DOCUMENT RESUME

ED 461 658 SP 040 523

AUTHOR Cole, Donna J.; Mahaffey, Gregory; Ramey, Linda; Ryan, Charles W.; Swann, Raymond; Tomlin, James A.

TITLE Preparing Quality Science Educators: A Successful Tripartite Partnership.

PUB DATE 2002-02-00

NOTE 27p.; Paper presented at the Annual Meeting of the Association of Teacher Educators (Denver, CO, February 2-6, 2002).

PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS College School Cooperation; Cooperative Planning; Elementary Secondary Education; Higher Education; *Mathematics Education; Mathematics Teachers; *Partnerships in Education; Preservice Teacher Education; *Science Education; Science Teachers; *Teacher Certification; *Teacher Competencies; Tenure

IDENTIFIERS Praxis Series; Wright State University OH

ABSTRACT

This paper presents a model and process for shared decision making among teacher education faculty, pre-K through 12 educators, and college science and mathematics faculty in the preparation of quality educators at Wright State University (WSU), Ohio. WSU is immersed in change as Ohio moves from teacher certification to licensure. The paper describes WSU partners; highlights the math and science partnership on campus (jointly appointed mathematics and science education faculty and teaching of mathematics and science courses); explains the integration of science with the Praxis model (science was the first content area where alignments with the Praxis III four domains were attempted); provides a public school educator's perspective on the partnership (the educator believes that using inquiry teaching and National Science Education Standards at WSU to ask educators to teach in different ways is time consuming but motivates students to do well in their science classes); and summarizes the promotion and tenure process (examining critical variables related to tenure and faculty productivity that may provide guidelines for practice at selected institutions). (Contains 14 references.) (SM)

College of Education and Human Services

Wright State University

Paper Presented at

Association of Teacher Educators
Annual Conference
February 2002

Preparing Quality Science Educators: A Successful Tripartite Partnership

BY

DR. DONNA J. COLE, PROFESSOR AND DIRECTOR OF FIELD EXPERIENCES, COLLEGE OF EDUCATION AND HUMAN SERVICES, WRIGHT STATE UNIVERSITY

MR. GREGORY MAHAFFEY, EDUCATOR
FAIRBORN CITY SCHOOLS

DR. LINDA RAMEY, ASSOCIATE PROFESSOR; COLLEGE OF EDUCATION AND HUMAN SERVICES, WRIGHT STATE UNIVERSITY

DR. CHARLES W. RYAN, PROFESSOR AND DIRECTOR OF GRADUATE PROGRAMS, COLLEGE OF EDUCATION AND HUMAN SERVICES, WRIGHT STATE UNIVERSITY

MR. RAYMOND SWANN, PARTNERSHIP ADMINISTRATOR, COLLEGE OF EDUCATION AND HUMAN SERVICES, WRIGHT STATE UNIVERSITY

DR. JAMES A. TOMLIN, ASSOCIATE PROFESSOR, COLLEGE OF EDUCATION AND HUMAN SERVICES, WRIGHT STATE UNIVERSITY

WRIGHT STATE
UNIVERSITY

Preparing Quality Science Educators: A Successful Tripartite Partnership

Section A: Dr. Donna Cole, Professor and Director Office of Professional Field Experiences

Historical Perspective

Historically, the College of Education and the Arts and Sciences failed to interact supportively in the preparation of teachers. A process for involvement and collaboration of diverse partners to prepare quality educators is imperative. This paper presents a model and process for shared decision-making among teacher education faculty, Pre-kindergarten through grade 12 (PreK-12) educators and the Science and Mathematics faculty in the preparation of quality educators. Wright State University (WSU), part of the National Network for Educational Renewal (NNER), was selected in 1994 as one of 18 institutions whose process for teacher education reform made extensive use of PreK-12 sector involvement. This university successfully received re-accreditation by the National Council for the Accreditation of Teacher Educators (NCATE) in the fall of 2001. Several joint faculty appointments between the College of Education and Human Services (CEHS) and the College of Science and Mathematics (COSM) serve as pivotal factors, insuring that learned society guidelines are infused into content courses for early childhood, middle childhood and secondary pre-service students. The following overviews our path to quality science education.

Wright State used a process model to plan and articulate the simultaneous renewal of the education of educators and the PreK-12 sector. CEHS at WSU, has been formally involved in this ongoing process to bring about systemic change to PreK-12 higher education since January, 1992. Over 430 representatives of the PreK-12 sector, business, human service agencies, university, military, and others, provided input on the changes needed to create a new culture for

the collaborative education of educators who are responsive to society's needs (Milestone One, 1993, Two, 1994).

Individuals from the PreK-12 sector who work with this initiative are classroom teachers and administrators representative of a number of school systems within the Dayton metropolitan region that WSU serves. With the amount of criticism aimed at the public schools and the growing concern about teacher preparatory programs, educators can no longer work in isolation. The college has faced this challenge and invited not only the PreK-12 sector to join hands in problem solving, but has turned to the University at large to work collaboratively in building a program that will prepare more qualified pre-service teachers and renew PreK-12 and higher education faculties and administrators.

