Appendix D. — A Chronology of Reports on Engineering Education

1918 Publication of the Mann Report, *A Study of Engineering Education,* sponsored by the Society for the Promotion of Engineering Education (SPEE) and funded by the Carnegie Foundation. It urged: return to fundamentals and unify fragmenting curricula; merge theory and practice in coursework; introduce "real work," including "values and costs," into teaching engineering problem solving; retain shop experience, laboratory, industrial training, cooperative and summer work in curriculum; English mastery; link technology to its human and social setting; closer university-industry linkage, especially in research, to improve productivity and thereby national well-being; develop discipline for work and "lifelong" study; select faculty based on teaching ability and work experience, not just research excellence.

1930 Publication of volume 1 of the Wickenden Report, *Report of the Investigation of Engineering Education 1923-1929.*

1934 Publication of volume 2 of the Wickenden Report. It urged a halt to fragmentation of curricula; graduate engineering education and continuing education for 5 years after graduation; forms of technical education other than engineering colleges; functional rather than professional engineering education; design project, including writing, for second and third year students; third year project teaching, fourth year honors option; stronger high school preparation; lifetime learning in cooperation with industry; professional certification by engineering societies independent of State licensing; higher faculty standards; teach engineering method; teach society and values so engineers can understand social impact of engineering.

1939 H.P. Hammond Report for SPEE, *Aims and Scope of the Engineering Curriculum,* recommended: diversification of curricula; parallel technical and humanities/social sciences "stems"; reconsideration of 4-year curriculum and move to 5- or even 6-year program.

1944 H.P. Hammond Report for SPEE Committee on Engineering Education After the War: reaffirmed 1939 report; promoted expanding technician programs to

fill industrial needs then being met, non-optimally, by engineers; and teaching the "art" of engineering as distinct from scientific method.

1955 L.E. Grinter, *Report on the Evaluation of Engineering Education* for American Society for Engineering Education (ASEE). The final report included comments by 122 engineering colleges. It recommended: five "stems" — humanities and social sciences, mathematics and basic science, generic engineering science, engineering specialty subjects, and electives; a two-track undergraduate curriculum, one to immediate employment, the other to graduate study; twin goals for engineering education — technical (analysis and "creative design"; construction, production, operation) and social (ethics, general education, leadership in technological action); improved high school preparation and articulation with admission standards; the integration of graduate education and research-oriented faculty into undergraduate curriculum; requirements for industrial experience and proven teaching ability for tenure; programs for gifted students; improved facilities; dropping shop and upgrading laboratories, retaining a 4-year curriculum but encouraging experimentation; a focus on design; a base curriculum of engineering science, not contemporary engineering practices; the inclusion of social and economic factors in solutions to technological problems; unification of analytical methods in all branches of engineering; and lifelong learning.

1956 Publication of the E.S. Burden Report, complementary to the Grinter Report, *General Education in Engineering — Report of the Commission for the Humanities: Social Research Project* (of the ASEE). Conclusions: more humanities and social sciences needed; rejected fears that this will either weaken engineering education or lead to superficial treatment of humanities and social sciences.

1959 Report to President Eisenhower by Lee DuBridge, Chairman of the President's Science Advisory Committee, *Education for the Age of Science* urged: enhance the image of the teaching profession; improve high school education as preparation for science and engineering careers; reform curricula by unifying it along scientific principles common to engineering specializations, teach relation of engineering to social and governmental problems instead of parallel humanities/social sciences stem; promote the Ph.D. for engineers;

provide special programs for gifted students; expand technical institutes; and retain faculty.

1966 Engineers Joint Council response to *Interim ASEE Goals of Engineering Education* Report: integrate teaching of engineering practice into its social context; focus on fundamentals, not current information; do not standardize curricula or accreditation; increase student-faculty interaction; promote lifetime learning; and expand the role of engineering professional societies in linking education to state-of-the-art practices.

1968 Publication of Final Report of the 5-year ASEE study, *Goals of Engineering Education.* It endorsed the Grinter Report on engineering science as the basis of engineering education. Recommendations: add 1 year of graduate study to basic engineering education; limit prerequisites and open the engineering major to transfers; expand cooperative and interdisciplinary programs; reduce credit hours for graduation; improve teaching of social and economic factors influencing, and influenced by, technology by integrating humanities and social sciences into the engineering curriculum; integrate research and undergraduate teaching; hire faculty with industrial experience, regardless of degrees; expand technician programs; and expand industry funding of engineering research; promote advanced engineering education (Ph.D.), continuing education, lifelong learning, professional registration by faculty. Predictions: M.S. will become the basic engineering degree; fewer programs/institutions; and the increasing use of engineering to solve social problems.

