They acknowledged that the question of how to transfer these “best practices” still requires additional resources or departmental support at their home institutions.

### **Year 4—Full-scale Course Implementation**

The instructors completed the Course Quality Assurance Self-Assessment and submitted it to the project management team for inclusion in the 1999 annual project report. These completed forms were also reviewed by the evaluator and related to the students’ course ratings. The student course evaluation results are found in the following four tables:

Table 1 All VCEPT courses - Percentage distribution of student responses

Table 2 Subset of All Mathematics, Science, and Technology courses

Table 3 Subset of All Teaching Methods courses

Table 4 All VCEPT courses — Means & standard deviations

### **Discussion**

Examining the feedback from 2,045 students in 36 courses reveals that the most frequently identified course characteristics were #1 “active student learning” and #2 “up-to-date teaching technologies,” with 66% choosing “systematic” or “customary” frequency. The criteria #4 “connections to the natural world” had 64% of students choosing the same two highest categories. Also highly rated by students were #5 “mixture of breadth and depth in coverage” and #6 “interesting and intellectually involving concepts,” with 62% of the students indicating these occurred in three-quarters or more of their classes. The two VCEPT course characteristics least often noted by the students were #7 “critical thinking about current events” and #14 “ethical and social implications in the world,” with 40% identifying these as occurring with “systematic” or “customary” frequency.

These student ratings do support the conclusion that these course development criteria were evident in most VCEPT courses. Twelve of the fifteen identified course characteristics were rated by 75% or more of the students as occurring in at least half of their classes. The three lowest rated items not meeting this level were #7 “critical thinking about current events,” #14 “ethical and social implications in the world,” and #8 “practical applications to students’ own lives.”



These were rated by 65%, 66%, and 72% of the students as occurring in at least half of their courses.

Students also indicated the importance of these VCEPT characteristics in helping them learn in this course by using a five-point scale that included “Very Important,” “Important,” “Unimportant,” “Detrimental to your learning,” or “Not Applicable or No Opinion.” The three most valuable course characteristics were: #1 “active student learning” (57% chose “Very Important”); #6 “interesting and intellectually involving concepts” (49% chose “Very Important”); and, #15 “assessment of student performance in different ways” (41% chose “Very Important”). The three characteristics reported as least important with only 23%, 25%, and 25% of the students, respectively, choosing “Very Important” were #7 “critical thinking about current events”; #14 “ethical and social implications in the world”; and, #3 “connections to other related disciplines.” Since two of these least valuable course characteristics were also the two characteristics least often found in the VCEPT courses, faculty members seem to have matched their reform course changes to reflect student preferences.

The one item which students rated as reasonably helpful to their learning which was not perceived as frequently happening in their courses was #8 “practical applications to students’ own lives.” Students saw this feature as beneficial (36% rated it “Very Important” and 45% rated it as “Important”). However, it was the third least noted course feature with only 48% of the students acknowledging this happened in at least half of their classes. In fact, 12% of the students selected “Occasional Use” (0-24% of classes) for item #8, the third lowest rating.

Table 4 expresses the students’ ratings by weighting their responses on a five-point scale (A = 5, B = 4, C = 3, D = 2, E = 1 for both the Presence items and for the Value items). Again, this way of analyzing the students’ ratings reveals the highest rated class frequency was for item numbers 1, 2, 3, 4, 5, and 12. The most valuable for learning were again #1, #6, #2, and #15, as noted above.

Although most of the reform courses were math and science courses, there were seven education courses with a total of 115 students responding to the course questionnaire. Tables 2 and 3 show the student ratings separated for arts and science courses and for education courses. While there are individual differences to specific course features, the most dramatic differences can be found in the last three items on the questionnaire. In the math and science courses, 784 of

the 1,930 students who responded plan to teach. When asked whether this course experience increased their motivation to try a variety of math and science teaching strategies in their own teaching, 26% “Strongly Agree.” Of the 115 students in the teaching methods courses, 83% “Strongly Agree” to that same question. To item 34 asking whether the course increased their understanding of how to use different math/science teaching strategies, 28% of the students in the math and science courses “Strongly Agree” while 76% of the students in the education courses “Strongly Agree.” A similar difference was found to the final question about whether the student was likely to share ideas from this course with classmates: 24% of the math and science course students “Strongly Agree” and 68% of the education students “Strongly Agree.” While these differences could be due to generally smaller class sizes and a higher percentage of juniors and seniors in the education courses, it could also represent a difference in student purpose for the general education math/science courses and for the education teaching methods courses.

