New Orleans JAZZED about Engineering Education

Paper ID #14400

Teaching Ethics For Construction Management Majored Students: Standalone Or Micro-Insert? - Globalization and Sustainability Considerations

Dr. George C. Wang, East Carolina University

Dr. George Wang had worked in the industry for 15 years prior to coming back to academia. He has broad research interests including infrastructure construction engineering and management, ethics education in engineering and construction, risk management in construction, environmental and energy aspects in constructed facilities, nontraditional materials utilization in construction, concrete and asphalt technology. He has managed numerous international construction projects in different countries, and conducted many research projects funded by federal, state/provincial governments and industries. He is an international training expert hired by the World Bank Group, Washington DC, and a visiting professor at several universities. He is the sole author of the new book, entitled "The Utilization of Slag in Civil Infrastructure Construction", published by Elsevier in 2016.

Prof. John St James Stewart Buckeridge, RMIT University

John Buckeridge, PhD, CP (Env) FGS is Professor of Natural Resources Engineering at RMIT University, Melbourne, Australia, where he maintains wide international involvement in the environment and ethics. He is on the Executive Board of the International Council for Science, Immediate Past President of the International Union of Biological Sciences, President Emeritus of the International Society of Zoological Sciences, Chair of the International Union of Biological Sciences Ethics Commission, Honorarprofessor of Engineering Ethics at Wismar University of Business, Technology and Design (Germany) and Honorary Member of the Hungarian Academy of Sciences.

Teaching Ethics for Construction Management Majored Students: Standalone or Micro-insert? – Globalization and Sustainability Considerations

George C. Wang
College of Engineering and Technology
East Carolina University
Greenville, North Carolina, USA

John S. Buckeridge
School of Engineering
RMIT University
Melbourne, Victoria, Australia

Abstract

Ethical decision-making is central to the practice of construction management. This is no more evident than in the twenty-first century, when the construction industry must function in very diverse organizational contexts. While construction companies pursue projects in international markets, many investors are buying or forming joint ventures with domestic companies. New and varied professional attitudes have recently arrived in western markets because construction companies are increasingly employing managers from developing nations to undertake commercial and infrastructure engineering projects. The construction industry, in both developing and developed countries, is vulnerable to unethical behavior or corruption – vulnerability in part because of differences in culture and managerial systems across countries; and this diversity is manifest in the different perspectives of professional ethics and professional practice. On the other hand, the incorporation of sustainability principles in natural resources, environmental management, the economy and adoption of a "reduce, reuse and recycle" philosophy in construction and constructed facilities are clear imperatives. Our contention is that construction management students must be fully cognizant of these imperatives. However ethics education for most construction management students currently lacks global and sustainability components, and, further, curricula only require "micro-inserts" of ethics teaching without any systematic or standalone course for professional education. This is contrast to engineering programs, such as civil, environmental, and computer engineering. This paper discusses the nature of the construction industry, globalized trends, sustainable development and confirms the necessity for integrating ethics education into the curriculum – in anticipation that this will ensure the highest level of professionalism when construction management students graduate.

1. The nature of construction industry, trends and changes

The construction industry is currently one of the largest industries in western democracies. In the United States, it is on a par with education and health and along with associated investment and service industries, it contributes about 9% of the US Gross Domestic Product (GDP) and employs more than 10 million workers. Australia has a similar profile, where the construction industry contributes to 8% of the GDP and employs more than a million people – about 9% of the total workforce[1].

Modern construction spans design, new construction, rehabilitation, renovation, maintenance of constructed facilities, manufacture and supply of building and construction materials and equipment through to demolition. Prediction shows that from 2010 to 2020 there will be an annual growth rate of 2.9% in construction related jobs in the US, making this the largest increase in employment among all industries. Estimations also show that the construction industry will experience one of the largest increases in real output by 2020, rising from just over $830 billion, to reach almost $1.2 trillion per year. Investment in the non-residential market is expected to grow 3.2 % per year, with residential investment projected to grow at 7.0 % per year[2,3].

Technically, sectors in modern construction can be divided into building (vertical) construction and infrastructure (horizontal or heavy civil) construction. Building construction focuses on homes, schools, hospitals, sky scrapers and shopping centers; while civil infrastructure construction builds highways, bridges, airports, harbors, dams, pipelines, water treatment facilities, power plants etc. From a market point of view, the major types of construction projects can be classified into commercial, industrial, infrastructure, institutional and residential.