The concept of "simultaneous renewal" of both PreK-12 and teacher education surfaced as an essential component of our advancement efforts. No partnership can exist where only one partner grows and benefits. As Goodlad establishes in *Educational Renewal: Better Teachers, Better Schools* (1994), working together must be mutually advantageous.

Wright State's redesigned teacher education curricula, a conceptualized post baccalaureate professional school model for middle school and high school educators, formally established six partnership districts. Classroom teachers, school administrators, arts and sciences faculty, education and human services faculty, and community representatives continue serving as integral collaborators in the ongoing process for renewal. All partners are actively involved in professional development activities and in our advisory committee structure. CEHS' agenda focuses our energy and resources in alignment with the College's conceptual framework: *"To foster the art and sciences of teaching."* Partner schools and districts also have an identified

agenda of specific goals and improvements. Partnershipping goals focus on moving the agenda of both parties forward (Clark, 1997).

WSU Administrators have promoted bridges between the various colleges in our institution to more effectively integrate the separate pieces of the teacher education enterprise. Nowhere is this initiative more visible than in interactions between COSM and CEHS. Over the last ten years, WSU has appointed seven joint appointment faculty to the Department of Teacher Education, with partial assignment to respective departments in COSM. These individuals, as well as several regular COSM faculty and in-service teachers have formed the nucleus of a science education team. This core-teaching nucleus is charged with the responsibility to reduce institutional barriers. These barriers have traditionally represented impediments to inter-department collaboration towards improved pre-service and in-service professional development and pedagogical practice.

WSU is immersed in change; change in our teacher preparation program as the state of Ohio moves from teacher certification to licensure. Change in our courses as we continue to strive to develop science content courses that incorporate "best practices" and effective science teaching pedagogy. Change also in our roles as college faculty as we move from beginning assistant professors to more seasoned, "connected", knowledgeable facilitators of the simultaneous renewal and partnershipping efforts within the partnership schools in which we work. For the purpose of partnership clarification, the following sections expand on certain aspects of the relationship. Section B addresses Wright State school partners. Section C highlights the math and science partnership on campus. Section D explains the integration of science with the Praxis model. Section E provides a public school educator's perspective, and Section F summarizes the promotion and tenure process and summary conclusions.

Section B: Raymond Swann, Partnership Administrator

Wright State School Partners

Partnershipping for Tomorrow's Superior Educators

By 1995 WSU's CEHS and the PreK-12 sector of the Ohio Miami Valley commenced the process of joining hands (partnershipping) to work collaboratively to build a program that prepares more qualified pre-service teachers and renews PreK-12 and higher education faculties and administrators.

Relationship building between Wright State's CEHS precedes 1987. By 1995, it was natural for the Fairborn City Schools and WSU's CEHS to enter into their first written formal partnership agreement. Since 1995, Wright State has established formal written Partnership Agreements with:

District	Year Partnership Established
Dayton Public Schools	1998
Trotwood-Madison City Schools	1999
West Carrollton City Schools	2000

Since 2000, Sugarcreek Local and Milton-Union Exempted Village have been accepted as Partner School districts. Formal agreements are in process.

The movement from certification to licensure as required by the State of Ohio and the need to comply with the NCATE's 2000 Diversity Standards moved WSU's CEHS to seek the identification of more partner schools. This would allow pre-service teacher candidates to have placements in urban and suburban settings during the academic year.

WSU's Partner Schools

Fairborn City Schools; A working class, suburban school district. The schools of this district identified as WSU's Partner Schools are:

Five Points Elementary, T. Walker, Principal, is the largest elementary school in Ohio. It has a student population of approximately 1309, and it is a placement site for the Early Childhood Educator (ECE) Program and Middle Childhood (MC) Program.

Baker Junior High, E. Gibbons, Principal, has an approximate student population of 891 students, and is a MC and an Adolescent/Young Adult (AYA) Licensure Placement site.

Fairborn High School, R. Cotter, Principal, has approximately 1716 students. A MC and an AYA Licensure Placement site.

Dayton Public Schools: An urban school district.

E.J. Brown Elementary, N. Gaston, Principal, is a site-based managed school with an approximate student body population of 570. It serves as a placement site for ECE and MC Licensure Programs.

Dunbar High School, L. Love, Principal, has an approximate student population of 740 and is a placement site for MC and AYA Licensure Programs.

Fairview Middle School, V. Jackson, Principal, has an approximate student enrollment of 830 students. It is a placement site for the MC and AYA Licensure Programs.

Trotwood-Madison City Schools: A suburban, lower to middle class, culturally diverse district.

Shilohview Elementary School, S. Jackson, Principal, is a placement site for ECE and MC Licensure Programs, where approximately 540 students attend.

Trotwood-Madison Middle School, D. Cook, Principal, currently educates approximately 785 students, and serves as a placement site for MC and AYA Licensure Programs.

Trotwood-Madison High School, S. Mayo, Principal, is a placement site for MC and AYA Programs, and the student population is approximately 1202.