Finally, there was much variation among courses on the four features rated by the students as most important. For example, using the five-point scale presented in Table 4, students’ ratings on the frequency of “active student learning,” varied from a high course mean of 4.9 to a low of 2.4. To the course feature “interesting and intellectually involving concepts,” the perceived frequency rated by students ranged from a course mean of 4.8 to 2.6. On the course characteristic “assessment of student performance in different ways,” the course means ranged from 4.5 to 2.6. On the use of “up-to-date teaching technologies” in their classes, the mean student ratings ranged from 4.9 to 2.6. As noted in Table 4, all fifteen course characteristics showed an overall mean of 3.0 or above. However on the four most important course characteristics, there were from three to five courses below the 3.0 level.

These student frequency ratings should provide helpful feedback to course instructors for further development of their courses, especially for the lowest rated courses. Because these instructors have also done a Self-Assessment of their course, it is possible to do a preliminary analysis as to why students reacted so differently. For example, the reform course rated highest on “active student learning” was a “studio physical science” course in which students spent almost all of their class time in small groups working with microcomputer-based and video-based labs. In an education course seen as also encouraging “active student learning,” the instructor described her course as involving small group activities (both cooperative learning and group projects) that involved computers, graphic calculators, and student manipulatives. Reform courses that were rated low by students on “active student learning” reported using computer-based

homework, Internet assignments, CD-ROM assignments, *PowerPoint* presentations, and some group exercises. Clearly, what is done may not be as important as how it is done and how often it is done. Even within the same course, it was clear that instructor differences made a big difference. For example, among six different sections of the same computer science course, the mean student ratings to “active student learning” were 3.6, 3.4, 3.6, 2.4, 2.7, and 3.6, respectively.

### **Educational Implications**

Although it is important not to overgeneralize from any initial offering of newly developed courses, the results of this evaluation of these reform college science and math courses do allow some tentative conclusions which have important educational implications:

- Designing and delivering a learner-centered reform course are two separate actions— What is listed on the page may not be what is presented in the class.
- Changing experienced professors from their traditional role as “sage on the stage” is a challenge—Skills and preferences developed during more traditional teacher-centered instruction do not always generalize to more reform-oriented, student-centered instruction.
- Changing students’ expectations about their math and science instruction is also very important—Not all students respond favorably to traditional lectures, but not all students respond favorably to “active learning” classroom teaching either.
- Students’ course assignments and class activities shape their expectations, focus, effort, and ultimately, the kinds of learning that will remain after the course is completed—Students planning to be K-8 teachers can be influenced by their math and science professors’ teaching techniques, but these pre-service teachers still tend to focus on content knowledge in these general education courses and focus on pedagogy in their teaching methods courses.
- Connecting student assessment and grading procedures to the reform teaching strategies is critical—Traditional paper and pencil exams testing basic knowledge may undermine a reform instructional approach that stresses student involvement and critical thinking.
- Learning through collaboration and team teaching can be an effective professional development strategy for college professors—Math and science college professors in this project express enthusiasm for observing and discussing course activities, but express less in how to develop the necessary classroom skills and ways to facilitate their students’ learning.
- All reform courses do not look the same! The degree of “reform” varies with the course topic, class size, access to technology, and unique instructor qualities—College professors in specific mathematics, science, and education courses will interpret and apply general reform

course development guidelines in ways that reflect their disciplinary background, pedagogic beliefs, and teaching experiences.

