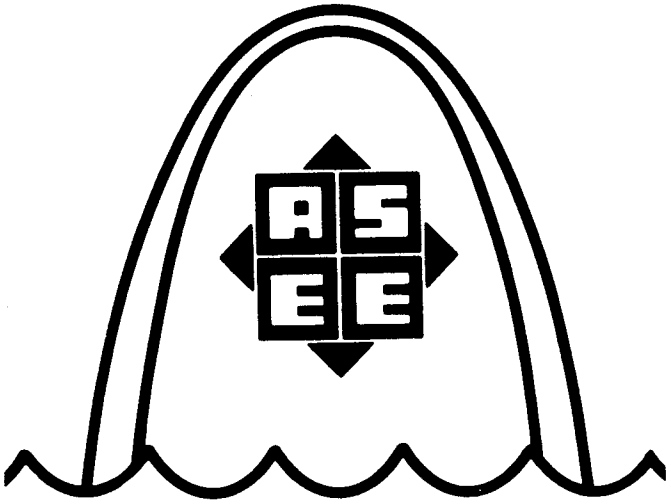
Conference Proceedings

Fourteenth Annual
Midwest Section Meeting
American Society of Engineering Education



GATEWAY TO THE '80s ENGINEERING AND TECHNOLOGY EDUCATION

March 14-16, 1979
St. Louis Community College at Florissant Valley

Paper Sessions

Session I-A, room SM-203

Engineering Spectrum and Industry

Session chairman: Gerald A. Rath Witchita State University

"Defining the Engineering Spectrum," Gerald A. Rath

"Advisory Councils," George P. Waldheim, University of Nebraska-Omaha

"Industry Input for Projecting Engineering Students From Industry,"Keytack Oh, University of Missouri-Rolla-Graduate Engineering Center

Session II-A, room SM-203

Instructional Materials and Methods

Session chairman: Eldon Rush, Longview Community College-Kansas City

"Use of Objectives in Textbook Development," William F. Schallert, St. Louis Community College at Florissant Valley

"Deliberate Incorporation of Good Teaching and Learning Techniques in Writing Engineering Textbooks," Gabriel G. Skitek, University of Missouri-Rolla

"Authors Textbook Review," William Gruener, Addison-Wesley Publishing Co.

"Minimum Essentials of Effective Teaching," Edward P. Mikol, University of Wisconsin-Madison

Session III-A, room SM-203

Programs for Instructional Improvements

Session chairman: Wayne W. Williams, Kansas State University-Manhattan

"Design Problems for a Course in Foundation Education," Wayne W. Williams, Edwin C. Lindly, Kansas State University-Manhattan

"An Evolutionary Approach to Introducing Digital Filtering and Control Experiments into Undergraduate Engineering Curriculum," R.E. Ziemer, D.R. Fannin, P.D. Stigall, University of Missouri-Rolla

"Computer Applications to Industrial Engineering Practice and Education," Robert H. Eastman, University of Missouri-Columbia

"Factors Influencing Success in Engineering Statics," Lawrence E. Ehlers, University of Nebraska-Omaha

Session I-B, room E-115

Technology Programs

Session chairman: Thomas F. Creech, Kansas Technical Institute-Salina

"Problems and Prospects of a Two-Year Engineering Technology Program," Thomas F. Creech, Kansas Technical Institute

"The Senior Project as a Terminal Requirement in an Engineering Technology Curriculum," Charles L. Sedlacek, University of Nebraska-Omaha

"Establishing a Design Center for Industrial Projects," Gerald R. McClain, Oklahoma State University

Session II-B, room E-115

Courses for Engineering Science and Engineering Technology

Session chairman: Larry Farmer

"Teaching Mathematics to Engineering Students-An Unorthodox Approach," Hermann J. Donnert, Kansas State University-Manhattan

"Transitional Mathematics in Two-Year Technical Institute," Robert Bingham, Robert Homolkey and William B. Powell, Kansas Technical Institute-Salina

