Two-year College Biology Instructors' Perceptions about their Role Expectations

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Perspective

Two-year colleges, during their early years, were in search of professional identity and recognition. While striving to appease both scientific and educational facets of the higher education establishment, two-year colleges sought to maintain their innovative instructional image while enhancing their professional status. To attempt this, they raised their standards and applied more rigor for hiring faculty by requiring (in most disciplines) a masters degree in the subject field for which the candidate was seeking employment. Prior to these new standards, they were hiring instructors with a variety of experiences and a diversity of backgrounds represented by business, industry, former high school teachers and dissatisfied university professors. Past history (Palinchak, 1973; Monroe, 1976) depicts these early two-year college instructors as being expected primarily to fulfill a set of role expectations very similar to those of secondary school instructors. The more recently hired instructors, however, have a better command and depth in their academic disciplines; they have been hired as subject specialists. Albeit a discussion of detailed past role expectations for two-year college instructors, have the new hiring criteria promoted a similar rigor in present expectations? And if so, are our present graduate training programs adequate to meet both the hiring criteria as well as the presently perceived role expectations? This study attempts, in part, to respond to these questions.

Much literature (Rosen, 1976; Edwards, 1977; Chiapetta and Collette, 1978; Horak and Lunetta, 1979) exists regarding the expectations of the secondary school biology teacher; however, very little literature has been generated with respect to the expectations of two-year college science instructors (Cohen and Brawler, 1980; 1983). Butzow and Quereshi (1978) were concerned about the validty of expectations and noted that an expectation needs to be defined in terms of its demonstrability by science teachers or instructors and its ability to be observed. When generating statements of expectations, it appeared helpful to synthesize broad categories of skills or competency areas into which specific expectations can be grouped. Simpson and Brown (1977) developed seven general and fundamental competency areas for science instructors; these were (1) professional knowledge, (2) knowledge of science, (3) planning skills, (4) evaluation skills, (5) instructional skills, (6) management skills, and (7) human relation skills. Unfortunately, present hiring criteria only account for a candidate's qualifications in the area of knowledge of science. The subject specialist's degree program often precludes skill training in planning, evaluation, instruction, management, or human relations.

Two-year colleges have thus been left to hire new faculty that need to be extensively prepared by way of inservice programs to remediate inadequate preservice university graduate program deficiencies. Dean (1970) remarked that most of the preparation for biology instructors has been through a teaching assistant program whereby the training had been less than adequate. Bleyer (1979), nearly a decade later, also reported that university teaching assistant programs for preparing two-year college instructors appears to be grossly inadequate where the teachers tend to be either narrow

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subject matter specialists or secondary school-oriented education majors.

When considering adequate or enhanced preparation, Palinchak (1973) and Roueche (1983) concluded that two-year college instructors need to be trained in programs that not only provide subject area expertise but also a background in learning theory, program planning, curriculum design, instructional strategies and evaluation techniques. Related to this stance, Roueche and Hurlburt (1968) found that two-year college students in terms of their overall impression rated educationally-trained biology instructors significantly higher than scientifically/research-trained biology instructors; students also claimed that they learned more from educationally-trained biology instructors. The relative importance of educationally-related role expectations and the ability or inability of our present graduate training program to meet these needs is being discussed by both university science educators and biology professors (Dowling and Roland, 1982; Coleman and Selby, 1983). Discussion is not sufficient, however, to document the need for enhanced preparatory programs to remediate the perceived deficiencies of current two-year college instructors.

Methodology

The purpose of this exploratory survey was to examine the perceptions and observations of practicing two-year college biology instructors about their role expectations, and to document a testable role state-of-the-art which hopefully might be pursued more rigorously from a research framework and more indepth from a qualitative perspective. To collect data, a survey instrument, "Two-Year College Biology Instructors' Role Expectation Inventory," was developed and validated.

The survey instrument is composed of 15 Likert items which examine two-year college biology instructors' role expectations. Abbreviated phrasing of the items can be found on the left hand side of Table 1. The respondents are asked to rate the items on a scale of 5 (a must), 4 (very desirable), 3 (desirable), 2 (some importance), and 1 (unimportant). A sixteenth item is also provided for the respondent to write in a role expectation not included in the survey instrument. In addition, ample space is provided for respondents to write down, "a final thought" on the improvement of biology instruction at their institution. Self administration time was field tested to be about 15 to 20 minutes.