- Identifying reliable, valid, and convincing measures of student achievement in reform math and science college courses is difficult—It is easier to get college faculty to discuss learner-centered course characteristics and student activities than to discuss their measures of student learning in their courses.
- Informal conversations with project participants may be more influential than formal evaluation reports—The neutrality you “lose” by being an inside project evaluator can be outweighed by the influence you “gain” through regular participation in project discussions and decisions. ■

## References

- [1] *Science for All Americans*, American Association for the Advancement of Science, Oxford University Press, New York, 1989.
- [2] *Benchmarks for Science Literacy*, American Association for the Advancement of Science: Project 2061, Oxford University Press, NY, 1993.
- [3] *National Science Education Standards*, National Academy Press, Washington, DC, 1996.
- [4] *Curriculum and Evaluation Standards for School Mathematics*, National Council of Teachers of Mathematics, Reston, VA, 1989.
- [5] *Principles and Standards for School Mathematics*, National Council of Teachers of Mathematics, Reston, VA, 1998.
- [6] *Principles and Standards for School Mathematics*, National Council of Teachers of Mathematics, Reston, VA, 2000.

Appendix A  
VCEPT Course Quality Assurance Self-Assessment

The purpose of this checklist is to assure that the VCEPT criteria for course development are reflected in each VCEPT course. The six guidelines emphasize: (1) active student learning through up-to-date teaching technologies and methods; (2) interconnectedness to other disciplines and to the natural world; (3) practical applications to students' own lives; (4) effective interactions among students and appropriate analysis of information; (5) reflecting standards-based curriculum—both national guidelines and/or Virginia Standards of Learning; and, (6) a variety of student assessment strategies. The full VCEPT course development guidelines are listed below.

**General Criteria for Course Development**

The Collaborative has adopted the following general criteria for all science, math, interdisciplinary, technology, and methods courses we may develop. These courses should offer a broad-based core of knowledge taught with the goal of producing well-informed citizens. In addition, methods courses should increase knowledge of how to teach math and science to K-8 students.

1. The most up-to-date teaching technologies and methods should be incorporated into these courses as available and appropriate to enhance active student learning.
2. These courses should nurture student awareness and appreciation of the variety and interconnectedness of ways scientists learn about the natural world. Thus, each course should be broad in outlook, encouraging and assisting students to make connections with other related disciplines.
3. These courses should invite, enable, and expect students' active interest and involvement in the subject, beyond the receiving and recounting of information. Students' active involvement in these courses will enable them to hone their abilities to think clearly about current events, to become more deeply involved intellectually, and to relate science and mathematics to situations in their own lives.
4. These courses should create a sense of intellectual community among students and between students and faculty. To foster this, small group collaborations, whenever appropriate, should be built into the course, allowing interactive teams of students to communicate ideas, gather, organize, and analyze information, draw logical conclusions from objective data, and address ethical issues. Internet forums and e-mail could provide additional methods of interaction within the classroom, where appropriate, or outside of class.
5. These courses should provide prospective K-8 teachers with an understanding of the material specified in the Virginia K-8 science, mathematics, and technology Standards of Learning as well as the national standards developed by the National Research Council and the National Council of Teachers of Mathematics.
6. These courses should enable students to demonstrate their mathematics and science understanding in a variety of assessment situations.

Please keep these criteria in mind as you describe your course in the following four sections. Each section asks you to relate the VCEPT criteria to important course development decisions you made about your (1) instructional objectives, (2) course content, (3) teaching activities, and (4) student assessment.

### 1. Course Objectives

How well do your instructional objectives, identifying what you want students to accomplish by the end of your course, reflect the following VCEPT criteria?

Please circle the appropriate letter on this 3-point rating scale to reflect your self-assessment:

D = Definitely emphasized	[Primary consideration]
S = Sometimes emphasized	[Secondary consideration]
R = Rarely emphasized	[Minor consideration]

The [bracketed number] refers to the specific VCEPT criteria for each phrase.

(1) active student learning [#1]	D	S	R
(2) up-to-date teaching technologies [#1]	D	S	R
(3) connections to other related disciplines [#2]	D	S	R
(4) critical thinking about current events [#3]	D	S	R
(5) practical applications to students' own lives [#3]	D	S	R
(6) effective interactions among students [#4]	D	S	R
(7) ability to collect pertinent information [#4]	D	S	R
(8) ability to organize information [#4]	D	S	R
(9) ability to analyze information [#4]	D	S	R
(10) ability to communicate conclusions and ideas [#4]	D	S	R
(11) ethical and social implications in the world [#4]	D	S	R
(12) standards-based curriculum such as NRC, NCTM, Va. SOL [#5]	D	S	R
(13) assessment of student performance in different ways [#6]	D	S	R

### 2. Course Content

How well does your course content, including class topics and course readings, reflect the following VCEPT criteria?

