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A Technological Teacher Education Program Planning Model

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The purpose of the paper is to briefly state the case for a revised technological[1] teacher education program and describe a conceptual model developed at the Faculty of Education, The University of Western Ontario. The model outlined assumes that a re-thinking of how technological teachers learn to teach is necessary if new ways of teaching are to be fostered. The need has three dimensions. First, technology and the way we transmit knowledge about it in schools, is changing. Second, substantive analysis of past practices in technological teacher education are overdue. Third, teacher development is a complex human and professional process combining personal and environmental factors that are often poorly understood.

The curriculum design represented herein is a starting point for research, reflection and development only. A more comprehensive technological teacher education pedagogical model will evolve differently from one institution to another. There are two aspects to the design put forward for reader analysis: the elements which give the design its structure; and the program activities themselves. The description of both is condensed. The paper gives the reader information about the features of the model and, to a lesser extent, information about how to use it. A more detailed description of the teacher development project which led to the adoption of the new model and detailed information on its use is available (Hansen, R., Froelich, M., Fleisser, C., and McClain, J., 1991).

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[1] In Ontario, "technological education" is a term the provincial government has chosen to define a long-standing but evolving subject area. The term encompasses all technological education programs from Kindergarten to high school honours graduation. These include: technology in education (grades K-6), in which the learning of technology is part of an integrated core program for all students; design processess in technology (grades 7-9), an integral element of a math, science, and technology core curriculum for all students; broad-based technologies (gradess 10-12), a program which provides students with an introduction to one or more of six technology areas; concentrated technologies (grades 10-12) which provide skills development for students with an interest in a specific technical field; and Ontario Academic Credits (O.A.C.) for students wishing intense technological skills and knowledge in preparation for post-secondary studies in engineering or science.

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The case for a revised technological teacher education program is based on the recent "research on teacher education" literature (Carter, 1990; Feiman-Nemser, 1990; Zeichner and Gore, 1990). That literature suggests that prospective teachers come to the profession with preconceptions of what teaching is all about. Technological education teachers, as observed in the project at the University of Western Ontario, are no exception. Compounding the problem is a growing alarm about teacher education program effectiveness. "Many people believe that teacher education is a weak intervention incapable of overcoming the powerful influence of teachers' own personal schooling or the impact of experience on the job" (Feiman-Nemser, p.229). Missing, according to Feiman-Nemser, from the research on teacher education, is a conceptual framework that identifies central tasks of teacher preparation, e.g. helping teachers to examine their preconceptions about teaching and learning; to learn about transforming subject-matter knowledge for purposes of teaching; and to develop a commitment to teaching all children.

The Technological Teacher Education Model

The challenge undertaken in this project was to understand these preconceptions and to transform the technological teacher education curriculum as it existed at The University of Western Ontario. Four aspirations guided the program reformulation process. First, the faculty members involved wanted students to achieve a sense of professional self-awareness. Schon (1987) refers to such awareness as "reflective practice." Being able to isolate preconceptions is one thing; intelligently and systematically modifying them is another. Understanding the curriculum development process, i.e. being able to separate "what to teach" from "how to teach" questions, was the second direction. Third, the ability to connect higher order learning outcomes (e.g. independent learning ethic, critical thinking) with meaningful classroom experiences was a priority. Finally, the issue of "context" for student teachers required attention. What is technological education? Why have technology in the curriculum? The introduction of the program was linked to a comprehensive research project and program evaluation.

To help the reader conceptualize the model that evolved, a series of illustrations follow. Figure 1, an axonometric note-pad representation, is based upon the systems elements of input, process, and output. The 'input' stage in the teacher preparation process is comparable to recruitment into the profession. Candidates in the UWO program are selected based on a set of criteria which includes technological expertise and knowledge, formal and informal education accomplishments related to technology, and a disposition for organizing and sharing knowledge and competencies with adolescents. Admission to the program is highly competitive (one out of ten applicants is admitted) and involves interviewing as well as competence testing. A teacher-

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needs analysis within the target region of southern Ontario is used to rationalize and justify the recruitment process from year to year.

The "process" stage, detailed on the conceptual model and the main thrust of this paper, has several components. The three views, front, top, and side, correspond to a program emphasis. Each emphasis is focused around a curriculum question; what should be learned? (content) how should it be learned? (process) and why should it be learned? (purpose). Together they give technological teacher educators and program planners a general framework from which to consider program development, both in consecutive and concurrent teacher education programs. The practice of "planning" and "conceptualizing," processes so integral to effective learning in technological education classrooms, is followed here to help the reader.

Figure 1.

The Curriculum Content

The curriculum "content" part of the program (Figure 2) includes four components: technological foundations, pedagogical knowledge and skill, curriculum development and knowledge of the profession. Technological foundations involves topics such as the history of technological education, the sociology of work, education and the economy, and ultimately the sociology of technological education. The need is to give would-be-teachers in technology education a context in technology and a grounding from which to better understand its many places in the school curriculum, and its relevance to social, economic, cultural, and political policy development. The program engages students and a

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range of faculty with social science backgrounds in a series of seminars. The concept of pedagogical knowledge and skill for teachers is defined by Shulman and Sykes (1986) as the core concepts, skills, and attitudes which a given topic has the potential of conveying to students. One example core concept in technological education that is often learned and reinforced is "economization/optimization." Each time a student is invited to develop a pattern for an object or artifact, a resourcefulness mind-set as well as skill is being acquired; examples include the development of a garment pattern or the design of a floor plan with different configurations for making maximum use of flooring materials.

