

# Contemporary Issues Held By Undergraduate Engineering Students

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**Abstract** – *The Accreditation Board for Engineering and Technology (ABET) has ruled that students should have a knowledge of contemporary issues. Therefore, every student should pursue knowledge of global contemporary and past information regarding various engineering issues. This paper presents the level of understanding of typical contemporary issues held by undergraduate engineering students. It has been written that currently engineering students are prepared for jobs that don't yet exist using technologies that haven't yet been invented in order to solve problems we don't even know we have. In addition changes are needed in engineering education to address the 3Ns: numbers, needs, and new knowledge. Case studies may also be utilized, since they may be categorized as recent history: incidents that remain fresh in the minds of professionals. It is important to introduce various case studies in the class room as they will help students to gain knowledge on contemporary issues. There also is a need for professionals to make changes in the practice of engineering. It is known that expertise is required in numerous fields to effectively manage a project. The expertise depends, in part, on knowledge and experience with contemporary engineering issues. The findings show a lack of knowledge of certain engineering issues by some students that may, if important, affect their future professional career.*

**Index Terms** – *Accreditation, Contemporary Issues, Engineering Undergraduates, Global Knowledge.*

## INTRODUCTION

The present educational system was generally developed in the 1950s and was suitable for that time. Today, engineering programs should be conducted on a global scale with industrial practice activities heavily required along with team work projects. Therefore, engineering students may be enrolled in programs that need fundamental changes. There also is a need for professionals to make changes in the practice of engineering. The 1986 failure of the space shuttle Challenger has become a classic example, of the conflict between engineers and managers providing the kind of dramatic tension that assists students to remember the facts and issues. It may be stated that design is a timeless endeavor and failure an ageless problem.

In order to introduce the required ABET criteria concerning knowledge of engineering and contemporary issues; the senior seminar was revised to include a section on this subject area. A questionnaire distributed to both graduate and the undergraduate classes was designed to measure student perceptions of various engineering and ethical issues. This knowledge of contemporary issues held by engineering students could prove to be beneficial to them as they graduate and become employed by organizations.

## FINDINGS

Tabular results of the study are found in Tables 1 and 2. Different findings are shown below:

Question No. 1: President Obama wrote a letter during Engineers Week from the White House addressed to all engineers. Roughly, what did it say?

Overview: President Obama requested engineers to assist in making the world a better place to live. Incorrect responses for these questions were: “To continue studies since there are no jobs” and “CEs are needed for work.” In this case 52% of the students answered this question correctly [1].

Question No. 2: The Stimulus Bill passed by Congress should help civil engineers. What was its approximate funding level?

Overview: The approximate funding amount of the Stimulus Bill passed by Congress is \$787 Billion. The bill includes an estimated \$130 billion in spending for construction programs as well as tax incentives that also will give the industry a

boost. Roughly 39% of the students answered this most important question correctly. Typically, incorrect answers were 27 billion, 100 billion, 8 trillion, 3 trillion, 5 million etc. [2].

Question No. 3: According to a recent study, estimate the average salary offer to civil engineers graduating with a bachelor's degree?

Overview: The average salary offered to civil engineers graduating with a bachelor's degree is approximately \$50,000. About 78.4% of the students answered correctly. Incorrect responses were \$32,000 or \$40,000. Salary.com states "The median expected salary for a typical new Civil Engineer in the United States is \$53,712". The same results were quoted by payscale.com [3] – [4].

Question No. 4: Does the EEOC approve of an English only language requirement for consulting engineers? (Yes or No)

Overview: EEOC does not require an English only language requirement for consulting engineers. It can only be approved in a case such as a hospital operating room. The EEOC views English-only rules as creating an intimidating and isolating work atmosphere for minorities. Even so, it recognizes that there are some jobs in which business needs justify the use of one language by all employees. Such needs, however, must truly rise to the level of a business necessity. The EEOC will give special consideration to situations where safety or cooperative job performance requires all employees to communicate efficiently and effectively with one another, i.e. an emergency room at a hospital. About 65% of the students answered this question correctly [5] – [6].

