



Ethics in Undergraduate Construction Curricula: A Two-Stage Exploratory Sequential Approach to Developing and Piloting the HETC Survey

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the United States Air Force Academy and Arizona State University. Her interest in ancient construction practices led to a National Science Foundation grant to explore the construction techniques of the Inca, specifically the Inca road throughout Peru. This research is part of a Smithsonian exhibit at the Museum of the Native American Indian through 2020. She was recognized as an Engineering News Record Top 25 Newsmakers of 2010 for her research on the Inca Road. Additionally, Dr. Fiori was featured on the Science Channel in an Episode of Strip the City pertaining to Machu Picchu. Dr. Fiori led the Construction Engineering and Management program and also facilitated the service learning programs for the Myers-Lawson School of Construction. She has led diverse groups of student teams to Vietnam, Kenya, Belize, Guatemala and Haiti to complete construction projects and community engagement programs. Currently her work is focused in Belize and Africa. She also serves as a Faculty Fellow for the Sigma Phi Epsilon fraternity, is a Bridges to Prosperity Construction Mentor, serves on the Board of Directors and as a mentor for the ACE Mentoring program of Southeastern Pennsylvania and was elected as the first Affiliate member of the Carpenters' Company of the City and County of Philadelphia. In her spare time she enjoys working with non-profits such as Peacework and Habitat for Humanity, traveling, bee-keeping and scuba diving.

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Abstract

Construction and construction related engineering programs (construction engineering and civil engineering) must provide ethics education to students for accreditation; however, there are limited resources for instructors who teach ethics in these degree programs. This exploratory two-stage sequential research study utilizes three of Eash's five curriculum components (content, modes of transaction, and evaluation) as the conceptual framework to understand the teaching of ethics in construction programs by developing and piloting a survey instrument. Using this framework, an initial exploration on ethics education, particular to these types of construction related programs, was performed (literature and program guide review). Informed by this exploration, a survey was developed on how ethics is taught in construction and construction related programs (HETC). A pilot investigation into how ethics is taught was conducted into five construction programs to gain a deeper understanding of the pedagogical content (topics) and techniques those programs use to teach ethics while possibly exploring any pedagogical gaps. We found that there are a wide range of pedagogical techniques used to teach ethics that can be used to inspire ethics educators in these construction disciplines but have found that there are gaps in current academic literature that does not highlight the use of various pedagogical approaches or content unique to construction ethics instruction.

Introduction

Ethics refers to the code of principles by which a group of people lives. It is the good and bad or right and wrong of behavior that is socially acceptable to a particular group [1],[2],[3],[4],[5],[6] and the construction industry as a group has been infamous with regard to ethical conduct. Unethical conduct in the construction industry is indiscriminate of global region or stakeholder. The global construction industry has been recognized as the most corrupt of any international business sector [5],[7],[8],[9].

Research suggests that there are various issues specifically related to the construction industry's poor ethical performance such as professional issues related to collusion, bid shopping, or claims games. Also, societal issues like sustainability, the environment, and discrimination [5] were also identified, which may not be present in other industries or even other engineering disciplines. The vast number of ethical issues associated with the construction industry incited a mandate for ethics education by accrediting agencies of construction programs, which requires all accredited construction programs to include ethics education as part of their curricula [10],[11].

Problem & Purpose

Educators need a means to provide ethics education to construction students. According to research, the problem is that this type of instruction is done without an understanding of pedagogical practices that can or should be used to teach ethics. Adding to this, traditional and

technically trained educators sometimes consider ethical topics secondary to technical curricula [5], [12].

Working towards a framework for ethics instruction requires the following broad questions to be answered:

- RQ₁. What does literature tell us about how ethics educators should operationalize curriculum components for ethics education?
- RQ₂. How can we better understand how content and pedagogical techniques are used in construction programs to teach ethics while identifying gaps in academic literature?

The purpose of this study is to answer these questions to gain a preliminary understanding of ethics pedagogy in construction education using a mixed-methods approach.