To introduce curriculum development concepts and curriculum writing skills, three studios were conceived, one in each of: computer graphics, design studies, and communications technology. Each studio was created to be "process" rather than "content" orientated. Student teachers are invited to develop curriculum learning units with a problem or a challenge focus rather than a specific subject focus. Finally, knowledge of the profession involves a deliberate attempt to prepare aspiring teachers for their fifth year in the profession as well as their first. Topics include professional development theory, teacher wellness, conflict management, and leadership/followership values, to name a few.

Figure 2.

The Curriculum Process

The curriculum "process" part of the program (Figure 3) includes planned reflection (examination of one's own preconceptions and how they change over time), classroom instructional strategies (the introduction of important topics in teacher preparation e.g. lesson planning, objective writing, peer learning, and student assessment), individualized and group learning (independent and small group inquiry skills were developed by the students through a learning package and student socialization opportunities), and an introduction to a technological

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method based on the work of Savage and Sterry (1990), for the transmission of knowledge and the development of new knowledge.

Figure 3.

The planned reflection exercise developed for students involves a conscious effort to monitor and experience at the same time, the "gap" or "dissonance" that students find between what they learn in their Faculty of Education classes and what they discover in the practicum. An observation and practice teaching assignment guides the learning exercise. Outcomes of the reflection are a better understanding of the "ideal" teacher, student, curriculum, and school milieu (Clandinin and Connelly, 1988).

Classroom instructional strategies are taught and experienced at the same time. A ten week practicum in local schools serves to give student teachers an opportunity to both practice conventional instructional formats and alternative pedagogical strategies. A significant part of the student teacher's development is to always consider dimensions of "learning how to learn" while facilitating the learning of core concepts. An independent self-paced learning package corresponds to and complements the traditional teaching methods material found in most teacher education programs. The exercise also reinforces the life-long learning ethic so important in a learning society.

The technological method (Savage and Sterry, 1990) provides the program with a vehicle for involving students in the teacher development problem solving process while it is happening. Using the problem solving steps, students are asked to identify their own perceived needs vis-a-vis becoming a successful

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teacher, and lay out a strategy to meet those needs. The aim of the focus on the technological method is to reinforce the knowledge technologists have about their own field but never articulate in other than an everyday problem solving discourse. It is quite a comfort for students to discover that the problem solving process has a set of universal steps and that the process involves the development of knowledge parallel to that developed through, for example, the scientific method. The fact that knowledge of how something is done or accomplished relates to and often precedes higher order knowledge (Pring, 1976), is also quite a revelation to student teachers.

The Curriculum Purpose

The purpose or rationale for the teaching of technological education (Figure 4) is systematically addressed in the program. The elements of the rationale which are explored include the experiential method or process itself, personal development or fulfilment, technological enlightenment for all, and economic well-being (individual and societal). These elements are not taught as distinct topics unto themselves; instead, through year long journaling, students are invited to formulate a personal philosophy of technological education. They are asked to answer the question - why teach technological studies in schools? Journal entries are shared with faculty and methodically tailored to reflect the student's own background experience in technology. A technological education “issues” class, designed and operated collaboratively by the students and fac

Figure 4.

ulty, augments the journaling exercise by focusing on the following: technological change, the political realities of technological education, the natural and human altered world, and the many direct and indirect connections between education and work. The works of McCormick (1990) and The Ministry of Education Committee on Technological Teacher Education (1992) are used as a foundation for discussions about a rationale for technological education.

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Concluding Comments

The "output" stage is one that is overlooked by program planners because of institutional constraints. For example, constraints include budgets, lack of a systems perspective which recognizes the importance of feedback and evaluation analysis, and limited human and physical resources. At The University of Western Ontario, graduating teachers become an integral part of the program for the subsequent year's cohort of teacher candidates. First and second year teachers, through a voluntary but planned networking arrangement initiated each year by the current graduating class, organize a workshop for their protege′s during the subsequent school year. Workshop topics include the relevant but often overlooked unknowns that "would-be" teachers want to discuss with recent inductees of the profession; for example: How do you overcome public speaking anxiety? What curriculum changes did you have to make? What technological activities/projects did you conceive?

By examining the entire teacher development process from recruitment, through pre-service preparation, to the first two years of teaching, continuity from the beginning teacher's perspective, is enhanced, and program excellence is fostered. Technological education teachers, as found in the project, come to teaching with several preconceptions, some problematic, others refreshingly precious. The following are some examples of both. Acceptance of technological phenomena as either given or already determined, conventional notions of the value and purpose of skill development, the place of entrepreneurship in the technological education curriculum, subordinate role model behavior (presumably a manifestation of life in hierarchial organizational structures), the emulation of a significant other (e.g. a teacher from the past) and a distorted view of the profession (e.g. salary scales, vacation opportunities, security) are some of the preconceptions that were found to be prevalent with the cross section of students in the project. For all the preconceptions that were identified as problematic, there were others that needed to be celebrated and reinforced. Work ethic, tolerance for different learning styles and abilities, commitment to learning, and workplace and labour market understanding, are but a few of these.

The curriculum themes, "content," "process," and "purpose," presented in this paper are central features of any successful curriculum. What was important for the faculty in the program described and what is important for others wishing to re-formulate their programs, is the recognition that the elements in the model are interrelated and in a continual state of flux. Furthermore, the force for program change has to be both internal and external to the student teachers who are learning. With these perspectives and a sensitivity to the many processes by which learning occurs, a chance for meaningful intervention exists.

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