Please circle the appropriate letter on this 3-point rating scale to reflect your self-assessment:

D = Definitely emphasized	[Primary consideration]
S = Sometimes emphasized	[Secondary consideration]
R = Rarely emphasized	[Minor consideration]

(1) connections to other related disciplines [#2]	D	S	R
(2) connections to the natural world [#2]	D	S	R
(3) mixture of breadth and depth in coverage [#2]	D	S	R
(4) interesting and intellectually involving concepts [#3]	D	S	R
(5) critical thinking about current events [#3]	D	S	R
(6) practical applications to students' own lives [#3]	D	S	R
(7) information gathering and analysis [#4]	D	S	R
(8) ethical and social implications in the world [#4]	D	S	R
(9) reflects standards-based curriculum - [national professional association guidelines and/or Virginia Standards of Learning] [#5]	D	S	R

### **3. Class Activities**

*Among some of the different teaching strategies that can be used to address the VCEPT criteria are the following: Multimedia lecture (with videos, slides, transparencies, CD-ROMs, etc.); Modified lecture -- (includes brief individual or small group activities); "Socratic" dialogue (active teacher questioning & student answering); Small group instruction -- separate discussion/problem solving groups; Small group instruction -- peer teaching (e.g. Jigsaw); Student debates; Simulated role play activities; Technological tools (e.g. Graphing calculators); Computer-based activities or assignments; Team projects using Web-based resources or CD-ROM software; Written assignments -- individual or team; Research-like experiences; Student presentations -- individual or group; Poster sessions -- individual or group; Internet or email discussion forums;*

Please list some of the class activities you use in this course that address each of the following VCEPT criteria. (One activity may certainly address more than one VCEPT criteria.)

Guideline (1) Active student learning through up-to-date teaching technologies and methods

Guideline (2) Interconnectedness to other disciplines and to the natural world

Guideline (3) Critical thinking about current events and practical applications to students' own lives

Guideline (4) Effective interactions among students and appropriate analysis of information

Guideline (5) Reflecting standards-based curriculum - national professional association guidelines and/or Virginia Standards of Learning

### **4. Course Assessment**

*Among some of the different assessment strategies that can be used to evaluate student knowledge and understanding in a VCEPT course are the following: Quizzes and exams (open or closed book); Presentations/demonstrations (individual or small group); Projects with data collection & analysis (individual or small group); Individual reports/papers (library research; reflection/reaction); Problem sets; Simulations & role-playing; Technological tools (e.g. Graphing calculators); Computer activities or tutorials; Internet-based research tasks; Development of webpages; Required student study groups; and Lesson plans for K-8 students.*

Please list some of the course assessments you use in this course to allow students to demonstrate their understanding of course content.

**TABLE 1**  
**Virginia Collaborative for Excellence in the Preparation of Teachers**  
**Fall 1999 Evaluation Questionnaire**

**Feedback on All Courses**

Presence: A= Systematic use (100% of classes); B= Customary use (75%-99% of classes);  
 C= Frequent use (50%-74% of classes); D= Moderate use (25-49% of classes);  
 E= Occasional use (0-24% of classes)  
 Value: A= Very Important; B= Important; C= Unimportant; D= Detrimental to your  
 learning; E= Not Applicable or No Opinion