Overarching Methodology

This exploratory sequential design [13] is comprised of an exploration of current construction academic literature on ethics to answer RQ₁. From this initial exploration, findings are used to develop the quantitative survey, *how ethics is taught in construction education* (HETC) to answer RQ₂. The HETC was administered to a sample of faculty and students of construction programs for comparison to the literature review [13],[14], [15]. Additionally, accreditation documents of sampled programs supplement our interpretation of the results to begin filling gaps not covered in previous strands (see *Figure 1*).

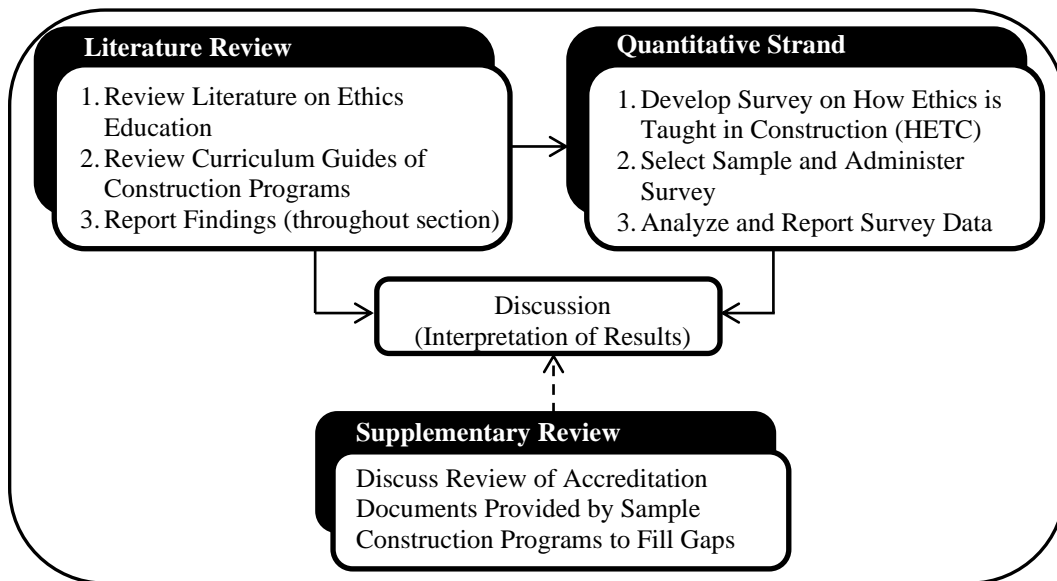


Figure 1. Exploratory Sequential Design of this Study [13]

Conceptual Framework

To move toward an understanding of how ethics is taught in construction education, we need to understand the curriculum components. Therefore, we use Eash's [16] curriculum components model as a conceptual framework for this research. Eash's [16] curriculum components include: (a) framework of assumptions about the learner and society; (b) aims and objectives; (c) content

or subject matter with its selection, scope, and sequence; (d) modes of transaction, for example, methodology and learning environments; and (e) evaluation. These components “must all be well-coordinated for the organism [curriculum] to live and develop; yet, they may be separated for purposes of description, study, and research” [16, p. 67].

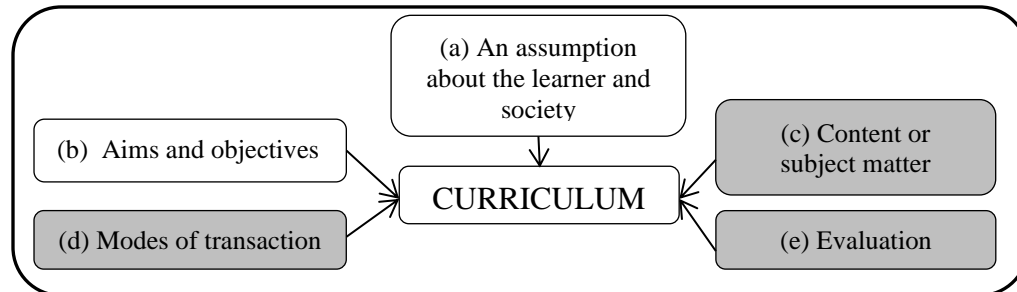


Figure 2. Eash's [16] five components of the curriculum

For the purpose of this study, we elect to investigate the operationalization of Eash's [16] components of content (c), modes of transaction (d), and evaluation (e) to limit the scope of the work.

