Diversity: The Role of International Students as the New Global Prerequisite

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Abstract

A study completed by the Western Interstate Commission for Higher Education in July 1998, forecasts more diversity in high school graduates while other studies have shown that students learn more effectively working in teams than they do independently. A review of the Society of Manufacturing Engineers, Manufacturing Education Plan, clearly outlines integrative academic components in which the following emerging skills were identified: Personal attributes (values), communication and teamwork skills.

The new global climate in which we live, the rapid development and emergence of advanced technology, communication systems, and social and cultural diversity are all exhilarating opportunities for not only the students but also the educators. The continuing demand and search for teamwork, and multicultural diversity are at the heart of the emerging engineering curriculum. As the global economy, at a rapid rate continues to change, organizations are training their workforce on adaptability, communication and cultural diversity skills to become more successful. The role of international students and their cultural diversity and values has an important and central place in engineering education and their future.

The following topics will be explored:

An analysis of identified needs, cultural diversity and values;
The role of international students in cultural understanding; and
Future needs.

An analysis of identified needs, cultural diversity and values:

The new millennium introduces challenging experiences for all students and educators including those in engineering. The multicultural environments of the global marketplace, continuing development of advanced technology, and communication systems will prompt more demanding and rewarding opportunities where industries and businesses are in need of graduates who could ensure economic development and enhanced competitiveness. Recent findings suggest that organizations make clear a desire for teamwork and self-skills above knowledge, degree classification, and reputation of the institution the graduate attended [1].

There is no question that advances in technology are changing the workforce, and the American engineers who no longer work independently, must change with it. Employers are looking for more quality-minded and customer-oriented employees who can complete multiple assignments

while working with self-managed work teams. "I think America is starting to understand the world is becoming smaller with everybody becoming more global. It used to be that we could just speak our language and do what we wanted ... it is not really cutting it anymore" says Stewart the co-founder of the CGM's consultants [2].

The question remains what is engineering or engineering education? Engineering is characterized as introductory education to gain entry into an occupation, which demands a degree of higher learning. While for many years the engineering schools have trained some of the best specialized engineering professionals, the industrial complex's needs have and continue to change [3]. Therefore, engineering is not simply design and mathematical analysis, even though these skills are important, there is an urgent need for diversity in science, engineering, and technology education.

The role of international students in cultural understanding:

First, what do culture and diversity mean? Webster defines culture as "acquaintance with and taste in fine art, humanities, and broad aspects of science as distinguished from vocational and technical skills" and diversity as "the condition of being different, an instance or a point of difference" [4]. Furthermore, Schein defines culture as a type of mutual fundamental premise that people learned as they resolved their problems of adaptation and integration [5]. And yet, Jiang asserts that "It is human common property and the relationship between higher education and corporations also is more important now than at any other time in history [6]." As such, there is a much-desired relation between these descriptions and engineering education, and the skills needed by engineering students. Indeed, the trust of higher education has been, and continues to be, to contribute to society by advancing the growth of students and by preparing them for public responsibilities and the world of work. In fact, while higher education has the responsibility to contribute to the global economy, the accelerating change in our society and the need to prepare for importance of varying cultural learning is becoming of higher standards.

There have been a number of research projects on the issue of diversity with regards to gender and underrepresented groups. Other studies have shown that students learn more effectively by working in teams than they do independently [7]. The United States continues to encounter more demand for higher education as the number of high school graduates will increase to 3.2 million in the 21st century, according to a study completed by the Western Interstate Commission for Higher Education (WICHE) and the College Board. However, and perhaps more importantly, the research predicts that the culture of high school graduates will also change drastically (table 1). As a result, institutions will encounter a significant push to grant entry to higher education to the increasing racial and ethnic diversity of students in every state [8]. In addition to cultural changes in the US, the demographics of the foreign students also continue to change (table 2).