1968 Olmsted Report for ASEE: integrate humanities and social sciences into 4-year programs; improve general education; retain humanities and social science faculty; and reduce the number of electives while retaining breadth.

1975 The Massachusetts Institute of Technology Center for Policy Alternatives Report, J. Herbert Holloman, Chairman, *Future Directions for Engineering Education: System Response to a Changing World,* provoked by a “precipitous decline” in engineering enrollments and America’s global dominance. It noted that engineering education was too responsive to "transient” changes. Recommended: prepare for declining enrollments; restore art of engineering to curriculum by teaching design; require work experience or cooperative

education; integrate humanities and social sciences into engineering curriculum; raise consciousness of "culture" of the sciences as opposed to their techniques; teach social, economic, political and legal constraints on engineering; expand 2- and 4-year technology programs; promote continuing education in engineering rather than management; expand evaluation; promote the engineering major as generic preprofessional training; and use industry more as a resource and sponsor.

1982 *The Quality of Engineering Education*, National Association of State University and Land-Grant Colleges, J. D. Kemper, Chairman. Cited problems of overenrollment, faculty shortages, and serious inadequacies in equipment, space, and facilities; and recommended increased faculty salaries and industry support and government funding to upgrade the infrastructure.

1985 The National Academy of Engineering (NAE) publishes a 9-volume study, *Engineering Education and Practice in the U.S.*, chaired by J.A. Haddad.

1985 NAE report to the National Science Foundation (NSF), New Directions for *Engineering in the NSF*, Peter Likins, Chairman.

1986 National Conference on Engineering Education, convened by the Accreditation Board for Engineering and Technology. Consensus recommendations: update undergraduate engineering education with mathematics concentration in probability, statistics, and numerical analysis; more breadth in basic sciences; expand humanities, social sciences, and communication skills; focus on design, including socioeconomic factors; intensify use of computers; introduce interdisciplinary coursework in real-world problem contexts; set admission standards that obviate need for remediation; strengthen faculty, requiring industrial experience and teaching effectiveness for tenure; continuing education; advisory committee of practicing engineers for each engineering education unit; raise fellowship stipends to one-half industry starting salary to attract U.S. graduate students; tighten the link of engineering education to engineering practice; encourage longer than 4-year curricula but do not mandate them; and increase role for

engineers vis-a-vis executives, economists, and politicians in improving competitiveness.

1986 Final ASEE Report, *Quality in Engineering Education Programs,* W. Edward Lear, Project Director. Cited problems of overenrollment, insufficient and obsolete laboratory equipment, and facilities shortage and deterioration. Recommended: re-emphasize production along with research; make industrial experience and effective teaching conditions of tenure; require test of spoken English for teaching assistants; institute structured continuing faculty education; implement computers and other new educational technologies; expand production of technicians; and improve laboratory teaching, assigning senior faculty to it.

1986 *The Quality of Engineering Education II,* followup to 1982 report, James E. A. John, Chairman. Recommended: promote U.S. citizen graduate study by raising fellowship stipends to one-half industry starting salary; fund large scale facilities improvement and maintenance; retain Ph.D. faculty with a healthy campus research environment; and produce more technicians.

1986 National Academy of Engineering, *The Impact of Defense Spending on Nondefense Engineering Labor Markets.*

1986 *Engineering College Research and Graduate Study: A 20 Year Statistical Analysis,* W.J. Fabricky, J.E. Osbourne and R.C. Woods.

1987 ASEE Report, *A National Action Agenda for Engineering Education,* E. E David, Chairman. Its eight recommendations: scale back the 4–year, necessarily limited curriculum to prepare for continuing education; make graduate education more practice-oriented; re-emphasize engineering design and manufacturing; improve undergraduate laboratories; attract more and better U.S. graduate students and faculty with higher salaries and research funding; bolster faculty development; support career-long education; and improve precollege mathematics and science education and introduction to engineering careers.

SOURCE: Steven L. Goldman, "The History of Engineering Education: Perennial Issues in the Supply and Training of Talent," OTA contractor report, 1987.