Question No. 5: Research findings indicate that engineers are among the most frequent cheaters during their college career. Which group has the highest rate of cheating?

Overview: Research has shown that engineering students are among the most frequent cheaters (82%), second only to business majors (91%). At least 61% of the students were correct [7].

Question No. 6: A national magazine illustrated roughly 13 individuals who are responsible for the economic problems in the U.S. Name one person.

Overview: Time magazine illustrated roughly 13 people who are responsible for the economic problems in the U.S.. They include: Alan Greenspan, Angelo Mozilo, Phil Gramm, Chris Cox, Hank Paulson, Joe Cassano, Ian McCarthy, Frank Raines, Kathleen Corbet, Dick Fuld, Marion and Herb Sandler and Bill Clinton. Many of the students answered that George W. Bush is one of the persons who were responsible for the economic crisis in the U.S. Nevertheless, approximately 65% of the students answered this question correctly [8].

Question No. 7: Name one country that is controlled by a dictatorship that limits human rights.

Overview: Zimbabwe, Burma, Saudi Arabia, Iran, Eritrea, Turkmenistan, Libya, Pakistan, Cuba, North Korea, Sudan, Iraq, and Afghanistan are the countries which are controlled by a dictatorship. The incorrect answer of many students was "Germany." 91% of students were correct in this case [9].

Question No. 8: What was the Morrill Act?

Overview: The Morrill Act provided funds to establish engineering schools and agricultural programs. Individuals Ambrose, at this time concluded that under General Thayer, West Point was turning out better engineers than soldiers. By 1860 "nearly all the great public works of the country had been directed by its graduates; and they were the pioneers in the construction of railroads and the great scientific works of the government." Nobody answered this question correctly [10].

Question No. 9: Walter P. Moore, a Houston consulting firm, won an award for interior design. What other award did the company recently receive?

Overview: Walter P. Moore, a Houston consulting firm, won an award for interior design. This firm was also named the "best firm for civil engineers to work in." Exactly, 4.35% of the undergraduate students were correct [11].

Question No. 10: The U.S. Federal Government does not collect enough taxes to pay for its operation. For the next budget, determine the % debt.

Overview: The U.S. Federal Government does not collect enough taxes to pay for its operation. For the next budget cycle the debt may be 75%. Roughly 17% responded correctly and incorrect answers were 7%, 10% and 25% [12].

Question No. 11: ASCE has rated the U.S. infrastructure. What is its infrastructure GPA?

Overview: The GPA of the U.S. infrastructure is "D", while the GPA for the Texas Infrastructure is "C-." Here, approximately 30% of the undergraduate students were correct [13].

Question No. 12: According to NTSB, why did the I 35-W bridge in Minneapolis collapse?

Overview: The bridge in Minneapolis collapsed because the design of the gusset plates. NTSB safety report says “The investigation discovered that the original design process led to a serious error in sizing of some of the gusset plates in the main trusses. Engineers working in the investigation used generally accepted calculation methodologies to determine the stresses in these gusset plates. Their results indicate that some of the gusset plates were undersized and did not provide the margin of safety expected in a properly designed bridge. These undersized gusset plates were found at 8 (of the 112) nodes on the main trusses of the bridge. These gusset plates were roughly half the thickness required.” At least 52% of the students were correct in this case [14].

Question No. 13: Are floods "Act of God" or "Act of Men"?

Overview: Floods are the “Acts of God”, but flood losses are largely “Acts of Men.” 26% of the students answered correctly [15].

Question No. 14: Name the certification level that Shangri la in Southeast Texas received from the U.S. Green Building council.

Overview: Shangri La Park received a “Platinum” certification from the U.S. Green Building council. Roughly 52% of students answered this question correctly [16].

Question No. 15: What material is used to construct the boardwalk at Shangri La?