Number of Respondents = 2045	Presence [%]					Value [%]				
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
1. active student learning	31.0	35.0	20.3	9.4	4.8	57.1	32.7	7.2	1.2	2.2
2. up-to-date teaching technologies	29.4	36.6	18.0	10.4	5.4	39.0	42.7	14.6	2.4	2.2
3. connections to other related disciplines	16.4	33.0	26.9	15.1	9.1	24.9	51.5	17.4	2.7	3.6
4. connections to the natural world	34.6	29.6	17.9	9.9	8.5	33.0	43.9	15.7	3.0	4.3
5. mixture of breadth and depth in coverage	24.6	37.3	25.1	9.2	4.3	31.3	50.2	12.3	2.1	4.2
6. interesting and intellectually involving concepts	28.9	33.3	23.3	9.6	5.6	49.1	38.7	8.2	2.3	1.9
7. critical thinking about current events	14.3	25.4	25.3	18.1	16.9	23.4	44.3	22.4	3.9	6.3
8. practical applications to students' own lives	19.8	28.4	23.8	16.9	11.7	35.7	44.9	14.2	2.5	2.9
9. effective interactions among students	22.2	31.1	25.3	13.2	8.7	32.0	45.2	17.6	2.6	2.7
10. opportunities to collect pertinent information	20.5	33.4	26.9	12.4	7.0	27.8	47.7	17.9	2.1	4.5
11. opportunities to organize information	23.8	33.3	26.6	11.5	5.2	30.0	49.4	14.7	2.0	4.0
12. opportunities to analyze information	25.0	36.0	25.7	9.2	4.6	34.6	48.8	11.3	2.1	3.3
13. opportunities to communicate conclusions and ideas	21.4	31.3	26.7	13.0	8.2	32.9	48.9	12.3	1.8	3.9
14. ethical and social implications in the world	15.4	24.4	26.5	17.9	16.1	24.9	43.7	20.4	3.0	7.9
15. assessment of student performance in different ways	21.7	30.2	25.4	14.2	8.9	40.5	43.7	10.6	2.2	3.3



**Biographical Information**

Academic classification at the beginning of the 1999 fall semester

Fresh - 38.3%      Soph - 25.4%      Junior - 17.4%      Senior - 12.6%      Graduate/  
 Unclassified - 4.5%

Do you plan to become (or are currently) certified to teach? [If unsure of grade, mark all those that might apply.]

No = 57.1%      Grades K-5 = 18.4%      Grades 6-8 = 2.7%      Grades 9-12 = 4.7%      Undecided = 9.9%

Students planning to teach used the following four-point scale to respond to these questions:

A = Strongly Agree    B = Agree    C = Disagree    D = Strongly Disagree

Number of Respondents = 897

	[%]			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
33. This course experience increased my motivation to try a variety of math/science teaching strategies in my own teaching.	33.3	36.3	23.1	8.8
34. This course experience increased my understanding of how to use different math/science teaching strategies.	34.0	41.0	18.1	6.9
35. I will likely share teaching ideas from this course with classmates in 1999-2000.	29.9	36.5	22.3	9.9

**TABLE 2**  
**Virginia Collaborative for Excellence in the Preparation of Teachers**  
**Fall 1999 Evaluation Questionnaire**

**Feedback on Math/Science/Technology Courses**

Presence: A= Systematic use (100% of classes); B= Customary use (75%-99% of classes); C= Frequent use (50%-74% of classes); D= Moderate use (25-49% of classes); E= Occasional use (0-24% of classes)

Value: A=Very Important; B= Important; C=Unimportant; D=Detrimental to your learning; E=Not Applicable/No Opinion

Number of Respondents = 1930	Presence [%]					Value [%]				
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
1. active student learning	28.8	35.4	21.2	9.9	5.1	55.1	34.0	7.6	1.2	2.3
2. up-to-date teaching technologies	27.9	36.5	18.9	10.9	5.7	37.2	43.6	15.3	2.5	2.4
3. connections to other related disciplines	16.1	32.0	27.3	15.6	9.5	23.6	51.6	18.2	2.8	3.8
4. connections to the natural world	33.7	29.6	18.2	10.1	9.0	31.8	44.4	16.2	3.2	4.4
5. mixture of breadth and depth in coverage	23.8	37.2	25.8	9.4	4.5	30.4	50.1	13.0	2.2	4.4
6. interesting and intellectually involving concepts	27.2	33.6	23.9	10.1	5.9	47.7	39.6	8.6	2.4	1.9
7. critical thinking about current events	13.9	25.1	24.9	18.5	17.6	22.8	43.8	23.2	4.1	6.3
8. practical applications to students' own lives	18.1	27.8	24.6	17.7	12.4	33.3	46.4	14.7	2.6	3.1
9. effective interactions among students	19.9	31.3	26.3	13.9	9.2	29.9	46.3	18.3	2.7	2.9
10. opportunities to collect pertinent information	18.9	33.3	27.7	13.1	7.4	26.3	48.0	18.8	2.2	4.8
11. opportunities to organize information	23.2	32.6	27.1	12.1	5.5	28.8	49.5	15.5	2.1	4.2
12. opportunities to analyze information	23.9	35.9	26.2	9.7	4.9	33.3	49.3	11.9	2.2	3.5
13. opportunities to communicate conclusions and ideas	19.5	31.2	27.7	13.7	8.6	30.5	50.4	13.0	1.9	4.1
14. ethical and social implications in the world	15.2	23.4	26.5	18.3	16.8	23.8	43.5	21.2	3.2	8.3
15. assessment of student performance in different ways	20.2	30.1	26.0	14.9	9.3	38.7	44.4	11.0	2.3	3.5