"Transvaluation: A Symbiotic Merger of Technical and Rhetorical Principles," Pearl Saunders, St. Louis Community College at Florissant Valley

"The Effects of Energy Conservation upon the Environment," Burns E. Hegler, J. Byron Nelson, University of Missouri-Rolla

Session III-B, room E-115

Programs for Special Student Needs

Session chairman: Daniel Babcock, University of Missouri-Rolla

"Weekend Engineering Management Course Experience," Daniel L. Babcock, University of Missouri-Rolla

"A Comparison of Women in Engineering Technology and Other Major Fields of Study on Patterns of Interest, Scholastic Aptitude and Demography," Neal A. Willison, Oklahoma State University

"Status of Programs to Encourage Minorities and Women to Enter the Engineering Profession in Missouri and A Plan for Action," Shankar Lakhavani, Emerson Electric Company

Session I-C, room IR-112

Considerations in Engineering Education

Session chairman: Andrew Lindberg, St. Louis Community College at Florissant Valley

"How Professional Concepts Can Be Taught," J. Kent Roberts, University of Missouri-Rolla

"A New Approach to Professional Development and Continuing Education," M.P. Dudokovic, Washington University; H. Houser, Monsanto Co.; J. Maguire, Monsanto Co.

"Survey of the Quality of Engineering Graduates," William R. Kimel, Melford & Monsees, University of Missouri, Graduate Engineering Program

"New Techniques for Dealing With the Explosion of Scientific and Technical Information," Dale I. Rummer, University of Kansas-Lawrence

Session II-C, room IR-112

Implications of Metrication on Engineering Education

Session chairman: Herb Crosby, University of Missouri-Rolla, UMR Graduate Engineering Center, St. Louis

George Hauck, Dept. of Civil Engineering, University of Missouri-Kansas City

John Henschke,Continuing Education Specialist, University of MIssouri Extension-Maryville

Karl Muhlbauer, University of Missouri-Rolla

Session III-C, room IR-112

Improvements for Student Transfers from Community Colleges

Session chairman: David Allen, University of Missouri-Rolla

"A Model Program for Engineering Transfers," David Allen, University of Missouri-Rolla

"Experience with a Model Articulation Program," Daniel Miller, St. Louis Community College at Forest Park

"The Community College Student," Robert Murray, St. Louis Community College at Meramec

TEACHING THE METRIC SYSTEM TO NON-ENGINEERS: AN ADULT CONTINUING EDUCATORS PERSPECTIVE

By Dr. John A. Henschke
Continuing Education Specialist
University of Missouri - Extension

The Engineering Educator is knowledgable, well equipped, used to, and successful in teaching the metric system to the engineering student and/or the professional engineer. However, there are times when the engineering educator is called upon to teach the metric system to non-engineers such as persons in business, grade or high school classroom teachers, mechanics, agriculturalists, or sales persons to name only a few. When he does, it usually becomes readily apparent that the teaching approach used with the student or professional engineer is not nearly so effective with the non-engineer.

The Adult Continuing Educator's research and experience is providing evidence that adult learners (which includes non-engineers) have four unique characteristics. These, in turn imply some things for their learning as well as the teacher's approach in teaching adults or in what may be more accurately called facilitating their learning.

The Bibliography at the conclusion of this paper indicates a few adult continuing educators who have extensive experience in the research and practice of teaching adults. Dr. Malcolm S. Knowles (6) has theorized about the four unique characteristics of adult learners, and the implications growing out of those unique characteristics for adult learning as well as for teachers of adults. An application of Knowles' work to the Engineering Educator's teaching the metric system to adult non-engineers would be described as follows in those three major categories:

A. Unique characteristics of adult non-engineer learners learning the metric system;
B. Implications for adult non-engineer learners learning the metric system; and,
C. Implications for engineering educators teaching the metric system to adult non-engineers.

I. Self-concept

A. Characteristic

Self-concept: The adult non-engineer learner sees himself as capable of self-direction in learning the metric system and desires the engineering educator to see

him the same way. In fact, one definition of maturity is the capacity to be self-directing.