Since the 1980s, along with the development of new technology, sustainability requirements, and managerial methods, constructed facilities and construction management are becoming increasingly complex from both technical and managerial perspectives. A single construction project may involve a wide diversity of professionals and skilled workers, including engineers, architects, general contractors and multitudes of subcontractors, numerous manufacturers and suppliers. For a construction project, it is normal to have several thousand, or tens of thousands of activities which need to be carefully planned and coordinated and this involves managing quality, costs, schedules, safety, resources, and more importantly, personnel and reputations. Those who are in the construction industry may undertake projects for both private and public interests. The industry also interacts with multiple facets of government at the federal, state and local level. Engineers and contractors will be intimately involved in the designs, amendment of technical drawings, selection of construction materials and construction methods.

The complexity of the construction industry has made it a high risk, volatile business, such that only those companies of proven competence, reliability and demonstrated integrity are likely to survive over time. Modern construction projects are more difficult to manage because each project is unique by nature, involving many skills that are non-repetitive and do not lend themselves to assembly type production – and they are dependent upon environmental and natural conditions which are often beyond the contractor's control. Construction managers face

many professional and social dilemmas that require effective (and sensitive) economic, engineering, ethical and environmental resolution during the construction process; in particular, these conundrums have arisen following globalization of the construction market. Two decades ago, international construction projects were conducted in developing countries by companies from developed countries[4]. However, in more recent years, there has been a dramatic change in the international construction market. Construction companies, foreign engineers and project managers from developing countries are now entering developed countries in significant numbers. In this rapidly changing, globalized construction market there are increasing opportunities for unethical and corrupt management – where the end justifies a means that would otherwise have been inappropriate[5].

In the market side, there are currently about 730,000 construction companies among some 27 million businesses in the US, where 90 % have less than 20 employees[6]. Over 80 % of all construction companies in the US are small firms that gross less than $500,000 annually. For every 1,000 firms in operation, 110-130 enter the field each year, with a similar number leaving – the highest rates of entry and leaving of all industries in the US. This will be the trend in the next decades or so. Whether large or small, specialized or general, success depends on the ability to manage personnel, cash flow, and safety; control costs, finance work, estimate, and schedule; and maintain an effective quality control system. For the contractor, technical competence alone does not ensure profit, as competition is intense. In the last decade or two, domestic contractors and suppliers from time to time have to compete with competitors from foreign companies. For a commercial project, a typical gross profit is approximately 5%; after home office overhead the profit is reduced to 2-3 %.

2. The globalization trend and its impact on the construction industry

Globalization refers to the increasingly international relationships of culture, people and economic activity. It has arisen due to a number of factors, with important drivers being ease of travel, ease of communication, improving education (internationally) and demographic changes in western democracies (the last is a function of a low or negative population growth, with the commensurate decrease in the local labor force). But it also refers to economics: the global distribution of the production of goods and services through the reduction of barriers to international trade such as tariffs, export fees, and import quotas. Globalization contributes to economic growth in developed and developing countries through increased specialization and the principle of comparative advantage. It can also refer to the transnational circulation of ideas, languages and popular culture.

For many centuries, construction had been traditionally conducted by local constructors; construction materials and equipment had been supplied locally. Rapid globalization has changed this dramatically. In order to survive, construction companies must seek work or pursue projects on the international market. Even in some traditionally domestic areas, engineers and managers have to consider global factors, such as environmental change that demonstrably impacts regions rather than individual countries. In the construction industry, foreign engineers, designers, and project managers may come to the US and Australia to build the nation's infrastructure facilities. Meanwhile, foreign investors are buying or forming joint ventures with

domestic companies. Engineers and project managers are increasingly selecting materials or equipment designed and manufactured by foreign countries for construction projects and this will affect every aspect of public welfare and safety.

It is not uncommon for the US and Australian contractors to find themselves bidding against foreign contractors on domestic projects. For example, Chinese construction companies started the Alexander-Hamilton bridge renovation project, the largest single-phase project for the New York Department of Transportation[7], and are building the new Bay Bridge span in California[8]. In 2014 the China Communications Construction Company (CCCC), purchased the Australian construction company John Holland for $1.15 billion[9]. CCCC specializes in large projects such as bridges, ports and high-speed rail networks. It is the first Chinese company of its size to operate in Australia and with a market capitalization of $23.5 billion, is the fourth largest construction group in the world. In addition, CCCC is owned by the Chinese government, which in turn places another level of complexity on its operations in Australia. Construction companies are also forming joint ventures like the American/Nigerian gas-to-liquids plant contract in the Niger Delta. Thus even if they work in their own country, engineers, managers and professionals in the US and Australia need international knowledge, experience, or awareness of a professional code and practice of conduct and ethics to work with international partners. Globalization's benefits have been stated, but there are costs, including how agencies and organizations monitor and assess the professional licensure and registration for foreign engineers and managers who work for US companies in the US or overseas.