**Biographical Information**

Academic classification at the beginning of the 1999 fall semester

Fresh - 40.5%      Soph - 26.8%      Junior - 17.5%      Senior - 11.5%      Graduate/  
 Unclassified - 1.8%

Do you plan to become (or are currently) certified to teach? [If unsure of grade, mark all those that might apply.]

No = 60.4%      Grades K-5 = 15.2%      Grades 6-8 = 2.6%      Grades 9-12 = 4.4%      Undecided = 10.4%

Students planning to teach used the following four-point scale to respond to these questions:

A = Strongly Agree    B = Agree    C = Disagree    D = Strongly Disagree

Number of Respondents = 784

	[%]			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
33. This course experience increased my motivation to try a variety of math/science teaching strategies in my own teaching.	26.1	39.0	26.4	10.1
34. This course experience increased my understanding of how to use different math/science teaching strategies.	27.8	43.5	20.7	7.9
35. I will likely share teaching ideas from this course with classmates in 1999-2000.	24.4	37.4	25.3	11.4

**TABLE 3**  
**Virginia Collaborative for Excellence in the Preparation of Teachers**  
**Fall 1999 Evaluation Questionnaire**

**Feedback on Education Courses**

**Presence:** A= Systematic use (100% of classes); B= Customary use (75%-99% of classes); C= Frequent use (50%-74% of classes); D= Moderate use (25-49% of classes); E= Occasional use (0-24% of classes)

**Value:** A= Very Important; B= Important; C= Unimportant; D= Detrimental to your learning; E= Not Applicable or No Opinion

Number of Respondents = 115	Presence [%]					Value [%]				
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
1. active student learning	67.0	27.8	4.3	0.9	0.0	89.6	10.4	0.0	0.0	0.0
2. up-to-date teaching technologies	55.7	38.3	4.3	1.7	0.0	69.6	28.7	1.7	0.0	0.0
3. connections to other related disciplines	21.7	49.6	21.7	5.2	1.7	46.1	50.4	3.5	0.0	0.0
4. connections to the natural world	49.6	30.4	13.0	7.0	0.0	53.0	35.7	7.8	0.0	3.5
5. mixture of breadth and depth in coverage	39.1	40.0	13.9	6.1	0.0	46.1	51.3	1.7	0.0	0.9
6. interesting and intellectually involving concepts	58.3	27.8	12.2	0.9	0.9	73.0	24.3	1.7	0.0	0.9
7. critical thinking about current events	20.9	29.6	32.2	10.4	5.2	33.0	51.3	9.6	0.0	5.2
8. practical applications to students' own lives	47.0	38.3	10.4	3.5	0.9	75.7	19.1	5.2	0.0	0.0
9. effective interactions among students	61.7	27.8	8.7	1.7	0.0	67.0	27.0	5.2	0.9	0.0
10. opportunities to collect pertinent information	47.8	35.7	13.0	1.7	0.9	53.0	42.6	3.5	0.9	0.0
11. opportunities to organize information	34.8	45.2	17.4	2.6	0.0	50.4	47.8	0.9	0.0	0.9
12. opportunities to analyze information	43.5	37.4	18.3	0.9	0.0	56.5	40.9	2.6	0.0	0.0
13. opportunities to communicate conclusions and ideas	53.0	33.0	11.3	1.7	0.9	73.9	25.2	0.9	0.0	0.0
14. ethical and social implications in the world	18.3	40.0	25.2	10.4	4.3	42.6	47.0	7.8	0.0	1.7
15. assessment of student performance in different ways	47.0	32.2	14.8	3.5	2.6	71.3	32.2	3.5	0.0	0.9