West Carrollton City Schools: An upper working class, suburban school district.

C.F. Holliday Elementary, C. Thiel, Principal, is a placement site for ECE and MC Licensure Programs, with an approximate enrollment of 560 students.

Sugarcreek Local School District: A middle-class, suburban school district.

Bellbrook Junior High School, J. Sigman, Principal, has an approximate student population of 625, and facilitates as a MC and AYA Licensure placement site.

Growth, sustainability, and maintenance of a partnership are determined by commitment, cooperation, respect, collaboration, flexibility, healthy communication, etc. The promotion of these qualities by key individuals and clear lines of communication empowers, energizes, and strengthens the partnerships.

The key personnel roles are:

University Key Personnel	**School/Districts**
Dean of CEHS	Superintendent
Dean's designees	Superintendent's designees
Administrators	**Administrators**
Chair of TED	Assistant Superintendent
Director of OPFE	Executive Principals
Partnership Administrator	Executive Directors
TED	**Schools**
Site Liaisons	Building Principal/Administrator
Interns	Mentor/Clinical Teacher

Clear lines of communication are fostered by the following advisory committee structure:

Governance Communication

University — **School District**

←---- Advisory Teacher Education Council

←---- CEHS Partnership Committee

←---- TED Partnership Steering Committee ----→

←---- Partner School District/WSU (CEHS) Steering Committee ----→

←---- Advisory Council Meetings ----→

Focus Groups ----→

←---- Intern Cohort Meetings ----→

Now we will focus on Partnershipping within the University and College.

Section C: Dr. Linda Ramey, Associate Professor of Teacher Education

The Math and Science Partnership

The overall process of developing collaborative teaching programs between CEHS and COSM at WSU has been one of evolution. To understand how WSU has arrived at the position that exists today requires understanding historical perspectives of growth and change.

In the early 1990's the CEHS was teaching science and mathematics courses using a combination of adjunct and instructor faculty. In 1992, a crisis situation arose within CEHS with the loss of instructors and a difficulty in finding adequate adjunct faculty. Another concern was the steady rising of public complaint regarding the educational preparation of students in grades PreK-12. People felt that teachers were not sufficiently prepared in the content of many disciplines, especially mathematics and science. Since the United States and Ohio economies were becoming more technologically based and requiring a steady supply of graduates versed in the areas of mathematics and science, it was imperative that newly trained teachers become well prepared in the content of mathematics and science and be able to encourage young students who have a natural proclivity for these areas.

[It is documented that lack of knowledge about a subject can lead to fear and anxiety of the subject, and that teachers are in a position which could subconsciously convey this fear to their students. Moreover, teachers comfortable and well-versed in mathematics and science content, could stimulate and motivate young students' learning in these areas.]

At WSU, the Deans of CEHS and COSM arrived at a unique solution to the conundrum. Courses specifically aimed at K-8 education majors would be taught in COSM by faculty who held at least a Masters Degree in the subject area. When this solution was first proposed, a potential difficulty was faced by CEHS, namely, the loss of student credit hours. WSU is a state of Ohio university and as such qualifies for state subsidy that is based upon several factors, one

of them being student full-time equivalencies. Discussions with the provost helped alleviate that problem. Since the state subsidy is greater for courses taught in COSM than in CEHS, the university, overall, would gain additional subsidy monies. CEHS would be held financially and "staff" harmless for the loss of student credit hours since the university would be the ultimate beneficiary of the additional subsidy monies.

Joint Appointed Faculty

CEHS and COSM have collaborated to redesign the mathematics and science teacher preparation programs in an effort to review the pre-college sciences and mathematics sector. This commitment to redesign science and mathematics teacher preparation programs required the development of a new educational curriculum that included hiring faculty. As described above, it was decided that both CEHS and COSM would hire mathematics and science education faculty and as such, they would hold joint appointments in the departments of Teacher Education and Science and Mathematics in COSM. Currently there are presently seven dual appointees (assuming a new Biology person is hired there will be eight). When these joint faculties were hired they were presented with specific expectations. Additionally, new problems arose which had to be solved with the full support of both Deans and the concurrence of the provost.

Of principal interest to the joint appointment of science and mathematics educators were issues related to promotion and tenure. It was decided:

a) The College in which the faculty principally resided (>50% appointment) would be the College, which would originate the promotion and tenure document. The College in which the science and mathematics educator had a <50% appointment would review the document and make relevant comments, but would only vote on the faculty's suitability for promotion and tenure at the university level.

b) Criteria for promotion and tenure. The Dean of COSM was insistent that there be only one set of by-laws for each department. Thus, sciences and mathematics educators would have to meet the minimum requirements for promotion and tenure

that were set down for other members of the Geology, Biology, Chemistry or Mathematics Departments. Latitude in the area of scholarship for science and mathematics educators was broadened. Instead of a minimum of four papers published in peer-reviewed journals, which is required for regular science and mathematics faculty, science and mathematics education faculty would have their scholarship evaluated in a broader sense. Science and mathematics education faculty must have a minimum of two papers published in peer-reviewed journals. Additionally, they may demonstrate a significant record of successful grant activity. Service is expected in the COSM, but unfortunately, it is rarely given much consideration at promotion and tenure time for regular science and mathematics faculty. The scholarship of service for science and mathematics education faculty with respect to monitoring prospective teachers as they complete field experiences was noted and accepted.

