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ABSTRACT

The Certification and Accreditation in Science Education (CASE) project is a joint National Science Teachers Association (NSTA)/Association for the Education of Teachers in Science (AETS) undertaking to develop standards for science teacher education that are consistent with the national science education standards and other standards projects, applicable to multiple levels of preparation based on research and performance, and that are flexible enough to allow for program variation and experimentation. During the years since the project's inception, science educators have grappled with their own conceptions of the CASE Network standards and how they will help guide best practices in science teacher education. This paper presents preliminary work on the implementation of the standards using a generative conception of portfolio development. (CCM)

THE USE OF THE CASE NETWORK STANDARDS IN PRESERVICE LEVEL PORTFOLIO DEVELOPMENT

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The CASE (Certification and Accreditation in Science Education) project is a joint NSTA/AETS undertaking to develop standards for science teacher education that are:

1 consistent with the national science education standards and other standards projects

2 applicable to multiple levels of preparation

3 based on research and best practice

4 performance-based

5 flexible enough to allow for program variation and experimentation (Gilbert, 1997, p.6)

During the four years since the project's inception, science teacher educators have grappled with their own conceptions of the CASE Network standards and how they will help guide best practice in science teacher education. This paper presents preliminary work on the implementation of the standards using a generative conception of portfolio development.

Like many other NCATE accredited programs, Hofstra University's secondary science teacher education program requires only one science teaching methods course. The number of concepts to be understood that related directly to science teaching was extensive and students were wearied by the sheer load of coursework. Well over 50 percent of the class meetings had written or hands-on assignments attached to them and it was proving increasingly difficult to broaden the scope of the course without increasing the number of performance pieces that students had to complete.

Reorganizing the Science Methods Course

After reading the standards, joining the CASE Network, and learning that if the standards were adopted by both NSTA and AETS, NCATE was expected to use them during reaccreditation, it seemed even more expedient to reorganize the science methods course around the standards. Prior to the first meeting of the science methods course, its syllabus was revised by eliminating all assignments associated with the concepts scheduled to be presented. The content of each class remained essentially unchanged. Each concept was evaluated by comparing it to the indicators at the preservice level of the standards. Once it was determined that each of the standards would be addressed within the concepts presented in the course, the generative phase of the project began.

Students were given a copy of the standards as a part of their syllabus and were asked to generate a list of projects that would demonstrate that they had achieved the standard (see Appendix A). As additional support, students were asked to work in groups and consult the CASE Network website (now at: http://www.aets.unr.edu/AETS/draftstand.html) for further clarification of standards, indicators, rationales, and recommendations.

The Cooperative and Collaborative Nature of Student-Generated Portfolio Evidence

While the course followed the syllabus, the students generated what they considered best evidence for achieving the standards. It was decided that the evidence that students would generate would be best housed in a portfolio. Much debate surrounded the discussions of how the portfolio was organized. It was decided that the portfolio would open with a letter to the reader that described the students' philosophy of teaching and how the inclusions in the portfolio were arranged around the standards. A table of contents followed. The next section included the actual evidence that the standards were attained and a description of why the students' believed the inclusions evidenced their attaining the standards. The final piece was a professional resume.

Quite a bit of mediation was also required. The students fell into at least one of three groups: (a) Those who wanted to do the minimum required; (b) Those who wanted to further interpret the standards to suit their needs; and, (c) Those who argued that most of what was suggested did not fit the standards exactly. In the final analysis, the students came to consensus around the wishes of the second group (see Appendix B). Once what constituted best evidence was accepted, they set out to choose submission dates. It was decided that instead of structuring 10 separate projects to address all ten standards, five projects that addressed two standards each would be more efficient and would allow for adequate preparation within the submission dates. Finally, the project placement on the calendar was determined by how much time each would take to complete.

Countering the Drawbacks

Some drawbacks are apparent when using cooperation and collaboration in developing student-generated portfolio evidence. There are ways to reduce the drawbacks. One drawback is the time it takes for students to work toward consensus. A strong facilitator is needed to decrease the amount of time spent rambling and arguing. Teaching students how to disagree agreeably may also be necessary to move the process along. Once this process has been completed by current students, the professor may opt to only allow future students to modify the existing projects.

Another drawback can occur when the evidence students choose is not what their professor would consider best evidence. This can be approached in a number of ways. If the professor chooses the concepts to be studied throughout the course and provides structure that reflects the standards as part of the syllabus, students will still have the opportunity to learn what the professor views as most important while generating a portfolio with inclusions that they feel are important. Another approach would allow the professor final veto on all projects. An opposite approach would be to value what the students view as important and let their conceptions direct the development of the evidence. By doing so, the reader of the portfolio can gain additional insight into how students actually approach their work when left to their own devices.

The final drawback discussed here would be not knowing what to expect from one administration of the course to another. Sometimes students rise beyond expectation and sometimes they fall below expectation. The professor must be flexible with regard to the needs of each class. Some classes will require more hands on contact from the professor to help students become successful using this method. The professor will be able to decide if this approach to using the standards is working for a particular group of students and if it is not, the professor has the option to suspend or terminate the approach.