3. Professional issues in construction market

The construction industry is oft perceived as being full of good, down-to-earth, honest people[10]. Construction professionals and workers have designed and built remarkable infrastructure, commercial and residential structures globally and have laid the foundations of modern society. However, a globalized and competitive construction market has had some less than desirable side effects.

Every year, the Consumer Federation of America and the North American Consumer Protection Investigators collect and analyze consumer complaints gathered from local agencies, to better understand macro-level consumer trends. In July 2012, feedback from thirty agencies from across the United States ranked the construction industry as “number three” for complaints of “shoddy work, failure to start or complete the job”[11].

In general, the construction industry has a reputation for delays, industrial disputes and late payment, threatening the finances of contractors, subcontractors, funders and clients. One of the most expensive cost overruns was that of the Sydney Opera House, which although budgeted at $7 million, cost more than $100 million and took more than a decade to complete, ending with a cost blowout of 1400 %[12]. Yet the reputation of any credible player in the construction industry is a key determinant of the quality of work they win, and the terms on which they can do business. Construction company reputation management is thus a critical business issue.

The rapidity of change in the construction industry has made it one of the most vulnerable areas for unethical, unprofessional and corrupt behavior. But it is also vulnerable because investment in construction is often very large with many participants and complicated processes and regulations.

And it is not just in the US where these issues arise: studies of construction practitioners in Australia, South Africa and the UK also highlight significant and rising amounts of corruption[13]. Construction professionals in South Africa, especially contractors, have reputations for unethical behavior such as collusion, bribery, negligence, fraud, dishonesty and unfair tendering practices over-claiming withholding payment for service delivered[14].

The Global Corruption Report 2008[15] states that the World Bank estimates that 20-40 % of investments in the water sector were lost as a result of corruption. It is not uncommon to find those unethical and unprofessional cases in the industry: in 2008 Siemens AG of Germany agreed to pay $800 million in fines to the US government to settle investigations involving alleged payments to government officials around the world to win infrastructure contracts; in 2008 Halliburton agreed to pay fines of $559 million to the US government to settle charges on bribes allegedly paid by its subsidiary, Kellogg, Brown and Root, for the construction of a liquefied natural gas plant in Nigeria, from 1996 to mid-2000s[16]; in 2009 the UK Office of Fair Trading announced its final decision to fine 103 construction firms £129 million for engaging in bid rigging, largely in the form of cover pricing, on 199 tenders between 2000 and 2006[17]; in 2013, SNC-Lavalin Group Inc., a construction and engineering company agreed to a settlement with the World Bank that excludes it from bidding on bank-sponsored projects for up to 10 years because of its involvement in a Bangladesh bribery scandal[18]; another high profile example is that of the drywall imported to the US from a foreign country that caused thousands of homeowners to become ill[19]. Unawareness of the differences of culture, ethics and professionalism among different countries can lead to wrong decisions which impact public welfare negatively[20].

These examples involve international projects. Not surprisingly problems arose because expectations in ethical and professional practice differ in different countries due to culture, overall managerial system and other social factors. Indeed, in some regions of the world systematic corruption happens regularly in the construction industry and as such, engineering education must prepare practitioners for how to deal with this and maintain an ethical behavior.

Traditionally, in most construction projects, domestic and international, ethical decision-making involves issues ranging from the selection of a variety of alternatives and uncertain circumstances (persons, materials, methods) to the consideration of consequences that may affect other stages, projects, companies or persons and have economic, legal and social implications beyond the client.

The main type of ethical problems for organizations includes human resource management, equitable and just treatment of employees, conflicts of interest, and division of the loyalty of employees. Customer confidence falls when a company shows lack of respect for its clients,

downplays public safety and makes inappropriate use of corporate resources for personal gain[21]. Sustainability has become one of the important components in ethics and professionalism.

4. Sustainability considerations

Sustainability is the capacity to endure in ecology. In more general terms, sustainability is the endurance of systems and processes. In construction, environmental and human health impacts, conservation of energy and natural resources of constructed facilities are hidden costs of our built environment. Impacts during manufacture, transport, installation use, winning and disposal of construction materials can be significant, yet often invisible.