Literature and Curriculum Guides Review

The first strand of our mixed methods approach involves the exploration of current research on ethics education to identify how Eash's [16] components (c) through (e) are operationalized. This exploration will begin to answer how literature and curriculum guides operationalize these components in ethics education.

We performed a literature review on ethics education research. We also performed a complementary review of construction programs' curriculum guides to get initial insight into how programs operationalize Eash's [16] components, and to determine gaps in current construction education research. To obtain sample literature for our review, we used combinations of the base words of construction, ethic, and education to search electronic databases for journals, books, and conference papers using the methods of Creswell [17]. Literature was then reviewed and elements of Eash's [16] components were extracted.

Key Findings in Literature

Key findings of our literature review highlight extracted elements of ethics education literature. This initial extraction is followed up with a literature review that specifically focuses on ethics education in construction programs.

(c) Content or subject matter

Regarding content (c), Herkert [18] provides an analysis of the development of engineering ethics education. Engineering was a focus because the U.S. Bureau of Labor Statistics (BLS) [19] highlights that required degrees of the construction profession include engineering. The fundamental concepts of public safety and welfare, health and environment, whistleblowing, codes of ethics, moral theories, and discrimination, among others, were topics related to

engineering ethics education. Engineering is a broad discipline with a variety of sub-disciplines, so having research on ethics content that specifically ties to the construction industry was necessary.

Sands & Pearce [5] provide an inventory of ethical issues that specifically relate to the construction industry. This study used textual analysis to analyze non-educational research papers and found 101 unique ethical issues associated with the construction industry. Ethical issues revealed by this study are categorized into modules and themes as a source of content for construction ethics education. From this review, we have an initial understanding of construction ethics content that can be used for construction education. Sands & Pearce's [5] inventory inspired the development of question six of the HETC survey to investigate what sampled programs cover in their construction curriculum.

(d) Modes of Transaction

Regarding modes of transaction (d), we identified three sub-components of curriculum setting (d_i) [20], media (d_{ii}), and teaching styles (d_{iii}). Regarding sub-component (d_i) curriculum setting, Stephan [21] studied ethics-related instruction in U.S. engineering programs. The intent was to focus on engineering programs where ethics was a significant part of engineering curricula and present this information in a database to inspire other engineering programs. In this study, Stephan [21] highlights the various ethics courses that exemplary engineering programs require students to take. For our purpose, the focus is on how this study highlights a source of curriculum settings of ethics courses, addressing how full courses were used for ethics instruction in engineering education. Complementing this study, Herkert [18] discusses the placement of ethics in a single course, across the curriculum, or by integrating ethics in courses that encourage students to engage with the ethical situation in a societal context.

Adding to component (d_i), Finelli et al. [20] assess engineering student ethical development based on their curricular and co-curricular experiences. The significance of this paper is Finelli et al.'s [20] definition of curricular setting and curricular pedagogies relating to the teaching of ethics by both studies. The curriculum settings identified in this study include pre-college programs, introductory engineering courses, out-of-class workshops, non-engineering courses, or some other means. These settings inspired the development of question one of the HETC survey.

Regarding media (d_{ii}), Stephan [21] briefly mentions the use of textbooks and Menzel [22] discusses ethics pedagogy and the use of research papers, biographies, videos/movies, PC/multimedia, and fiction/movies to present content to students.

Regarding teaching styles (d_{iii}), Finelli et al. [20] highlights pedagogies that include presentations by a professor, a person speaking about own experiences, a working engineer/guest speaker, discussions with classmates, films, skits, in-class activities (e.g., games, role-playing) and online modules. Menzel (1998) highlights pedagogies such as the use of case studies, lectures, small group discussions, decision-making scenarios, self-assessments, guest speakers, role-playing, simulations, and field studies, and assesses their use in ethics courses. Herkert's [18] study also discusses the teaching style of using case studies.