Conclusion

When employing this approach to implementing the standards, the professor must impress on students how critical it is to make decisions as quickly and efficiently as possible. Otherwise, they will not have time to complete the projects within the scope of the class. It is also helpful if the professor is willing to give up some measure of control and allow students to take the development of projects where they believe it should go. This provides students with leadership opportunities and requires them to make sense of what they have been taught in a more personal way.

After a bit of initial grumbling, students were quite happy with what they developed and talked often about how both the process and the product helped prepared them to teach. They were able to discuss the standards and their interpretation of them with ease by the end of the course. This helped instill confidence about how much they actually knew about preparing to teach science. Since the students chose what they considered best evidence and designed projects, the complaints about workload decreased significantly. This method of using the standards generated many positive outcomes in our estimation and we will begin to move beyond baseline data when the standards are finalized.

Reference

Gilbert, S. (1997). Status report on certification and accreditation in science education (CASE) project. *The Association for the Education of Teachers in Science Newsletter, 31*(3), 6.

Appendix A

(Excerpt from the secondary science methods syllabus for bachelors and masters degree candidates)

This course is designed to help you attain the National Science Teachers Association (NSTA)/The Association for the Education of Teachers in Science (AETS) *Standards for the Preparation of Teachers of Science* as set forth in the 1/21/97 draft version of the Certification and Accreditation in Science Education (CASE) Project. They are as follows:

1.0 Content

Teachers of science should possess an understanding of science concepts sufficient in breadth and depth, to support student learning as defined by state or national standards developed by the science education community.

2.0 The Nature of Science

Teachers of science should engage students in activities defining the values, beliefs and assumptions inherent to the creation of scientific knowledge within the scientific community.

3.0 Inquiry

Teachers of science should engage students regularly and effectively in science-related exploration and inquiry.

4.0 The Context of Science.

Teachers of science should relate knowledge constructed through science to the life and interests of students and to the needs, values, issues and interests of the community.

5.0 Pedagogy

Teachers of science should create effective learning opportunities for a diverse community of students, helping them to derive meaning from science instruction and creating a disposition for further inquiry and learning.

6.0 The Science Curriculum

Teachers of science should engage students in a science curriculum that is consistent with state and national goals for education and appropriate for the students' needs, abilities, and interests.

7.0 The Social Context

Teachers of science can effectively employ peer, family, and community resources to facilitate the education of students in science.

8.0 Professional Practice

Science teachers are part of a professional community that improves practice through personal education and development; community outreach; mentoring new colleagues; working with preservice teacher, participation in research ; and collaboration with colleagues to improve current practices.

9.0 Learning Environments

Teachers of science should design and manage safe, secure and stimulating learning environments that meet the needs of all students.

10.0 Assessment

Teachers of science should use a variety of assessment strategies that are aligned with goals and methods of instruction, appropriate to the level of the students, and conducive to continuous learning through science.

Appendix B

(Student-generated projects using the CASE standards)

Project 1: *Standards 1.0 (Content) and 6.0 (The Science Curriculum)*

- Work with your group to design a concept map demonstrating the interrelatedness of the concepts taught in a first year science class using the state standards in your discipline. The product should be your own but discussed and shared with your group members for further input. Please include a copy of the New York State (or Regents) standards for your teaching discipline.
- Compare and contrast the national and state goals for science education in your discipline. How do they compare with your own goals for science education in your classroom?

Project 2: *Standards 7.0 (The Social Context) and 9.0 (Learning Environments)*

- Develop a list of community resources for science teachers. This list should include places to visit locally for field trips, local organizations that provide guest speakers, and places that provide resource materials for science teachers. Report the name, address and phone number of the community resource and the name of a contact person (if applicable).
- Develop a set of science activities that involve families for a family science night. What could you include that would make science seem fun and attainable for all members of a family?

- Design your ideal science classroom including the materials that you will need, the company from whom you can purchase them and their prices. In addition, diagram the set up of the room itself. Remember to consider the needs of diverse learners.

Project 3: *Standards 2.0 (The Nature of Science) and 4.0 (The Context of Science)*

- Answer the following questions: Why is the number of American-born scientists decreasing and why are fewer students choosing to pursue scientific careers? How do you think that science teaching practice has influenced this trend? What will you do in your classroom to help reverse the trend? This paper should be researched and use APA style in its construction, citations, and references.
- Using a topical issue, develop a 'real world' lesson plan. Include a lesson plan and describe how and why your lesson is both topical and important from a real world perspective.

Project 4: *Standards 5.0 (Pedagogy) and 8.0 (Professional Practice)*

- Write a 5 page paper on the meaning and precepts of multicultural science education. This paper should be researched and use APA style in its construction, citations, and references. Describe how you will make your class meaningful for a diverse group of students by using the cultural capital they bring to the classroom.
- Join a professional teachers organization; one preferably in your teaching discipline but a general teacher's organization will do. Supply a copy of your ID card or canceled check.

- Write a discussion of what concerns you most about the act of student teaching or being observed in your own classroom next semester.

Project 5: *Standards 3.0 (Inquiry) and 10.0 (Assessment)*

- Prepare to teach an inquiry based lesson or laboratory in your discipline. Include a lesson plan and describe how and why your lesson promotes inquiry among students. Include a discussion of what factors should be considered in order to maximize the amount of learning stimulated by the lesson.
- Develop three alternate forms of assessment for the same material.

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