c) Departmental Stature - Since many of the joint appointed science and mathematics educator faculty in COSM regularly teach courses in the discipline, in addition to the content-based education courses, they are frequently welcomed as regular department faculty. Unfortunately, a few COSM faculty consider themselves discipline purists and may subconsciously look upon the sciences and mathematics educators as "second-class citizens". With COSM's Dean and Chairs' support, this archaic approach is slowly disappearing, as more of the science and mathematics educators become tenured in COSM. As of today, five of the jointly appointed science and mathematics education faculty who have been put up for consideration for promotion and tenure have been approved without difficulty.

In summary, the creation of the jointly appointed mathematics and science education faculty and the teaching of the mathematics and science courses have had the following positive benefits:

a) The mathematics and sciences content background in teacher preparation programs has been strengthened.

b) A closer working arrangement between faculty of the College of Education and Human Services and College of Science and Mathematics has developed.

c) The frequent exchange of information between faculty in the CEHS and COSM has fostered a better understanding of the goals of the two colleges. Ultimately, courses are in place for better-prepared teachers in science and mathematics and students in the schools are the ultimate winners of this program.

Section D: Dr. James Tomlin, Associate Professor of Education and Biology

Integrating Science with Praxis III Model

At Wright State University we believe that the Praxis III criteria, designed to be generic to all disciplines, can be enhanced by content mandates from the various learned societies. Science was the first content area where alignments with the Praxis III four domains were attempted. Attention was given to the National Science Foundation report (1996) entitled, "Shaping the Future: New Expectations for all in Understanding Education in Science, Mathematics, Engineering and Technology". The following are several key summations of this report:

- College science and math programs should be refocused in order to better educate the 80 percent of students who do not major in the science discipline.
- All students should learn these subjects by direct experience with the method and processes of inquiry.
- Any sustained national effort to improve science and math achievement eventually must address the quality of teacher education at the undergraduate level.
- Few teachers, particularly those at the elementary level, experience any teaching that stresses the skills of inquiry and investigation; they simply never experience those methods in their teaching.
- Faculty must actively engage their students preparing to be PreK-12 teachers (as well as others) by assisting them to learn not only science facts, but also the methods and processes of research, what scientists and engineers do, how to make informed judgements about technical matters, and how to communicate and work in teams to solve complex problems.
- While some institutions are already making the changes needed to help them meet that goal, most are not.

Traditionally at most universities two entities, the Arts & Science colleges and the College of Education & Human Services, failed to interface as seamlessly as possible. WSU we

are appreciative of our inter-departmental partnerships. Over the last nine years several noteworthy collaborations have resulted. Of particular interest to the issue of best practice in content disciplines are:

A. Joint faculty appointments, which resulted in improved science and math content courses for pre-service teachers as well as pedagogical theory within these courses.

B. Infusion of learned society standards into the Praxis Domains and Teacher Education Department (TED) courses.

Seven joint appointments exist currently at WSU. Three of the six exist between the Mathematics Department and TED. Moreover, three tenure lines were secured for mathematics educators rather than mathematicians. One mathematics educator line resides solely in the Mathematics Department. The other two math lines are split between the two colleges. The first split position has majority teaching responsibility to TED, while the second position responsibility lies within the Mathematics Department. The remaining joint positions are housed between the sciences and teacher education. Two of the science lines reside in Biology and one in Geology. Our lines were mirror opposites (i.e., 1 2/3 College of Science and Mathematics + 1/3 College of Education and Human Services and 1 2/3 College of Education and Human Services + 1/3 College of Science and Mathematics).

This cadre of science and mathematics educators is helping to produce a core of "best practice" public school teachers who are taking standards-based graduate and undergraduate courses and in-service workshops. To account for "best practice" the learned society standards have been infused into the Praxis III Domains and documented in the pre-service teachers' portfolios.

To assist teachers in developing pedagogical skills, curriculum knowledge and attitudes and dispositions necessary to educate all students, university and/or site based courses and

partner school learning activities are constructed to exemplify good science and mathematics teaching. These courses demonstrate the content and pedagogy of exemplary teaching that recent science education standards state are necessary. Within these classes valuable and practical learning episodes occur to support excellence and equity for pre-college students. Accordingly, we now have early and middle childhood science programs which not only strive to achieve science content understandings congruent with the *Ohio State Science Model*, the National Research Council's *National Science Education Standards* and the American Association for the Advancement of Science *Benchmarks for Science Literacy*, but also seek to impart pedagogical content knowledge specific to individual science disciplines. Moreover, student understandings are acquired within an active and constructive inquiry-based framework designed to enable students to witness science and science education faculty "walking the walk" and not just "talking the talk".

