

CURRICULUM RESTRUCTURING AT LYNCHBURG COLLEGE: EFFECTS OF REALIGNMENT TO STATE-MANDATED COMPETENCIES AND IMPLICATIONS FOR K-6 MATH AND SCIENCE TEACHER PREPARATION

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Because Lynchburg College offers a four-year program to attain teacher licensure, current restructuring efforts have been aimed at targeting the professional studies requirements across a program of courses that are efficiently integrated. Math and science methods courses will be combined into a workshop course. A new general studies program has been approved which requires eight hours of lab sciences and three hours of math. A General Science course has been approved which will be geared towards pre-service teachers. The professional core requires an additional eight hours of lab sciences, totaling 16 hours in science, and six hours of math, geared towards the needs of pre-service teachers. While recommended teaching practices are stressed, these may be de-emphasized by the student teaching capstone experience. This is due to the current pressure in public schools to address content-loaded Standards of Learning. From this perspective, standards-based education may prove to be an impediment to reform efforts in science education that stress process skills and the messy, time-consuming nature of learning.

This presentation will summarize curriculum restructuring efforts at Lynchburg College with respect to their effect on pre-service K-6 teachers' math and science preparation and address some potentially negative impacts of the standards-based movement on teacher preparation. A new general education program has been approved and efforts are currently underway to restructure and align the professional studies programs with the Virginia Department of Education Program Status Matrix. These new programs potentially increase the exposure of K-6 pre-service teachers to math and science course work, which will better prepare them to teach.

Lynchburg College, by virtue of its small size and the relatively large percentage of its graduates in Education, offers some promising possibilities for collaboration between science, math, and education departments. Pre-service teachers comprise more than 30% of students enrolled in introductory math and science courses. Through such collaboration, faculty in the science and math departments have designed courses that cater to the content needs of teacher preparation students. These include a two-semester sequence called General Science (with

labs), which focuses on some of the major science principles [1]. A two-semester math sequence has also been designed to accommodate the needs of pre-service elementary teachers (Introduction to School Mathematics I & II). Course objectives include an emphasis on NCTM standards and the formulation of lesson plans. Other encouraging interdisciplinary efforts included a science curriculum unit approved as part of the requirements in an environmental science course for prospective teachers enrolled in that course. Such collaborative efforts are made possible through open communication in smaller institutions where faculty regularly see each other.

A major outcome of the new general studies program was to reduce the number of hours required so students can have more elective courses. With only one mathematics and two lab-science courses required for general studies, the major interdisciplinary component was expanded to include eight additional hours of science and six hours of math, with science courses mentioned above strongly recommended and the “school math” sequence required. This totals 16 hours in lab-based science courses and nine hours in math courses. Current restructuring of the teacher preparation programs poses some complex problems because the state endorsement competencies must be addressed in a four-year program. As part of the realignment process, the education faculty is actively seeking to collaborate with other departments to assure that content specific competencies are being addressed. Such an integrated approach not only assures that the College meets state competencies, but may also positively influence student attitudes about the usefulness of their coursework.

The Program Status Matrix for Elementary Education PreK-6 delineates a fairly well defined set of content standards (Virginia Standards of Learning for elementary level) and alludes to the nature of science and math and its relatedness to technology. It also alludes to the ability to effectively teach content, skills, and principles. In contrast, the matrix for *Professional Studies Requirements, Elementary Education PreK-6* lists five major competencies with no specific mention of math or science—only “...the application of skills in discipline-specific methodology”, under “2. Curriculum and instructional procedures”! To accommodate the many other competencies to be addressed under these major groups, plans have been made to combine the two separate two-hour math and science methods courses into a single three-hour workshop type course.

If implemented as outlined, beginning in fall 1999, Lynchburg College K-6 pre-service teachers will receive a total of 16 hours in science content, nine hours in math content, and three hours of math/science teaching methods coursework. This preparation is transformed into practice through a sequence of three one-hour field experience courses (observation, individual tutoring, and single lesson whole-class instruction). Finally, the capstone student teaching experience requires a minimum of 300 contact hours and earns 12 hours credit. This gradual transition into apprenticeship is critical with respect to transforming theory into practice and can have a strong influence in shaping future teaching. The possibility of pre-service and inexperienced teachers being influenced by established teachers modeling behaviors not in line with current reform efforts continues to be a concern for teacher educators. Currently, this situation has been exacerbated by implementation of the Standards of Learning. Two issues are addressed below.

The Virginia Standards of Learning for science begin with a set of general goals that mesh nicely with the scientific “habits of mind” [2]. The first SOL cluster for each grade level is entitled “Scientific Investigation, Reasoning, and Logic” and includes a listing of these skills and practices. These are followed by 7-14 other major groupings of standards primarily referring to science content. These content standards are well in line with national standards [3]. For example, light, heat, electricity, and magnetism are listed as K-4 standards in the National Standards and these same topics are listed in the Virginia Standards for the K-4 level (light is listed as a 5th grade SOL). Though process is taught in the context of content, the listing of the SOL in this manner may encourage teachers to focus more on fact-based, direct instructional methods.

With pressure to improve SOL test scores, there may be a tendency for the teacher to attempt to “cover” all the SOLs as fact-based knowledge instead of an inquiry-based approach. In this respect, the credo of “less is more” [4] is traded for “If I don’t cover all these SOLs, the blame will rest on my shoulders!” Two very interesting outcomes from this perceived pressure are already impacting the pre-service teacher program at Lynchburg College. Some schools are now begging for more field experience students to tutor some of their children who have a low probability of passing the SOL tests. On the other hand, many schools do *not* want as many student teachers because the amount of mentoring required by the supervising teacher and the time the student teacher takes learning to teach effectively

detract from the time available to “cover” the SOLs. It should be noted that while there are negative effects due to implementing the standards, in many cases they have forced teachers to devote more time to math and science instruction and have given structure to teachers who might flounder otherwise.

Plans for improved pre-service teacher preparation at Lynchburg College are encouraging. An improved general education program that effectively addresses the needs of pre-service teachers, combined with methodology coursework and practicum experience, will hopefully result in an effective teacher preparation program. Whether current pressures placed on the teaching environment by the standards movement discourages recommended practices remains to be seen. The period of adjustment in the coming few years will offer plenty of challenges. ■

References

- [1] J. Trefil and R. M. Hazen, *The Sciences: An Integrated Approach*, John Wiley and Sons, New York, 1995.
- [2] J. F. Rutherford and A. Ahlgren, *Science for All Americans*, Oxford University Press, New York, 1989.
- [3] *National Science Education Standards*, National Academy Press, Washington DC, 1996.
- [4] *Benchmarks for Science Literacy*, American Association for the Advancement of Science: Project 2061, Oxford University Press, New York, 1993.