Various construction material selection and specification remains a challenging, sometimes even contentious issue. Many designers experience difficulty understanding the full extent of environmental and human health impacts of building materials as they are not easily quantified. Complete and accurate information is elusive. Life-cycle assessment, a thorough accounting of environmental and human health impacts of a material, is the best tool for truly evaluating materials.

The benefits of globalization for the construction industry are clear, but the cross impact on professionalism and ethics has seldom been addressed appropriately – especially in university curricula. This includes the impact, (often negative) of the inevitable influence of professional practice on international construction market. To stop all corruption practices, professional ethics education, with international related components, is seen as an essential component of the engineering curriculum[22].

To be competent in a global economy, the work of an engineer must demonstrate that it is sustainable, i.e., it must include an assessment of the long-term viability of the proposal, taking into account social, environmental, economic and technical dimensions. In the past, this has been addressed through the implementation of triple-bottom-line accounting.

The concept of triple-bottom-line assessment was created by John Elkington in the late 1990s as a means for organizations to demonstrate that they had strategies in place to ensure sustainable growth[23]. The three dimensions considered in Elkington's assessment are the environmental context (impact of the proposal on the biological systems operating within a region), the social and cultural context (impact of the proposal on the lifestyle of people who will be affected by the proposal), and the economic context (financial implications of the proposal). It is nonetheless evident that we are gradually using up our planet – particularly the accessible and non-renewable resources[24]. Any long-term plans for increased development (i.e., increased extraction and conversion or use) of these by any one sector or nation requires a commensurate reduction in use by another.

However, project sustainability that is assessed through triple-bottom-line accounting is deficient in one key dimension – the role of technology.

If the engineering is poor, irrespective of how much effort is placed to ensure that the other three parameters are addressed, the proposal will fail. Through "engineering" we address the technical aspects of a proposal – which in turn are a reflection of the design and the materials used. Further, if the structure has a designed life span, provision should be made to consider what should happen to the materials and the site on demolition. In light of this, Buckeridge[22] introduced the concept of the "4 Es" wherein those charged with ensuring the sustainability of projects must demonstrate that they effectively meet environmental, ethical, economic and engineering criteria. "Environmental" comprises all aspects of nature – conservation, and enhancement of ecosystems and geosystems; "ethical" comprises the human dimensions – cultural, social and spiritual; "economic" comprises the financial support including that to cover contingencies such as hazards during (and post) construction; "engineering' is all about good design and ranges from structural components through to selection of suitable materials. Poor design is clearly unsustainable, from the ethical, environmental, economic and engineering perspectives[25]. A recent example is that the developer of a high rise residential building which collapsed during an earthquake in Tainan, Taiwan on February 6, 2016 that killed 41 people with 100 missing was arrested for suspicions of negligent homicide over only major building to collapse in quake[26].

As corrupt business and construction practices are the norm in some environments, students must learn not only that there are differences in what is considered acceptable practice; they must also learn how to intellectually critique dubious ethical norms. We expect that exploration for and demonstration of universal and/or ubiquitous moral values will be an important component in international ethics education. One of the examples is the concept of Corporate Social Responsibility (CSR)[27]. CSR focuses on accountability of organizations to a broad group of stakeholders including employees, customers, suppliers, community organizations, subsidiaries and affiliates, joint venture partners, investors and shareholders. CSR policies are based on social justice principles, human rights, and environmental standards. CSR can make our science, engineering and management students better understand that "we do not inherit the earth from our ancestors; we borrow it from our children" – a Native American proverb. Balanced evaluations are necessary.

CSR is important to businesses as it enlightens self-interest because corporations perceived as being socially responsible might gain from getting extra and more satisfied customers. Those perceived as irresponsible may face boycotts. High calibre personnel might be attracted to work for and be committed to responsible firms. Voluntary commitment to social actions and programs might forestall legislation or other government action. When engineers contribute to society, the outcome is a long-term investment in a safer, better-educated, more equitable community, hence firms gain from a more stable business environment. A major principle of CSR is the chain of responsibility. Designers, engineers and producers have a duty to care for human rights and the work practices of communities to ensure the maximum benefits of sustainability.

Also, as future construction managers "we want a business that is financially sustainable but not to the extent of using workers that are exploited"[28]. The concept of Fairtrade will raise design

and production standards and produce a range of sustainable and ethically manufactured products, which directly profits every aspect of society.

These basic concepts along with others will help students fully understand the importance of ethics and professionalism and apply these principles in their work. It is stated that "an amateur practices until he/she can do something right; a professional practices until he/she cannot do it wrongly", and "professional behavior is usually characterized by making decisions that are in the best interests of the client and not the practitioner"[29].