Overview: The boardwalk is made from recycled plastic and wood at Shangri La Park. Approximately 43% of the students were correct [17].

Question No. 16: An organization has stated that its members should "listen to what science has to offer" and not "ignore scientific reason." Name the organization.

Overview: Roman Catholic Church has stated that its members should “listen to what science has to offer” and not “ignore scientific reason.” The incorrect answers included “ASCE”. 17.39% of the students answered this question correctly [18].

Question No. 17: Define QBS.

Overview: QBS means “Quality based Selection.” Roughly 17% of the students answered this question correctly [19].

Question No. 18: Which country owns the most "U.S. Debt"?

Overview: China owns about 24.07% of the U.S. debt, the most of any country. Approximately 61% of the students were correct [20].

Question No. 19: Halliburton and KBR have agreed to pay \$579 million in fines. Why?

Overview: Halliburton and KBR have agreed to pay \$579 million in fines related to allegations of foreign bribery, the biggest ever paid by U.S. companies in a foreign corruption case. This involved a joint venture that spent \$182 million to bribe Nigerian government officials over a 10-year period to win more than \$6 billion in construction contracts. Approximately 35% of the students answered this question correctly [21].

Question No. 20: The American Recovery and Reinvestment Act (Stimulus Bill) allocated \$27.5 billion for a specific Civil Engineers Area. Name that Area.

Overview: The American Recovery and Reinvestment Act (Stimulus Bill) allocated \$27.5 billion for Roads and Bridges. About 48% of the students were correct [22].

Question No	Question	Total Persons Answered		Answered Correctly from Persons Answered		Answered Correctly from Total Persons	
		No	%	No	%	No	%
1	President Obama wrote a letter during Engineers Week from the White House addressed to all engineers. Roughly, what did it say?	18	78.26	12	66.67	12	52.17
2	The Stimulus Bill passed by Congress should help civil engineers. What was its approximate funding level?	21	91.30	9	42.86	9	39.13
3	According to a recent study, estimate the average salary offer to civil engineers graduating with a bachelor's	23	100.00	18	78.26	18	78.26

	degree?						
4	Does the EEOC approve of an English only language requirement for consulting engineers? (Yes or No)	23	100.00	15	65.22	15	65.22
5	Research findings indicate that engineers are among the most frequent cheaters during their college career. Which group has the highest rate of cheating?	23	100.00	14	60.87	14	60.87
6	A national magazine illustrated roughly 13 individuals who are responsible for the economic problems in the U.S.. Name one person.	21	91.30	15	71.43	15	65.22
7	Name one country that is controlled by a dictatorship that limits human rights.	21	91.30	21	100.00	21	91.30
8	What was the Morrill Act?	2	8.70	0	0.00	0	0.00
9	Walter P. Moore, a Houston consulting firm, won an award for interior design. What other award did the company recently receive?	13	56.52	1	7.69	1	4.35
10	The U.S. Federal Government Does not collect enough taxes pay for its operation. For the next budget, determine the % debt.	18	78.26	4	22.22	4	17.39
11	ASCE has rated the U.S. infrastructure. What is its infrastructure GPA?	21	91.30	7	33.33	7	30.43
12	According to NTSB, why did the I 35 - W bridge in Minneapolis collapse?	21	91.30	12	57.14	12	52.17
13	Are floods "Act of God" or "Act of Men"?	23	100.00	6	26.09	6	26.09
14	Name the certification level that Shangri la in Southeast Texas received from the U.S. Green Building council.	17	73.91	12	70.59	12	52.17
15	What material is used to construct the boardwalk at Shangri La?	18	78.26	10	55.56	10	43.48
16	An organization has stated that its members should "listen to what science has to offer" and not "ignore scientific reason". Name the organization.	11	47.83	4	36.36	4	17.39
17	Define QBS.	9	39.13	4	44.44	4	17.39
18	Which country owns the most "U.S. Debt"?	18	78.26	14	77.78	14	60.87
19	Halliburton and KBR have agreed to pay \$579 million in fines. Why?	17	73.91	8	47.06	8	34.78
20	The American Recovery and Reinvestment Sect (Stimulus Bill) allocated \$27.5 billion for a specific Civil Engineers Area. Name that Area.	20	86.96	11	55.00	11	47.83