**Biographical Information**

Academic classification at the beginning of the 1999 fall semester

Fresh - 0.9%    Soph - 1.7%    Junior - 14.8%    Senior - 31.3%    Graduate/Unclassified - 50.4%

Do you plan to become (or are currently) certified to teach? [If unsure of grade, mark all those that might apply.]

No = 0.9%	Grades K-5 = 72.2%	Grades 6-8 = 4.3%	Grades 9-12 = 9.6%	Undecided = 1.7%
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Students planning to teach used the following four-point scale to respond to these questions:

A = Strongly Agree    B = Agree    C = Disagree    D = Strongly Disagree

Number of Respondents = 114

	[%]			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
33. This course experience increased my motivation to try a variety of math/science teaching strategies in my own teaching.	82.5	17.5	0.0	0.0
34. This course experience increased my understanding of how to use different math/science teaching strategies.	76.3	23.7	0.0	0.0
35. I will likely share teaching ideas from this course with classmates in 1999-2000.	67.5	29.8	1.8	0.0

**TABLE 4**  
**Virginia Collaborative for Excellence in the Preparation of Teachers**  
**Fall 1999 Evaluation Questionnaire**

**Feedback on All Courses - Means and Standard Deviations**

Presence: A= Systematic use (100% of classes) = 5; B= Customary use (75%-99% of classes) = 4; C= Frequent use (50%-74% of classes) = 3; D= Moderate use (25-49% of classes) = 2; E= Occasional use (0-24% of classes)=1

Value: A= Very Important=5; B= Important=4; C= Unimportant=3; D= Detrimental to your learning=2; E= Not Applicable=1

Number of Respondents = 2045	Presence [Mean SD)]	Value [Mean SD)]
1. active student learning	3.8 (0.7)	4.4 (1.2)
2. up-to-date teaching technologies	3.7 (0.7)	4.2 (0.9)
3. connections to other related disciplines	3.3 (0.5)	3.9 (0.9)
4. connections to the natural world	3.7 (0.7)	4.0 (0.8)
5. mixture of breadth and depth in coverage	3.7 (0.6)	4.0 (0.9)
6. interesting and intellectually involving concepts	3.7 (0.6)	4.3 (1.1)
7. critical thinking about current events	3.0 (0.3)	3.8 (0.7)
8. practical applications to students' own lives	3.3 (0.4)	4.1 (0.9)
9. effective interactions among students	3.5 (0.5)	4.0 (0.8)
10. opportunities to collect pertinent information	3.5 (0.5)	3.9 (0.8)
11. opportunities to organize information	3.6 (0.6)	4.0 (0.9)
12. opportunities to analyze information	3.7 (0.6)	4.1 (0.9)
13. opportunities to communicate conclusions and ideas	3.5 (0.5)	4.0 (0.9)
14. ethical and social implications in the world	3.1 (0.3)	3.7 (0.7)
15. assessment of student performance in different ways	3.4 (0.5)	4.2 (1.0)

### Biographical Information

Academic classification at the beginning of the 1999 fall semester

[Mean (SD)] 2.1 (0.1)

Do you plan to become (or are currently) certified to teach? [If unsure of grade, mark all those that might apply.]

[Mean (SD)] 1.7 (0.2)

Students planning to teach used the following four-point scale to respond to these questions:

A = Strongly Agree B = Agree C = Disagree D = Strongly Disagree

Number of Respondents = 897

	[Mean (SD)]
33. This course experience increased my motivation to try a variety of math/science teaching strategies in my own teaching.	3.0 (0.6)
34. This course experience increased my understanding of how to use different math/science teaching strategies.	3.0 (0.6)
35. I will likely share teaching ideas from this course with classmates in 1999-2000.	2.8 (0.5)