B. Implications for adult non-engineer learning

- A climate of openness and respect is helpful in identifying what the adult non-engineer learners want and need to learn regarding the metric system.
- Adult non-engineers enjoy planning and carrying out their own learning exercises in learning the metric system.
- Adult non-engineers need to be involved in evaluating their own progress toward self-chosen goals in the process of learning the metric system.

C. Implications for engineering educators

- Engineering educators recognize adult non-engineer participants as self-directing in learning the metric system and treat them accordingly.
- The engineering educator is a learning reference for adult non-engineer learners in learning the metric system rather than a traditional instructor; engineering educators are, therefore, encouraged to "tell it like it is" and stress "how I do it" rather than tell participants what they should do.
- The engineering educator avoids talking down to adult non-engineer learners of the metric system, because these people are usually experienced decision makers and self-starters. The engineering educator instead tries to meet the non-engineer learners' needs in learning the metric system.

II. Experience

A. Characteristic Experience: Adult non-engineers bring a lifetime of experience to the learning situation including the metric system. Student and professional engineers tend to regard experience as something that has happened to them, while to an adult non-engineer, his experience is him. The adult non-engineer defines who he is in terms of his experience.

B. Implications for adult non-engineer learning

- Less use is made of transmittal techniques; more of experiential techniques in learning the metric system.
- Discovery of how to learn from experience is the key to self-actualization in learning the metric system.
- Mistakes are opportunities for learning the metric system.

- To reject adult non-engineer experience is to reject the adult non-engineer.

C. Implications for engineering educators

- As the adult non-engineer is his experience, failure of the engineering educator to utilize the experience of the adult non-engineer learner in learning the metric system is equivalent to rejecting him as a person.

III. Readiness to learn

A. Characteristic

Readiness to learn: Adult non-engineer developmental tasks increasingly move toward social and occupational role competence in learning the metric system and away from the more pre-determined maturation tasks of childhood as well as the pre-determined subject matter of the student or professional engineer.

B. Implications for adult non-engineer learning

- Adult non-engineers need opportunities to identify the competency requirements of their occupational and social roles as regards learning the metric system.
- Adult non-engineer readiness-to-learn and their teachable moments peak at those points where a learning opportunity is coordinated with a recognition of the need to know the metric system.
- Adult non-engineers can best identify their own teachable moments and their own readiness to learn the metric system.

C. Implications for engineering educators

- Learning the metric system occurs through helping adult non-engineers with the identification of gaps in their knowledge of the metric system.
- No questions are "stupid"; all questions are opportunities for learning the metric system.

IV. A problem-centered time perspective

A. Characteristic

A problem centered time perspective: Students and professional engineers think of education in the metric system as the accumulation of knowledge for use in the future. Adult non-engineers tend to think of learning the metric system as a way to be more effective in problem solving today.

B. Implications for adult non-engineer learning

- Adult non-engineer education in the metric system needs to be problem-centered rather than theoretically oriented.
- Formal curriculum development in the metric system is less valuable

than finding out what in the metric system the non-engineer learners need to learn.

- Adult non-engineers need the opportunity to apply their new metric system learning quickly.

C. Implications for engineering educators

- The primary emphasis in adult non-engineers learning the metric system is on non-engineer learners learning the metric system rather than on engineering educators teaching the metric system.
- Involvement in such things as problems to be solved, case histories, critical incidents generally offer greater metric system learning opportunity for adult non-engineers than "talking to" them abut the metric system or using other one-way transmittal techniques.

Much more could be written about the engineering educator's improving his teaching of the metric system to the adult non-engineer. On the other hand, many challenges could be issued to what has already been written here. Nevertheless, for the engineering educator desiring to consider some variations and/or improvements on his current practice in teaching the adult non-engineer or better yet, "helping the adult non-engineer learn" the metric system, some food for thought has been offered here and may be probed more deeply in the ensuing bibliography.

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