Working with both pre-service and now in-service teachers in our science courses creates greater potential for blending science education theory with best teaching practices in the partnership classroom as thus benefiting students and teachers alike. Presently, CEHS is exploring ways to match pre-service teachers' experiences from the initial early observational phase to internships, and student teaching with in-service teachers who are immersed in our expanded science course offerings. This process requires finding ways to overcome many of the traditional ways in which school districts place pre-service teachers in classrooms. This is proving to be another challenge for change, change within the traditional culture of the school districts and the university system. CEHS' thinking at this point reflects Michael Fullan's "Ready, Fire, Aim" approach, we keep moving forward even when the path is not clearly visible in front of us (Fullan, 1998). Some of that 'surefootedness' comes from the college's years of

learning to deal successfully with the constancy of ambiguity and change while proceeding forward. However, CEHS is confident because the strategy has proven successful for implementing and institutionalizing our ever-changing science education program.

Two example courses include a content biology course developed and taught by science educators with strong content preparation and a content specific, science methods course developed and taught in collaboration with scientists and science educators with extensive pre-college science teaching experience. Assessment issues related to classroom performance are evaluated within a context that is reflective, authentic and congruent with performance-based state licensure requirements, as well as learned society content standards for NCATE accreditation.

The faculty in science education has developed a conceptual framework for undergraduate elementary pre-service students at WSU. The framework contains six levels. The first level consists of a foundational course aimed at developing initial science literacy and problem solving. The second level involves four conceptual units in physics, chemistry, geology and biology. The third level builds on level two by advancing knowledge and skills in the four science disciplines (physics, chemistry, geology and biology). The fourth level requires students to complete projects in science. The final two levels involve post baccalaureate science teaching application. Level five integrates math and science methods, while a capstone level includes supervised field and intern placements (Figure 1). Being a faculty member in two colleges is perhaps the best training for us in learning to cope with the ebb and flow of ambiguity and the tension of differing cultures at work in arts and sciences, CEHS and at professional development schools.

This flexibility and openness to ever changing ideas and methodologies has permitted us to effectively develop a science program based on the State and National Science Education Standards (NSES) and to be responsive to the science technology needs of in-service teachers. CEHS has now moved on in our program changes and developments modifying our science courses to allow classroom teachers opportunities to learn content while updating their understanding of science education pedagogy.

Section E: Gregory Mahaffey, Educator, Fairborn City Schools

A Public School Educator's Perspective

Contextual Information

I currently teach in Fairborn, Ohio a suburb of Dayton, Ohio, and work for the Fairborn City Schools, a district serving 6,000 students with a free and reduced lunch rate of 30 percent. In my job as a seventh grade teacher at Baker Junior High, a school with 1,000 seventh and eighth graders, I teach integrated science to 160 students. As a member of an interdisciplinary teaching team that is composed of two language arts teachers, one social studies teacher, one math teacher and one science teacher, our efforts focus on the inclusion model. We also have two special education teachers who work to modify curriculum for the team's thirty special education students.

Special Circumstances

The Fairborn City Schools have a strong connection to Wright-Patterson Air Force Base, which creates two unique situations: a high degree of mobility for both students and staff and decreased revenue due to the high number of personnel cutbacks at Wright-Patterson during the last decade (ten thousand positions cut). The diversity of the student population is moderate, with

one exception, a high percentage of students of Appalachian descent. These students frequently display a low interest in education and a distrust of the public schools. Thus, teachers in this district are most successful when they can adopt teaching methods to motivate both those who are high achieving and those who are lower achieving.

Impact of Partnership on Best Practices as a Teacher

My first contact with WSU occurred as a result of my work with a pre-service teacher. I was impressed by the inter-relationship that exists between WSU and the Fairborn City Schools. This partnership benefits both institutions by improving the quality of instruction for Fairborn students and creates a better environment for Wright State's pre-service teachers.

While hosting a student teacher, I became aware of an opportunity to enhance my practice. Wright State had created a 160-hour institute that would focus on inquiry teaching and the NSES. Additionally, the institute would improve my skill as a mentor for a Wright State pre-service teacher. As an institute participant I learned science content exactly as my pre-service counterparts had. The experience was further enhanced by a semester long follow-up course designed to assist me in implementing inquiry curriculum. I was involved in a monthly study group and compiled a portfolio of student accomplishments. This training was different than training I had completed in the past, because it was easily translated for use in my seventh grade classroom. Subsequently, I have worked with student teachers trained at WSU who have felt more comfortable entering a classroom where they were able to observe and to practice using the same methods with which they were familiar. Often times methods classes at a university do not coincide well with what practicing teachers are doing inside their classrooms. This discrepancy can put pre-service teachers in a position where they either have little guidance or actual resistance from their co-operating teachers. New methods are often looked upon by clinical

faculty as the next fad to come from higher education. By building an understanding between clinical faculty and pre-service teachers, as is the case for WSU and the Fairborn City Schools, instruction for pre-service teachers and PreK-12 students is improved.

Wright State has shown a further commitment to its partnership with the Fairborn City Schools by organizing a grant to bring training and resources to science and math teachers. I have witnessed how this training has fostered interaction among staff members and I am excited to see how it will impact student learning.