5. The necessity for strengthening ethics education for construction management students

Professional services carry significant moral responsibility and invoke public interest and public good arguments. But some professionals offer their services purely for pecuniary reasons[30]. The process of learning ethics is however not simply confined to the undergraduate curriculum. It should be life-long, for only then can it truly be of major advantage to society. New ethical problems arise continuously, and many do not have easily defined solutions – they are often surrounded by ambiguities, complexity and ill-defined boundaries. In a global situation, students who enter civil, construction, environmental protection, logistics, and supply chain industries and services, should clearly understand the outcomes that may have economic, legal and social benefits, and outcomes that may have economic, legal and social costs[25].

It is clear that there exists an imperative for incorporating globally related ethical components into future ethics education. However, few researchers have dealt with international related ethics topics to date[31,32].

Thus ethics provides specific rules for determining right and wrong in a given situation. In some ways, the law represents a particular society's "codified ethics". However, ethics is generally held as going beyond the law, and in light of this, professional bodies have found it necessary to develop their own discipline specific protocols, or "codes of ethics". It follows then, that when professionals such as engineers develop their code of practice, as well as guidelines for technology and business practice, they must include an ethical framework, or a Code of Ethics[25].

Ethics is intimately linked to professionalism and in many respects "professionalism" can be equated to "professional ethics". The Royal Institution of Chartered Surveyors Working Committee (2000) states professional ethics involves "giving of one's best to ensure that clients' interests are properly cared for, but in doing so the wider public interest is also recognized and respected".

Ethical problems do not have such easily defined solutions – rather ethical conundrums are usually surrounded by ambiguities, complexity, and ill-defined boundaries, and involve decisions characterized by choice as alternative courses of action are available – hence ethical choices and ethical dilemmas.

Current civil engineering and construction management programs curriculum in construction management education institutions provide students with sound technical knowledge. However

construction managers increasingly need to operate in diverse organizational contexts; as such they need the intellectual tools to comprehend the moral diversity within different cultures and different disciplines (Wang et al. 2010). Differences can arise due to varied cultural, religious, environmental, legal and political perspectives, and not surprisingly, can be considerable, affecting an engineer's and a manager's judgment, the public welfare, the environment, and sustainable economic development. Further, in the last few decades, the concept of ethics is no longer limited to an individual's code of conduct; it involves the morally-based practices of groups or disciplines, e.g. a company's corporate responsibilities, and responsibilities and ethical decisions that relate to the environment[34-36]. Some ethicists have even split ethics into micro-ethics and macroethics[37], and to combine these changes or international components in ethics education is a challenge for educators.

Current ethics education curricula in construction management program curriculum (micro-insertion) do not usually provide students in construction management students with basic ethic training including globalization and sustainability related ethical practices that reflect the changing world even basic ethics training.

As globalization and sustainability components are incorporated into ethics education of engineers it will allow students to

a) identify the differences in ethical standards and implementation in different countries;
b) identify the differences in ethical practice and the root causes and the cross impacts of these practices in an international environment;
c) apply the principles in making ethical decisions.

A major aim of a standard code of ethics is "to respect the inherent dignity of the individual"[38]. Civil engineers selecting materials and equipment in designing constructed facilities introduce the supply chain issue in a globalized economy. Current supply chains can cause desperation and death for many people, especially those living in developing countries. They can also lead to extensive environmental degradation and concurrent loss of biodiversity. To counter these problems, we need to ask, how do supply chains benefit the poor and disadvantaged? What impact do they have upon the environment? Can we manage supply chains based on what our conscience demands? The Fairtrade concept that was developed recently is becoming popular in countries such as Australia and the UK. Fairtrade Labeling Organizations International is a non-profit, multi-stakeholder association (labeling initiatives and producer networks) that develops and reviews Fairtrade Standards and assists certified producers in gaining and maintaining Fairtrade Certification while capitalizing on market opportunities. Its strategic intent is to deliberately work with marginalized producers and workers in order to help them move from a position of vulnerability to security and economic self-sufficiency; to empower producers and workers as stakeholders in their own organizations; and to actively play a wider role in the global arena to achieve greater equity in international trade. Savaidis[28] stated that, "we want a business that is financially sustainable but not to the extent of using workers that are exploited". The concept of Fairtrade will raise design and production standards and produce a range of sustainable and ethically manufactured products, which directly profits every aspect of society.