TABLE 1 RESPONSES OF THE UNDERGRADUATE STUDENTS

#### SUMMARY AND CONCLUSION

In the department of Civil Engineering most of the undergraduate students are local students. Results indicate that some of the undergraduate students are more aware of these issues than other students. This concept is illustrated in the Table

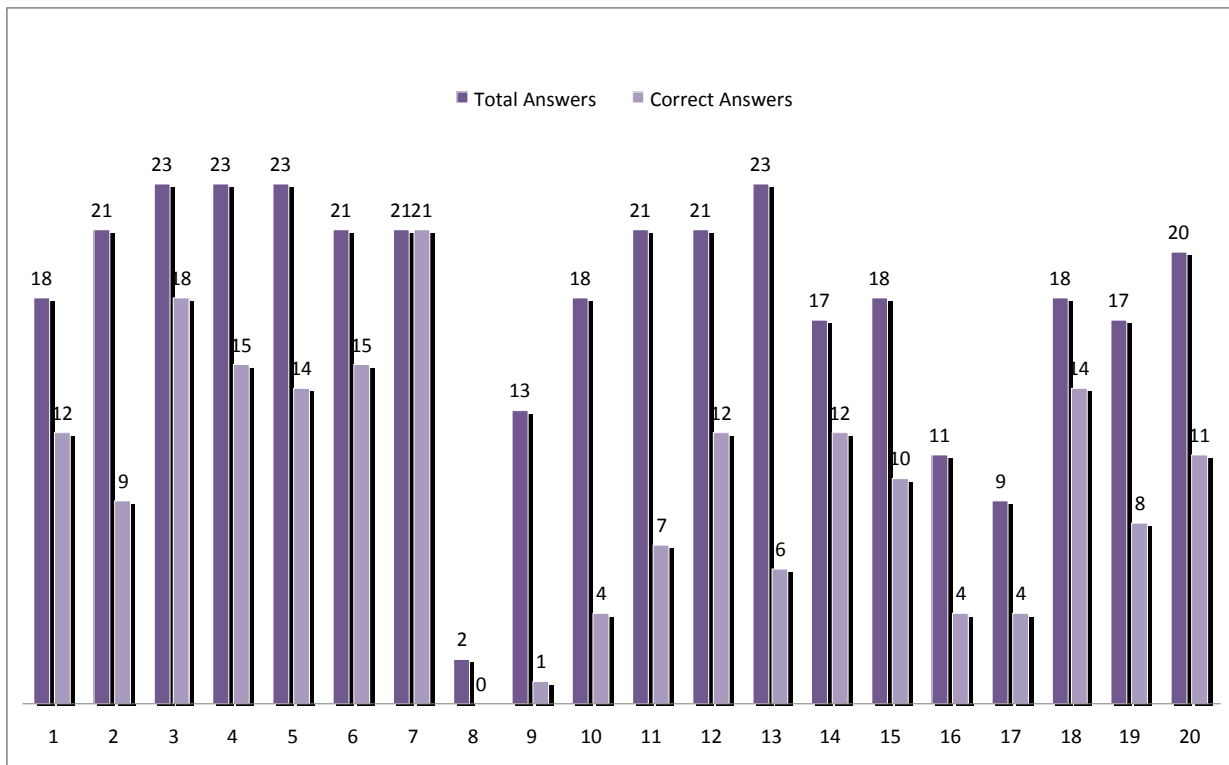


TABLE 2 BAR CHART

2. Most likely, the lack of knowledge of contemporary issues may cause a problem during the professional career of the students.

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