Face validity of the items and content validity of the instrument were established. Face validity, a measurement of item relevance, was determined by 2 science educators with the assistance of a community college biology instructor who were involved with the generation and refinement of the items. During the item refinement process emphasis was given to the relevancy of the substance of the items, and the degree to which the items purported to measure the role expectations. Content validity, a most basic validation process, to determine representativeness, was assessed for the "Two-Year College Biology Instructors' Role Expectation Inventory" by a panel of 3 "experts-judges" who provided reaction, input and evaluation. The judges were 2 regional junior college and 1 community college professors of biology. The judges were requested to mark-up, make marginal notes or comments on, and rewrite, eliminate or add items to a preliminary draft (22 items) of the survey instrument. The validation dimensions reacted to by the judges were (1) representativeness of the items from a total pool or universe of items dealing with the role expectations, (2) relevance (how pertinent) of the items to the need to conduct a survey of this nature, (3) clarity and understanding of the items by the target population, and (4) utility/usefulness of the knowledge production resulting from the collected information. The constructive suggestions of the judges resulted in discarding some items, rephrasing of some items and eliminating redundant verbiage. Several items were eliminated because of lack of relevance, perceived respondent lack of interest, and perceived respondent attention time.

TABLE 1. Summary of Findings on Role Expectations of Two-year College Biology Teachers

Expectations \ Measures	Mean Rating	Rank Order	Skill-Competency Category
1. Possess Secondary Schools Teaching Experience	2.3	14	Instructional
2. Teach Courses Other than Biology	1.9	15	Knowledge of Science
3. Design/Implement Laboratory Exercises Supplemental to Content Learning	4.1	4-5	Planning
4. Design a Variety of Experiences that Maximize Student Learning	4.0	6-7	Instructional
5. Measure and Evaluate Student Learning	4.4	2	Evaluation
6. Be Cognizant of Theories and Principles of Learning	2.9	12	Professional Knowledge
7. Willing/Able to Experiment with and Evaluate Different Methods of Instruction	3.5	9	Instructional
8. Strive to Assist Each Student to Achieve Success	4.5	1	Human Relations
9. Encourage Students to Develop their Own Values Rather than Imposing Values	3.6	8	Human Relations
10. Point Out to Students the Implications Biology Has on Everyday Life	4.2	3	Human Relations
11. Advise Students Whose Careers Involve Required Study in the Sciences	4.0	6-7	Human Relations
12. Demonstrate the Ability to Carry Out Scientific Research	2.6	13	Knowledge of Science
13. Keep Abreast of New Scientific Theories and Discoveries	4.1	4-5	Professional Knowledge
14. Work with Other Faculty in an Interdisciplinary Course of Study	3.3	10	Instructional
15. Participate in Educational and Community Service	3.1	11	Human Relations

A total of 240 two-year colleges were selected from a possible of 1,169 (21%) offering general biology using a table of 5,000 random numbers. In order to obtain a nationwide sample of present biology instructors, a directory of institutions published by the American Association of Community, Junior and Technical Colleges was used for selection purposes. The validated instrument was mailed to the 240 institutions with directions in a cover letter to forward it to at least one biology instructor or science department chairman who could best represent the following demographic criteria: (1) at least 3 years of instructional experience; (2) at least a masters degree in either biology or science education; and (3) should reflect the institution's role expectations. Because of the high cost factor, no follow-up mailings were conducted, nor were duplicate responses accepted from any single institution to avoid unrepresentative bias from those institutions or states.

The instrument was responded to by biology instructors or science department chairs representing 126 institutions (53% response rate) geographically located in 38 states. Although the 53% response rate might be questionable in some circles, the respectability of the response rate can be enhanced by its representing an 11% nationwide sample of all two-year college institutions that offer biology. The expectation statements have been rank-ordered in Table 1 by the arithmetic mean. The best possible rating would be a mean value of 5.0, conversely the lowest would be a mean of 1.0. The statements have been listed in the order they appeared on the survey. The fifteen items have, in addition, been classified as to skill-competency areas (Simpson and Brown, 1977; Butzow, 1978; Chiapetta and Collette, 1978; Horak and Lunetta, 1979).

Findings

The 15 expectations found in Table 1 lack a statement of two-year college biology instructors' content proficiency or effectiveness in teaching the subject matter. Items of this nature were excluded because practitioners might have construed it as a statement of their lack of expertise; these items were eliminated from the original list of 22 expectations at the recommendations of the judges serving as content validators. If the respondent considered these two expectations "a must," then they could be listed and rated under the "write in" expectations. Their absence from the survey instrument does not preclude their importance, but implies that they exist inherently in the other expectations and not as separate entities.