Complementary Review for Components (c) and (d)

Complementing components content (c) and modes of transaction (d), we performed a review (textual analysis) of curriculum guides of construction programs that were publicly available online for programs' 2012-2013 academic year [23]. This analysis was our first look into actual construction programs' ethics education. We used Sands & Pearce's [5] inventory to identify courses related to ethics based on course names.

Our interest is in undergraduate construction programs that are accredited, or programs that are candidates for accreditation in the U.S. Therefore, we reviewed 118 U.S construction programs that were either accredited by the Accreditation Board of Engineering and Technology (ABET) or the American Council on Construction Education (ACCE) or were candidate programs of the ACCE. The sampled programs for this investigation included 12 ABET accredited construction engineering programs, 26 ABET accredited construction engineering technology programs; 72 ACCE accredited construction programs and eight candidates for accreditation by the ACCE.

We found that there are programs have ethics education throughout the curriculum [curriculum setting (d_i)]. We also found few courses (construction ethics, engineering ethics, and technology ethics) where ethics was the primary subject matter. Additionally, some programs appear to teach construction ethics as a module within a broader course or require students to take a business ethics course, or an ethics course in philosophy. We also wanted to identify course content (c) and found topics that included themes of legal studies, safety and health, sustainability, social responsibility, human resources, business ethics, and the philosophy of ethics. This review gave us an initial look into construction programs and was a source of purposeful sampling to administer the HETC survey.

(d) Evaluation

Component (e) evaluation is very difficult when it comes to teaching ethics, as it is difficult to assess student ability to behave ethically in the variety of ethical situations they may face. As a start, Menzel [22] provides insight into evaluation techniques used in ethics education. Menzel [22] suggests the use of written papers, oral reports, objective exams, and essay exams as evaluation techniques.

Construction Ethics Education Literature Review

Adding to an initial review on construction ethics education research [5] (see Table 1), it was found that there is a range of topics discussed in construction ethics education literature that complements Sands & Pearce's [5] inventory on construction ethics education topics. Additionally, modes of transaction for construction ethics education vary by curriculum setting, media use, and teaching style. Lastly, the use of case review analysis, the defining issues test, and review of student portfolios were found to be techniques discussed to evaluate student ethical competencies.

Table 1.

Literature on Construction Ethics Education; and expansion of Sands & Pearce (2014)

Author(s)	(c) Content or subject matter discussed	(d) Modes of transaction discussed	(e) Evaluation techniques discussed
Robertson [24]	Discusses topics of codes of ethical conduct/practice, safety, bid-rigging, environmental impact, construction ethics vocabulary, ethical vocabulary, ethical theory, moral obligation, duty to society, and law and justice	Suggests the presentation of ethics throughout the curriculum and taught by faculty in the Philosophy department (d _i). Also suggests having faculty and upperclassmen act as exemplars to reflect ethical culture, using case studies, using problem-based learning (d _{iii}).	Discusses use of detailed case review analysis assignment
Mulligan [25]	Discusses topics of hazardous waste/pollution, culture/multiculturalism, global awareness, and environmental impact	Suggests the use of lectures (d _{iii}), textbooks, videos, and magazine articles from Engineering New Record (ENR) (d _{ii}).	Not discussed
Killingsworth [26]	Discusses topics of codes of ethical conduct/practice, construction safety, law, stealing, and cheating	Suggests integration of ethics throughout the curriculum, adding ethics modules to key courses, having one- or two-hour course in construction ethics, mentoring and connecting ethical issues to professional practice (d _i). Suggests the use of case studies and use of peer discussions of ethical case studies (d _{iii}).	Discusses use of the adapted version of the defining issues test, used at beginning of student curricular experience and repeated throughout the degree of study
Tepper [27]	Discusses topics of construction safety and OSHA regulations as a moral and ethical issue	Suggests the use of case studies and discussions on the moral and ethical implications, and on-site education (d _{iii}) Also suggests presentations via visual and audio aids (d _{ii}).	Not discussed
Ohrn [28]	Discusses topics of bid shopping, bid peddling, front-end loading, payment delays, modification of lab results, codes of ethical conduct/practice	Suggests the introduction of ethics in a broad spectrum of courses such as estimating, project management, and soils and concrete (d _i)	Not discussed
Toco [29]	Discusses topics of alternative dispute resolution, conflict, arbitration, and mediation	Discusses the use of scenarios, exercises, mock arbitration, and mediation sessions (d _{iii}). Discusses use of course web page, and suggests video vignettes (d _{ii}).	Not discussed