Impact on Student Learning

NSES calls for students to: ask questions about the world in order to learn how it works, develop theories using the instruments and techniques of science, test these theories by conducting investigations, share their results and to ask each other how they know what they know. My Wright State training helped me to outline three fundamental principles for my classroom.

First, I work to validate students' questions and answers. I encourage this with our class motto, "No Shame Science: there is no such thing as a stupid question, there is no such thing as a stupid answer." By promoting the need to ask questions and to develop answers to those questions, we work to foster an environment where ideas can be shared without the fear of being laughed at or ridiculed. Early in the year, I use co-operative problem-solving puzzles to teach children to work together and then share their solutions with other members of the class. These activities are designed to introduce students to one another and to develop a sense that solutions to problems can be discovered co-operatively.

Secondly, I want my students to gain the ability to look closely at and observe the world around them. Life science lends itself to careful observation. An example of this type of

observation is a study of the life cycle of the mealworm. Students follow the metamorphosis of the mealworm by creating detailed drawings, making written observations and devising simple and humane experiments. Finally, students are able to create a timeline detailing many important observations about the mealworms' life requirements, behaviors and life cycle. By making careful observations and paying attention to details, students are better prepared to create and implement scientific investigations.

Later in the year a cosmetics investigation was used to help foster students' abilities to form, test and share theories. As a part of this investigation, students choose a product that claims to provide a benefit to the user and then design an investigation to determine if the product does what it claims to do. I attempt to gently guide the creation of the investigation and help students to understand and use as many of the tools and techniques of science as possible. By design, the investigations are always less than perfect. This provides the class with the opportunity, not only to utilize the beginning steps in the scientific method, but also to critically reflect upon the mistakes they made and then work to implement further investigations.

In summary, Wright State is using inquiry teaching and NSES to ask teachers to teach in different ways. It is more time consuming and it requires more energy on the part of the teacher, but it motivates students to do good science. Parents and teachers who understand rote memory as the path to important science content are sometimes resistant to this approach. They want their children to be successful in their pursuit of science and often times associate this with the ability to memorize lists, names, formulas and theories. While the retention of knowledge is an important skill to master, by itself it leads only to a surface understanding of the process and the nature of science.

All of the projects and investigations in my class are designed to be meaningful to students. To give them something to remember and build upon as the year progresses. They are also designed to meet the needs of a diverse group of learners, by allowing students to progress at their own rate, work to the best of their ability and also do meaningful work. Wright State's program has helped me utilize an inquiry approach to science that is in keeping with the NSES. As a result of this, I believe that students are more likely to ask the questions that are important to them. These questions inevitably lead to the essential questions of science and when children, not teachers, are the ones asking the questions they will remember the answers.

Section F: Dr. Charles Ryan, Professor and Director, College of Education and Human Services, Graduate Studies

The tenure system, or other alternative assessment systems, has been subject to criticism from the standpoint of how faculty productivity is determined. Generally speaking, the purpose of this section is to review several critical variables related to tenure and faculty productivity that may provide guidelines for practice at selected institutions. By developing a model of general standards for productivity analysis, a descriptive picture can be developed that provides an empirical basis for examining what is meant by faculty productivity (Figure 2). The second purpose of the section is to comment on joint appointments between a professional college and an academic college where standards for promotion and tenure often differ. In short, this section of the paper will explore the complex association between tenure and faculty productivity, as it is associated with joint appointments between a professional school and an academic unit.

Prior studies by the research team on the issue of tenure and promotion examined a variety of professional viewpoints in the area of higher education sources. A purposive sampling of selected literature sources from higher education during the period of 1995 – 2000 was

obtained through electronic procedures and analysis of articles, faculty handbooks and other sources (Antony, et. al., 1998). A number of critical variables were identified and after analysis of the data a number of themes emerged which provided visible linkage to concerns, positions and opinions regarding granting tenure (Chait, R.P., 1994).

In evaluation for promotion to tenure, they are both matters of fact and unobtrusive factors that are difficult to assess (Rice, 1999). The role of faculty in American higher education varies by complexity, size of faculty, organizational structure, context variables, and teaching vs. research commitment. Also, there are other variables that professionals use to arrive at performance judgment. For instance, the college mission must be considered. The goals and objective of a College of Education faculty are typically related to varied assignments that require commitment to teaching, service, and administrative type duties.

A policy issue is in developing a more effective model of evaluation that directs attention to *field based activity* for mathematics and science educators. As cited earlier, faculty with joint appointments in a college of science and mathematics are expected to document publication of two articles in referred journals. While this is a laudatory requirement, it may not be relevant to colleges of education and human services that must document professional field supervision and teaching by clinical education faculty. These clinical requirements are extraordinary in their time demand and place constraints on faculty to deliver courses and supervision at off campus sites. However, it does not say that professional schools negate professional publication, but that we place a different value on the amount of published research and the sources it could be published in. For example, education faculty are expected to submit articles for potential publication and have at least six published when their credentials are submitted in the sixth year of the promotion and tenure review process. These articles can be in journals that are heavily

weighted to professional field activities and/or professional curriculum revision and new program standards. They do not necessarily need to be published in journals that have a strong emphasis on experimental and empirical based articles.