Smith states that engineering is the practice of science and mathematics to a given problem. This means that engineers have been trained to solve problems in a systematic fashion [9]. Wenk argues that "if engineering is to be practiced as a profession, and not just a technical craft, engineers must learn to harmonize natural sciences with human values and social organization [10]." Therefore, these current and future prerequisites can only be accomplished by way of major

changes, as well as the incorporation of communication and social studies components. A review of the Society of Manufacturing Engineers' (SME) Manufacturing Education Plan clearly outlines integrative and flexible academic components in which communication, teamwork, personal attributes were identified, as emerging skill needs [11].

Much of the earliest analysis of culture seemed to be limited by anthropologists' point of view. Psychologists launched later studies, which was then followed by sociologists and educators in business. The relevance of such studies, however, has become more clear recently [12]. The role of culture in learning has been an argument in research for more than 50 years in the area of pre-school, elementary and secondary schools, according to a ("Cultural Context") report [13]. Much of the early research on the role of culture in learning assumed that human developed occurred in a sequential order. This is particularly true of cognitive and sensorimotor development skills. Contrary to these findings, the researchers' had not considered factors related to the differing culture of the groups in question. As adjustments were made in the methodologies used, to take into consideration different cultures, a diversity of paths were revealed which helped to explain how children achieved developmental milestones (Cole, 1992 and Cole & Bruner, 1971 as cited in Cultural Diversity and Early Education) [13].

According to Allen, the top characteristics employers seek in job candidates include honesty and integrity (values), communication, interpersonal, and teamwork skills among others [14]. Although interest in engineering education has been the theme of many commentaries for sometime, the objective of engineering education is to not only advance technological skills but also interpersonal, and social-technical competencies in engineering students [15]. Smith maintains that the choice of cooperative learning is the most practical method for advocating learning and teamwork skills in which students work together to achieve a mutual goal [16].

Businesses continue to trade across all boundaries, unlike students and educators who are/were typically based in a certain community with certain values. However, with advances in technology, telecommunication, Internet, and distance education such stability is no longer true. Continued advancement in technology guarantees to transform the way we teach more than any other dominance in the past hundred years. Moreover, led by the successes of global communication, the competitive environment has perhaps become unpredictable to the point that challenges the even well run organizations [17]. No longer do engineers work independently, and employers are looking for more quality-minded and customer-oriented work teams. Most research shows that when the learner is actively involved in acquiring knowledge, the acquisition occurs much more rapidly and is more effectively retained. Therefore, how seriously should educators take the training of social, ethical, human values, and communication skills? Perhaps one answer would be the inclusion of cultural diversity that is brought into the classroom by international students.

Cultural diversity is the beginning of prosperity in society. It is the notion that differences can provide for strength and pluralism, rather than weakness and insularity. The differences found in society, due to cultural diversity, is more inclined to provide the essence for trust and perseverance.

Future needs:

"I had a limited education, as I have only gradually come to understand. In the 1940s and 1950s I attended respected urban public schools, then studied at Radcliffe, Harvard, and the University of Minnesota. None was formally segregated, but none offered a diverse faculty or student body, and all had curricula focused on European and European-American intellectual traditions and history." writes Gudeman [18].

Although after fifty years, the cultural diversity has reached scholarly support [19], faculty have rarely instituted the distinct attributes and characters of the student into their agenda and instruction routine [20]. Sixty-nine per cent of American constituents nourish courses and campus activities that educate students with regard to cultural diversity, according to a poll by the Daniel Yankelovich Group (DYG Inc.) an independent polling firm. DYG, in their poll, defined diversity education as "formal course work and campus activities aimed at teaching the differences among people in terms of cultural background such as issues of race, ethnic background, social class, and gender" [21].

Cultural diversity has virtually become a reality of life in all societies, and higher education can play an important part in shaping future global engineers. Although higher education has been given some attention lately, the accentuation has been essentially on application of technology. It can be debated that a better balance in higher education curricula is needed, to reflect the skills required by the employers of engineers.

What we need is rethinking of the system and the planning of new curricula, in fact the entire educational system. Then it should include a plan of re-evaluation of teaching that includes issues such as cultural diversity. To achieve this, teams consisting of faculty members from different backgrounds, including social and humanities areas, to work cooperatively together in development of the new curriculum. The courses could perhaps be modularized, and in addition to performing technical activities, each team will have to prepare a list of activities and outcomes that would provide answers to these important issues. In conclusion, attaining diversity on campuses will ensure the culture of educational experience, enriches individual or personal growth, empowers society and workplace, and enhances economic competitiveness.