These basic concepts, along with others, will help students, researchers, and trainees fully understand the importance of ethics and professionalism and apply these principles in their work. It is stated that "an amateur practices until he/she can do something right; a professional practices until he/she cannot do it wrongly"[39], and "professional behavior is usually characterized by making decisions that are in the best interests of the client and not the practitioner"[29]. Professional services carry significant moral responsibility and invoke public interest and public good arguments. But some professionals offer their services purely for pecuniary reasons[30]. It is necessary to inform students and engineers that the process of life-long learning of ethics cannot be over-emphasized. Continued learning and education of ethics is a major advantage for the entire society. Frequently, ethical problems do not have easily defined solutions and are surrounded by ambiguities, complexity and ill-defined boundaries. In a global situation and the trend of internationalization of civil and construction industry, students entering civil, construction, environmental protection, logistics, supply chain industries and services, should clearly understand the outcomes that may have economic, legal and social benefits, and outcomes that may have economic, legal and social costs. Collaboration modules with the industry, international and interdisciplinary partners in ethics education in construction related fields should employed.

6. Current practices in construction management construction

In the United States, construction management programs in higher education intuitions normally accredited by the American Council for Construction Education (ACCE). ACCE, as the accreditation body currently does not required a mandatory ethics course for undergraduate construction management curriculum. According to ACCE, for four year bachelor degree construction management programs, ethics education is included in the selected courses including human relations; psychology; sociology; social science; literature; history; philosophy; art; language; political science. ACCE requires all topical content must be addressed and met in degree program, but no credit hour requirement for topical content. The topical content includes topics including written communications, oral communications, social science, and ethics[40]. Most programs require one academic hour insert to each core course covering ethics related topics. The current criteria for Student Learning Outcomes (SLO) by ACCE including 20 items, with SLO 6, ethics. To meet SLO 6, the minimal requirement is ethic topic is covered in at least core construction technical course.

This is in contrast to the engineering programs which are normally accredited by the Accreditation Board for Engineering and Technology, Inc. (ABET). As required by ABET, ethics and professionalism requirements are more mandatory and restrict for undergraduate engineering program students. In 1985, ABET reformed educational standards by adding engineering ethics courses as a condition of accreditation for US engineering programs. ABET emphasizes the nature of the accreditation and claims a criteria-based outcome for engineering ethics education. Engineering programs must demonstrate that their graduates have an understanding of professional and ethical responsibility. Broad education is necessary to understand the impact of engineering solutions in a global and societal context[41].

In contrast, in the document (Criteria for Accrediting Engineering Technology Programs for 2015-2016 Accreditation Cycle) of program criteria for civil engineering technology and similarly named programs issued by the Accreditation Board for Engineering and Technology, Inc. (ABET), the non-governmental organization that accredits post-secondary education programs in "applied science, computing, engineering, and engineering technology" requires graduates of degree and associate degree programs to meet Program Educational Objectives, including "apply principles of ethics in practice"[42].

And in the document (Criteria for Accrediting Engineering Programs Effective for 2015-2016 Accreditation Cycle) of program criteria for civil engineering programs issued by ABET, requires "the curriculum program must prepare graduates to analyze issues in professional ethics[43].

From the teaching construction management students, it has been noted that the disadvantage of the "micro-insert" is obvious:

a) lack of classroom hours to cover basic ethic topics and principles;
b) repeatedly use of the same materials by an instructor in different classes;
c) nonsystematic course materials; and
d) lack of learning outcomes.

7. Concluding remarks

It is crucial for educators to pass on the fundamental and critical information regarding the differences in ethics, including universal ethics theory, to their students before they graduate and join the workforce. Interestingly, it has been observed that a notable number of graduate students expressed great interest in ethical issues[22].

Measures to integrate global components into ethics education for construction majored students and professionals include curricula reform and development, international lecture exchange, study abroad, student exchange, scholar exchange and collaborative research.

The first step to improve ethics education is to conduct thorough international comparative studies and compile a standalone course materials for construction management students. The reform and improvement of ethics education involves basic ethics teaching, methodology improvement, including the use of modern telecommunication technology, and curriculum module development. The evaluation methods used are an important part of ethics education. Through effective ethics education, students should be able to solve issues in an international context, and differentiate between technical errors and ethical issues. Good case studies are essential.

A comparative study on ethics education and ethics practice will produce new concepts related to global contexts and ethics. Leadership should be the number one element of the leadership, and how an ethical perspective can lead to better humanity should be focused.