The review of promotion and tenure procedures and practices will continue as the debate intensifies throughout post-secondary institutions (NEA, 1999). As long as rhetoric is based on value bias of selected individuals in either content area, academic units or professionals schools, we will continue to have interpretations of tenure and promotions that may be in contrast to reality. The findings of our preliminary study suggest that the promotion and tenure process at the department level through the board of trustees is often impacted by differing values and interpretations while review of the candidate's tenure file is conducted by Promotion and Tenure Committees.

The implications of our collaborative efforts for the past eight years suggests that promotion and tenure will continue to be received favorably in this institutional environment. However, we must continue to work on defining the standards that are used to assess faculty work who hold joint appointments. Several concluding recommendations are as follows:

1. Early and sustaining review must occur for all candidates in an entry-level tenure track position. Performance appraisal on an annual basis should be conducted by institutional representatives at the department and college level to ensure that strengths and weakness are clearly identified and evidence of improvement is noted in subsequent years.

2. The assessment of one's professional potential for tenure must include review by colleagues within both departments from which the candidate is under consideration. It is extremely important that external review be used to substantiate the quality of teaching, research and clinical service. Mere quantity of publication is not the key variable in this issue. However, quality as related to theoretical judgment must be demonstrated in publications that focus on professional practice.

Summary

We continue to believe that the issue of promotion and tenure will consume many hours of productive work by promotion and tenure committees and selected administrators as we review candidates at this critical professional point. We believe that one's peers are best able to judge candidates for promotion and tenure and the overall quality of their work while holding a joint appointment.

References

Antony, J.S. and Raveling, Joyce (1998, November). A comparative analysis of tenure and faculty productivity: Moving beyond traditional approaches. Paper presented at the Association for the Study of Higher Education annual meeting.

Chait, R.P. (1994). Make us an offer: Creating incentives for faculty to forsake tenure. ERIC Report No.: Ej477905.

Clark, R.W. (1997), Professional development schools: policy and financing. Washington, D.C.: AACTE Publication

Fullan, M. (1998 April). Whats worth fighting for? College Park, MD: Vernon Anderson Lecture, University of Maryland.

Goodlad, J. (1994). Education renewal: Better teachers, better schools. San Francisco, CA: Jossey-Bass Publishers.

Goodlad, J. (1990). Teachers for out nation's schools. San Francisco, CA: Jossey-Bass Publishers.

Milestone one: A synthesis report. (Available from the College of Education and Human Services, Wright State University, Dayton, Ohio 45435)

Milestone two: A synthesis report. (Available from the College of Education and Human Services, Wright State University, Dayton, Ohio 45435)

National Science Foundation (1996). Shaping the future: New expectations for all in understanding education in science, mathematics, engineering and technology. Washington, D.C.

Rice, C. (1999, July). Transformation of Faculty Work. Paper presented at the Council of Graduate Schools Summer Workshop.

Sizor, T. (1992). Horace's school: Redesigning the american high school. New York: Houghton Mifflin Company.

Shulman, L. (1988 November) "A union of insufficiencies: strategies for teacher assessment in a period of educational reform. Educational Leadership, 36-41.

Shulman, L. Bird, T. and Haertel, E. (1989). Toward alternative assessments of teaching: A report of work in progress. Stanford, California: Teacher Assessment Project.

The truth about tenure in higher education. (1999, May). Washington, D.C., National Education Association.