Table 1
Proportion of 18-to-24-Year-Olds Enrolled in College by
High-School-graduation Status and Race, 1986 to 1996

	All		White		Black		Hispanic	
	All	H.S. Graduates	All	H.S. Graduates	All	H.S. Graduates	All	H.S. Graduates
1986	28.2%	34.3%	28.6%	34.5%	22.2%	29.1%	18.2%	30.4%
1987	29.6%	36.4%	30.2%	36.6%	22.8%	30.0%	17.6%	28.5%
1988	30.3%	37.3%	31.3%	38.1%	21.1%	28.1%	17.0%	30.9%
1989	30.9%	38.1%	31.8%	38.8%	23.5%	30.8%	16.1%	28.7%
1990	32.0%	39.1%	32.5%	39.4%	25.4%	33.0%	15.8%	29.0%
1991	33.3%	41.1%	34.1%	41.7%	23.6%	31.5%	18.0%	34.4%
1992	34.4%	41.9%	35.2%	42.2%	25.2%	33.8%	21.3%	37.1%
1993	33.8%	41.4%	34.5%	41.6%	24.5%	32.7%	21.6%	35.5%
1994	34.6%	42.4%	35.3%	42.7%	27.3%	35.5%	18.8%	33.2%
1995	34.3%	42.4%	35.3%	43.1%	27.3%	35.4%	20.7%	35.3%
1996	35.5%	43.5%	36.2%	44.0%	27.0%	35.9%	20.1%	35.0%

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Table 2
Foreign Students' Countries of Origin, 1996-97

Country or Territory	Students	1-Year Change	Country or Territory	Students	1-Year Change
Japan	46292	1.7%	Israel	2507	-4.9%
China	42503	7.3%	Argentina	2275	4.9%
Rep. Of Korea	37130	2.5%	Norway	2268	1.0%
India	30641	-3.5%	Trinidad/Tobago	2223	6.5%
Taiwan	30487	-6.8%	Australia	2206	-1.7%
Canada	22984	-0.1%	Peru	2205	-1.8%
Malaysia	14528	3.7%	Nigeria	2184	4.3%
Thailand	13481	10.8%	UAE	2133	-4.5%
Indonesia	12461	-2.8%	Iran	2129	-19.0%
Hong Kong	10942	-9.0%	Jordan	2094	-5.8%
Germany	8990	-0.3%	Bahamas	2060	23.6%
Mexico	8975	3.3%	Netherlands	1883	-2.2%
Turkey	8194	6.7%	South Africa	1851	-2.0%
United Kingdom	7357	-5.7%	Switzerland	1850	10.4%
Russia	6199	10.9%	Sri Lanka	1816	-6.9%
Brazil	6168	12.2%	Cyprus	1806	-0.7%
Pakistan	6095	-5.2%	Bulgaria	1805	13.7%
France	5692	-0.3%	Poland	1707	-2.1%
Spain	4673	-2.8%	Romania	1669	14.6%
Venezuela	4590	3.0%	Egypt	1540	3.4%
Saudi Arabia	4264	1.7%	Ecuador	1516	0.9%
Sweden	4096	5.3%	Yugoslavia*	1419	-11.0%
Singapore	3727	-9.1%	Nepal	1400	14.8%
Kenya	3723	26.9%	Lebanon	1370	-11.8%
Colombia	3636	5.0%	Ghana	1327	11.7%
Bangladesh	3462	3.0%	Ukraine	1305	7.4%
Jamaica	3357	14.1%	Panama	1286	-5.9%
Greece	3010	-10.5%	Ethiopia	1160	-12.7%
Kuwait	2924	-3.7%	Morocco	1053	6.8%
Philippines	2796	-10.6%	Denmark	1006	4.4%

Note: Includes only countries with more than 1000 students in U.S. institutions. (*) Former Yugoslavia.

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