The expectation receiving the highest rating (Table 1) was "striving to assist each student to achieve success," and running a close second was "measuring and evaluating student learning." The expectation viewed with the least favor was "teaching courses other than biology." Another expectation receiving a somewhat low rating was "possessing secondary school teaching experience." There were three frequently occurring "write in" expectations; these were "exhibiting a dedication to teaching" ($N = 14$; $M = 4.4$), "participating in faculty governance" ($N = 9$; $M = 4.3$), and "demonstrating total professionalism" ($N = 11$; $M = 4.1$). Many of the write-in's were very similar to or extensions of the listed 15 expectations.

While individual item-analysis, statement by statement, is in itself interesting, this analysis does not determine the general trend of perceived role expectations deemed as fundamental competency areas for science instructors (Simpson and Brown, 1977). Therefore, a "lumped" or grouped-analysis was performed on these identified skill areas by determining an overall arithmetic mean for all items/statements belonging to a particular category. When considering the general skill-competency areas, excluding planning and evaluation which contained only one expectation respectively, human relations was deemed the most important ($M = 3.9$). The remaining areas in rank order were professional knowledge ($M = 3.5$), instructional ($M = 3.3$), and knowledge of science ($M = 2.3$). However, when bringing the one-item areas of planning and evaluation under the instructional category, a higher mean of 3.6 surfaces.

The final discussion or "final thought" item allowing for divergent commentary tended to "converge" on the preparation of two-year college biology instructors as the major undergirding factor that would most contribute to the improvement of the biology programs at their respective institutions ($N = 54$; $M = 3.7$). These comments, at times, were very specific, even getting into what courses need to be taken at the preservice or inservice levels. Some respondents even sketched out a complete preservice course of study and/or inservice course sequence. Many of the respondents also proposed a dual masters degree program, one in biology and one in science education with an emphasis on learning theory and evaluation.

Discussion

The "ideal" (Hammons, 1979) two-year college biology instructor probably needs appropriate training in "broad-based" biology, teaching methods, and the philosophies/practices of two-year colleges. Learning psychology and evaluation/measurement might be included under teaching methods. In any instance, it appears that meeting the "ideal" set of role expectations at the two-year college level requires a more indepth scientific background than programs for secondary school biology instructors, yet it also demands a more professional educational background than programs for university professors. One way of meeting this requirement would be for two-year colleges to demand a dual or double masters degree. It is simply unrealistic, however, to suggest this amount of preservice preparation! Some universities presently

suggest a masters degree in the natural sciences coupled with a few basic educational training courses in teaching methods, philosophy and evaluation. But this approach to preparation, as evidenced by the respondents, appears too non-integrated to be useful in meeting the "ideal" for two reasons: (1) A masters degree in the natural sciences is too research oriented to allow flexibility in establishing a broad-base of science content necessary for effective two-year college instruction, and (2) the educational component is too heavily oriented toward secondary instruction to be relevant to the two-year college setting. In other words, simply patching together two unrelated programs is not an effective solution (Hansen and Rhodes, 1982).

One potential solution would be for universities to continue research for establishment of an integrated independent masters degree in biological education. This degree would allow candidates for two-year college instructional positions to establish a broad-base scientific background (without requiring specialized research orientation) while integrating professional education coursework specifically designed to meet the unique individual needs of the two-year college setting. Indeed, the results of this survey suggest that the two programs of study need not be mutually exclusive, but mutually beneficial and complementary.

No attempt is made, however, to delineate a specific program of coursework that might be more consistent with the perceived role expectations than may presently exist for two-year college biology instructors. The collected data are limited and respondents greatly differed on the specific biological science content that should be included in an "ideal" program.

Implications for Practice

Two questions were stated in the opening paragraph that have a direct bearing on both the findings of this study as well as the implications for practice. First, standardization of hiring criteria has allowed two-year college administrators the opportunity to expect a minimal level of competence in biological science content attained by prospective faculty candidates. This unfortunately, precludes the expectations of instructional capability, course development skills, and evaluate competencies deemed necessary by the population of practicing two-year college biology instructors. The results of this study suggest, therefore, that while both hiring criteria and role expectations have become more rigorous, these two factors are inconsistent with one another. Second, the discrepent inconsistency of these factors is indirectly attributable to the inadequacy of graduate training programs to supply the appropriate experiences required by a two-year college faculty candidate's opportunity to become proficient in both biological content and instructional competence.