Figure One
Wright State University Science Sequence

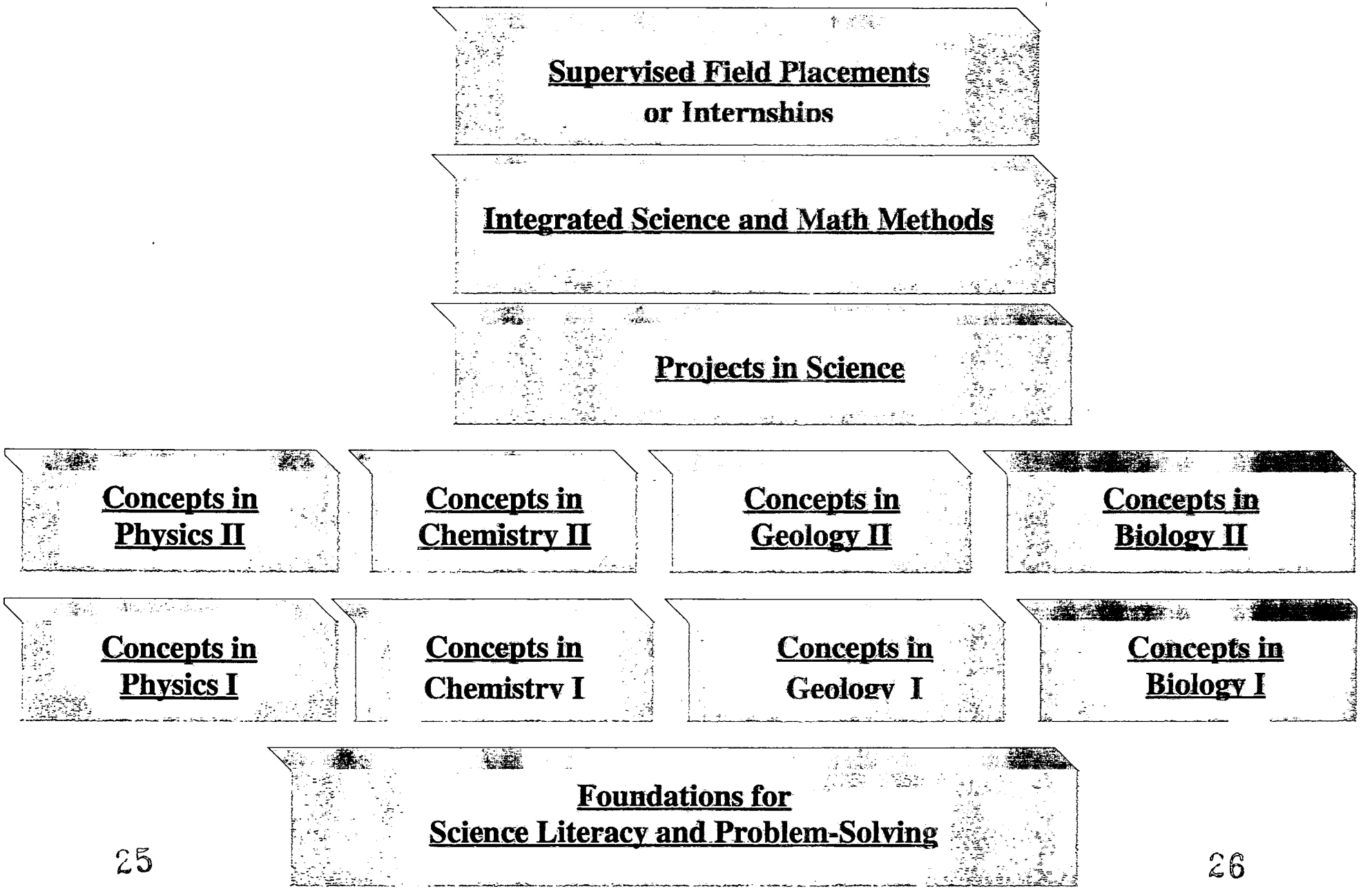

Figure 2

Productivity Analysis

Assessment Category	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05
1. Professional Responsibilities:						
• Student Services						
• President						
• Officer						
• Coordinator						
• Thesis Advisement						
• Presentations:						
• Number Annually						
National						
State						
Local						
• Faculty Research Awards						
• Community Service						
2. Teaching Effectiveness:						
• Teaching Hours/Year						
• Student Reviews						
• Peer Reviews						
• Innovations						
• Grants/Teaching						
• Advisees, number of is a variable						
3. Scholarly Activity:						
• Articles Published						
• Articles in Review						
• Books						
• Grants						
• Reviews						
• Curriculum Material						
• Consultancies						
• Technical Reports						
• Editorial Board						
• Newsletters						
4. Clinical Contributions						
• School Based Teaching						
• Practica/Internships to Field Sites						
• Specific Assignments						

Note: The model is used by graphical development of a profile of professional activity over a 6 year period – significant changes in either a positive or negative direction is noted.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: PREPARING QUALITY SCIENCE EDUCATORS: A SUCCESSFUL TRIPARTITE PARTNERSHIP

Author(s): DONNA J. COLE, LINDA RAMEY, JAMES A. TOMLIN, CHARLES W. RYAN, GREGORY MAHAFFY, RAYMOND SWANN

Corporate Source: COLLEGE OF EDUCATION & HUMAN SVCS. WRIGHT STATE UNIVERSITY

Publication Date: FEB., 2002

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 1	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2A	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2B
Level 1 ↑ ☒	Level 2A ↑ ☐	Level 2B ↑ ☐
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) *and* paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, → please

Signature: Charles W Ryan	Printed Name/Position/Title: CHARLES W. RYAN, PROFESSOR
Organization/Address: CEHS WRIGHT STATE UNIVERSITY	Telephone: 937-775-3286 FAX:
	E-Mail Address: CHARLES.RYAN@WRIGHT.EDU Date: 2/3/02

(over)

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, *or*, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

ERIC Clearinghouse on Teaching
and Teacher Education
1307 New York Ave., NW
Suite 300
Washington, DC 20005-4701

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to:

ERIC Processing and Reference Facility
4483-A Forbes Boulevard
Lanham, Maryland 20706

Telephone: 301-552-4200
Toll Free: 800-799-3742
FAX: 301-552-4700
e-mail: ericfac@inet.ed.gov
WWW: http://ericfac.piccard.csc.com

EFF-088 (Rev. 2/2000)