Curricula reform and development is necessary for ethics education for construction management students. International ethics and suitability case studies should play an important role to enhance students' awareness and ability to handle global and sustainable ethics dilemmas. The case study materials should include typical cases relevant to ethics issues under various contexts. Further, it may also be informative to consider ethical imperatives held by other disciplines, especially when they pertain to how we manage a degrading natural environment. A compilation of case studies will be a good reference for student learning, especially when active case studies are discussed and enriched as the project proceeds. The curricula should include the detailed teaching schedule, course content, learning outcomes and objectives, and evaluations.

Students should be taught internationally recognized ethics and professional practice standards and criteria for those who conduct international projects must be mandatory components in all engineering curricula and on-going professional education. While the development in international professional registration over the last few decades is showing considerable promise, the latter three international agreements (above) are still in the developmental stage; there is still a lack of more specific regulations in particular sectors, trades, and the construction industry. More importantly, any "recognition" is largely based on the equivalence of tertiary education programs. Engineering practice, the examination of ethics, engineering law, and engineering practices are often not covered in the engineering curricula in developing countries and the so-called equivalency of some courses may be little more than political education and deception.

The curriculum reform will prepare students a good preparation when they graduate and for their future career. It will impact construction management programs in the US and internationally, and indirectly over more than 25,000 corporate members of the Associated General Contractors of America. It will provide a solid platform for long-term ethics training with a systematic curriculum that will enhance the knowledge base of ethics for students entering the competitive global arena.

References

1. Toth, J., Freebairn, P., Hu, Y., Richardson, D., Dowling, C. and Spyropoulos, E. Australia's Construction Industry: Profile and Outlook. 2015; *AIG Economics Research.* 14pp. Retrieved from www.aigroup.com.au.
2. Henderson, R. Employment outlook: 2010–2020 Industry employment and output projections to 2020. 2012; *Monthly Labor Review,* 65-83.
3. Nunnally, S. W. Construction Methods and Management, 7th ed. 2007; Pearson Prentice Hall, Columbus, Ohio.
4. Raftery, J., Pasadilla, B., Chiang, Y., Hui, E. and Tang, B. Globalization and construction industry development: implications of recent developments in the construction sector in Asia. 1998; *Construction Management & Economics, 16(6),* 729-737.
5. Wang, G. and Buckeridge, J. Ethics for Construction Engineers and Managers in a Globalized Market. In Engineering Ethics for a Globalized World, 143 –164. 2015; Switzerland: Springer.
6. US Census Bureau. Construction Industry Statistics. 2013; Retrieved from http://www.statisticbrain.com/construction-industry-statistics.
7. EU. Chinese Construction Company starts New York Alexander-Hamilton Bridge renovation projects. 2009; *Government Updates, European Union Chamber of Commerce in China*. July 16, 2009.
8. PRI. California turns to Chinese company, labor to build most of new Bay Bridge span. 2011; Retrieved from http://www.pri.org/stories/world/asia/california-turns-chinese-company-labor-build-bay-bridge-span-6507.html.
9. ABR. John Holland Purchase Brings First Large Chinese Construction Company To Oz. *Australia Business Review*. 2014; Retrieved from http://www.businessreviewaustralia.com/leadership/1457/John-Holland-Purchase-Brings-First-Large-Chinese-Construction-Company-To-Oz.
10. Smith, J. Construction Management: Understanding and Leading an Ethical Project Team. 2010; Construction Analysis and Planning, LLC, Santa Monica, CA.
11. CFA. What could the remodeling/construction industry do to improve their reputation as a whole? 2012; Retrieved from http://www.buildzoom.com/answers/1017/remodeling-construction-industry-improve-their-reputation.
12. Chua, G. Sydney Opera House turns 40. *Architecture & Design*. 2013; Retrieved from http://www.architectureanddesign.com.au/news/sydney-opera-house-turns-40.
13. Carroll, A. & Buchholtz, A. (2006). *Business and Society: Ethics and stakeholder management.* 2006; Mason, OH: Thomson.
14. Pearl, R., Bowen, P., Makanjee, N., Akintoye, A. and Evans, K. Professional Ethics in the South African Construction Industry – A Pilot Study. 2005; Proceedings of the Queensland University of Technology Research Week International Conference. Brisbane.
15. TI. 2008; Global Corruption Report 2008.
16. Iriekpen, D. Nigeria bribe – Halliburton to pay US$559 million settlement. 2009; *World News Journal, 28 January*, retrieved from http://africannewsanalysis.blogspot.com/2009/01/nigeria-bribe-halliburton-to-pay-us-559.html.