In terms of recommendations for change, the findings of this study speak to both prospective faculty candidates and administrative practitioners. First, prospective two-year college biology instructors need to ensure that their program of study allow sufficient flexibility and/or opportunities to gain experience in the application of biological content through instructional techniques and practice. This might be accomplished as part of a cooperative internship program between two-year colleges and university graduate schools. Second, two-year college administrators need to consider a prospective faculty candidate in terms of demonstrable instructional competence and not simply in terms of content proficiency. If an internship program is not feasible, then renewed cooperation between two-year colleges and university graduate institutions needs to occur in order to establish a degree program more suited to the needs of the two-year college setting. In summary, perhaps alternatives to the MS/Ph.D. degree structures need to be reexamined (Hansen and Rhodes, 1982).

Suggestions for Further Study

Based on the quantitative and qualitative findings of this survey effort, the following hypotheses have been generated for testing in future inquiry endeavors:

Two-year college biology instructors see themselves as teachers rather than as scientists.

A primary self-assessed role expectation is being able to relate to students as individuals.

The development of biological applications and human values takes precedent over student content mastery.

The individualizing of instruction in two-year college biology is made available through evaluative techniques, various teaching methods, and a variety of learning experiences.

Two-year college biology instructors view scientific research as a relatively low priority expectation.

Two-year college biology instructors are not expected to teach courses other than biology

Experience as a secondary school science teacher is not deemed a necessary prerequisite for successful two-year college biology teaching.

Knowledge of theories and principles of learning are low priority expectations for two-year college biology instructors.

Literature Cited

1. Bleyer, D. Higher education's omission: The preparation of community college teachers. *Community College Review*, 1979, *6*, 46-51.
2. Butzow, J.W., and Quereshi, Z. Science teachers' competencies: A practical approach. *Science Education*, 1978, *62*, 59-66.
3. Chiappetta, E., and Collette, A. Secondary science teacher skills identified by secondary science supervisors. *Science Education* 1978, *62,* 67-71.
4. Cohen, A.M., and Brawler, F.B. *New directions for community colleges (no. 41): evaluating faculty and staff.* San Francisco, California: Jossey-Bass, Inc., Publishers, 1983.
5. Cohen, A.M., and Brawler, F.B. *New directions for community colleges (no. 31): teaching the sciences.* San Franciso, California: Jossey-Bass, Inc., Publishers. 1980.
6. Coleman, W.T., and Selby, C.C. *Educating Americans for the 21st century.* Washington, DC: The National Science Board Commission on Precollege Education in Mathematics, Science, and Technology, 1983.
7. Dean, D.S. *Pre-service preparation of college biology teachers: A search for a better way.* Washington, D.C.: Commission on Undergraduate Education in the Biological Sciences, American Association for the Advancement of Science, 1970.
8. Dowling, N.G., and Roland, H. Institutional and faculty life cycle changes. *Community College Review*, 1982, *10,* 36-39.
9. Edwards, C. Problems and promise of competency-based science teacher preparation. *Science Education*, 1977, *61*, 519-525.
10. Hammons, J.O. The multi-faceted role of an 'ideal' community college faculty member. *Community College Review*, 1979, *7*, 36-41.
11. Hansen, D.W., and Rhodes, D.M. Staff development through degrees: alternatives to the Ph.D. *Community College Review*, 1982, *10*, 52-58.

12. Horak, W., and Lunetta, V. Science teacher types: A study of beliefs about the importance of specific teaching behaviors. *Journal of Research in Science Teaching,* 1979, *16*, 269-274.
13. Monroe, C.R. *Profile of the community college.* San Francisco, California: Jossey-Bass Publishers, 1976.
14. Palinchak, R. *Evolution of the community college.* Metuchen, New Jersey: Scarecrow Press, Inc., 1973.
15. Rosen, S. Can science education mass produce superteachers? *Science Education*, 1976, *60*, 53-60.
16. Roueche, J.E., and Hurlburt, A.S. Research on junior college teachers. *Junior College Research Review*, 1968, *2*, 1-3.
17. Roueche, J.E. Wanted: teaching excellence in the community college. *Community College Review*, 1983, *10,* 51-57.
18. Simpson, R., and Brown, D. Validating science teaching competencies using the Delphi method. *Science Education*, 1977, *61*, 209-219.