A HALF CENTURY OF FRONTIERS OF ENGINEERING EDUCATIONAL RESEARCH

William K. LeBold

Abstract---Engineering education has a long history of conducting comprehensive national, regional and institutional studies. Many of those studies have utilized educational research to launch critical educational frontiers. Engineers love of numbers, and problem solving resulted in a wide range of educational studies during the past century! This work in progress paper will review the status of a comprehensive analysis of the various studies and research that have had a significant impact on engineering education.

EARLY STUDIES

The 1905 Flexner Report of medical education had a profound impact on professional education. It was not surprising that engineering education quickly followed with a study of their own. Funded also under a Carnigie foundation grant, the 1915 Mann Report utilized the educational statistical insights of Educational Psychologist Robert Thorndyke to identify the cognitive abilities associated with academic success in engineering; the study also identified the importance of industrial experience that launched cooperative education as one of the early engineering education frontiers. The 1930 Wickenden Investigation of Engineering Education involved input from all U.S. engineering institutions including a critical examination of engineering retention and semester hour loads and launched a new frontier: engineering technician education. The 1940 Hammond study of engineering education gave new impetus to both the technical-scientific and the socio-humanistic phases of engineering education. These frontiers of engineering education studies during the first half of the 20th Century provided the foundation for the golden era of educational research that have dominated the last half century of engineering education.

LAST HALF CENTURY STUDIES

Engineering education played critical roles during WWII by preparing officers for the growing Army (ASTP) the Navy (V-12 & NROTC), and by conducting critical R & D in communications, transportation, munitions and nuclear energy. Collecting data on engineering enrollments and degrees provided important insights into the supply of engineering manpower; opportunities for women and underrepresented minorities; increasing retention among honor, regular, and high-risk students; and measuring the effectiveness of individualized, cooperative and web-based learning. Both national and institutional perspectives on the role of engineering educational research in examining the quality and improvement will be examined. After WWII, two critical studies that had a major impact on the engineering curriculum were the reports of the U.S. Department of Education and the U.S. Department of Labor. The U.S. Department of Education report documented the very large enrollments in engineering that were due in large part to the returning WWII veterans with technical training who were pursuing engineering degrees under the G.I. Bill. The Department of Labor took those data and projected large unemployment of graduating engineering seniors. That shortage never materialized in part because of the Korean War, but also due to the rapid changes that were taking place in industrial practice that were utilizing many of the emerging technologies of WWII. Communications, materials, construction, and transportation industries recognized the importance of the more analytical and scientific methods and created new demands for engineers with stronger backgrounds in these areas. Engineering Deans responded by developing the 1956 Grinter Report on Engineering Education that called for both scientific and professional curricula with a strong emphasis on the engineering sciences. The impact of the Grinter report was far reaching and had very strong influences not only on the curricula, but the faculty, student selection and engineering facilities as well.

Other frontiers of engineering education strongly influencing engineering educational research were the 1958 Burdell Socio-Humanistic Study of Engineering Education, the 1960 Everitt Study of the Utilization of Engineering Faculties, the 1970 Walker Goals of Engineering Education Study, the 1973 Omsted Study of General Education, and the 1985 AAES Study of the Utilization of Engineers. During the late 1990's, ABET's demand for assessment is having a major impact on 21st century engineering education. As a result engineering conferences have brought only an increase in the quantity of engineering educational research studies, but their qualities as well. The internet has had a major impact on the availability and dissemination of educational research.

Each of these studies will be documented and reviewed with special emphasis on their short and long range impact on engineering education as this work in progress proceeds!

1 William K. LeBold, Purdue University, Freshman Engineering, ENAD213, West Lafayette, IN, 47907-1286, lebold@purdue.edu