17. Office of Fair Trading. Evaluation of the impact of the OFT's investigation into bid rigging in the construction industry. 2010; A report by Europe Economics. Retrieved from http://www.oft.gov.uk/shared_oft/reports/Evaluating-OFTs-work/oft1240.pdf.
18. Haggett, S. and Orr, B. SNC-Lavalin agrees to 10-year ban from World Bank projects. 2103; retrieved from http://www.cbc.ca/news/canada/montreal/story/2013/04/17/business-snc-lavalin.html.
19. Sawyer, J. Drywall imported from China causing construction problems. Construction Litigation Law Blog on January 13, 2009. Retrieved from http://blog.njeifs.com/2009/01/drywall_imported_from_china_ca.html.
20. USA Today. New cancer findings slam Lumber Liquidators. February 23, 2106. Page 1.
21. Barringer, B.R. and Ireland, R.D. Entrepreneurship: Successfully launching new ventures. 2006; Upper Saddle River: Pearson Education.
22. Buckeridge, J.S. Introducing philosophy and ethics to the engineering curriculum. 1994; *Transactions of the Institution of Professional Engineers New Zealand, 21(1),* 1-4.
23. Elkington, J. *Cannibals with Forks: The Triple Bottom Line of 21st Century Business.*1997; Oxford: Capstone Publishing Ltd.
24. Buckeridge, J. S. Application of ethics in engineering practice… quis custodiet ipsos custodes? *Innovations in Structural Engineering and Construction*. 2008; Proceedings of the Fourth International Structural Engineering & Construction Conference (ISEC-4), Melbourne, September 26-28, 2007. 1: 1273-1278.
25. Buckeridge, J. S. *4 Es: Ethics, Engineering, Economics & Environment*. 2nd Ed. 2011; Sydney: Federation Press.
26. The Guardian. Taiwan earthquake: developer of collapsed tower block arrested. Retrieved from http://www.theguardian.com/world/2016/feb/09/taiwan-earthquake-developer-of-collapsed-tower-block-arrested.
27. Baker, M. Corporate social responsibility - What does it mean? 2004; Retrieved from http://www.mallenbaker.net/csr/definition.php.
28. Savaidis, N. *The Age*. April 18, 2008.
29. Kelly, J., Male, S. and Graham, D. *Value management of construction projects.* 2004; Blackwell, Oxford.
30. Low, L. Professionals at the crossroads in Singapore. 1996; Times Academic Press, Singapore.
31. Feldhaus, C.R. and Fox, P.L. Effectiveness of an ethics course delivered in traditional and non-traditional formats. 2004; *Science and Engineering Ethics, 10,* 389-400.
32. Henderson, R., Antelo, A. and St. Clair, N. Ethics and values in the context of teaching excellence in the changing world of education. 2010; *Journal of College Teaching and Learning, 7(3),* 5-11.
33. Wang, G., Lu, H. and Ren, Z. Globalization in construction engineering and management education. 2010; *Journal of Applied Research in Higher Education, 2(2),* 51-62.
34. Carroll, A. & Buchholtz, A.K. 2011; *Business and society: ethics, sustainability, and stakeholder management,* 8th Ed.
35. Crane, A. and Matten, D. *Business ethics: managing corporate citizenship and sustainability in the age of globalization,* 2nd Ed. 2007; Oxford: Oxford University Press.
36. Elder, K. E. Ethics education in the consulting engineering environment: where do we start? 2004; *Science and Engineering Ethics, 10,* 325-336.

37. Herkert, J.R. Ways of thinking about and teaching ethical problem solving: microethics and macroethics in engineering. 2005; *Science and Engineering Ethics, 11*, 373-385.
38. Engineers Australia. (2013). Code Ethics Engineers Australia.
39. Lynch, P. Professionalism and Ethics. In Sadler, P. (Ed.) Management Consultancy: A Handbook of Best Practice. 1998; London: Kogan Page.
40. ACCE. Manual for preparation of the self-evaluation study. Document 102. 2014; American Council for Construction Education (ACCE), San Antonio, TX, April 2014.
41. ABET-EAC. Criteria for accreditation engineering programs. 2003; ABET Engineering Accreditation Commission (AEC).
42. ABET. Criteria for Accrediting Engineering Technology Programs for 2015-2016 Accreditation Cycle. 2014; Accreditation Board for Engineering and Technology, Inc. (ABET), Baltimore, MD.
43. ABET. Criteria for Program Criteria for Civil Engineering Technology and Similarly Named Programs. 2014; Accreditation Board for Engineering and Technology, Inc. (ABET), Baltimore, MD.