Author(s)	(c) Content or subject matter discussed	(d) Modes of transaction discussed	(e) Evaluation techniques discussed
Kang, Price, Thorpe, & Edun-Fotwe [30]	Discusses topics of acceptance of ethical practice based on culture/multi-culturalism, gift-giving, conflicts of interest, codes of conduct, report falsification, over-claiming expenses, honesty, deceptive advertising, trade secrets, questionable bidding practice, safety, quality control, abuse of client resources, and ethical theory	Suggests the instruction of ethics via ethical courses in an ethics training program (d _i)	Discusses use of the defining issues test prior to and after ethical training
Sinha et al. [12]	Discusses topics of construction law and contracts, legal systems and maxims of law, societal values and morality, professional practice, and employer obligations	Suggests situating ethics in a required course on engineering ethics, required course with engineering ethics integrated, across the curriculum, or via an integrated humanities and social science program (d _i). Suggests the use of lectures, invited guest lectures, problem-solving, case studies (d _{iii}) and use of interactive videodisc (d _{ii})	Discusses evaluation of student portfolios that contain samples of student essays analyzing ethical issues demonstrating student ability to apply knowledge of different ethical theories to make decisions
King, Duan, Chen, & Pan [31]	Discusses topic of adherence to building codes and regulations	Suggests an ethics course situated as a one-credit course on construction ethics to upper-class students (d _i). Suggests discussion as a means of ethics instruction (d _{iii}) and use of video recordings, textbooks, and computers (d _{ii})	Not discussed
Scalza [32]	Discusses topics of bid shopping, bid rigging/collusion/price fixing, owner's duty to act in good faith, work schedule games tied to the payment schedule, change order games, licensure, privileged info, safety, and professional ethics	Suggests the use of lectures (d _{iii})	Not discussed
Darwish, Agnello, & Burgess [33]	Discusses topics of sustainability, environmental ethics, green construction, code of ethics, construction safety, health, and welfare,	Suggests the "Center" approach or the "Whole" curricula approach which integrates more sustainable-green perspectives throughout the curriculum, use of ethics resources for distance learning, and discusses	Not discussed

Author(s)	(c) Content or subject matter discussed	(d) Modes of transaction discussed	(e) Evaluation techniques discussed
Darwish, Agnello, & Olaniran [34]	Discusses topics of sustainability, environmental ethics, green construction, safe water, resource depletion, generative waste, harmful emissions, energy efficiency, and globalization	Suggests using long-term educational programs on ethics. Also suggests a full semester of international experience. Also suggests integration across the construction curriculum (d _i)	Not discussed

How Ethics is Taught in Construction (HETC) Survey

Informed by the literature review of this study, we gained an initial understanding of construction ethics education and how it is taught. A deeper understanding of current pedagogical practice of ethics in construction programs is missing; this is especially true of evaluation. To expand our knowledge, we wanted to supplement our review with information from actual construction programs to compile data on ethics education into a single source. Therefore, to obtain additional insight, we want to know what content and pedagogical techniques are used in construction programs to teach ethics.

To address this question, we developed a survey, which is an information collection method used to “describe, compare, or explain individual and societal knowledge, feelings, values, preferences and behavior” [35]. Data collection using surveys can be self-administered questionnaires, interviews, structured observations, or structured reviews, which can be administered via the internet, over the telephone, or via a hand-written pen-paper instrument [17], [35], [36].

HETC Survey Development and Overview

The literature review (see *key findings in literature* section) served as the foundation for developing the HETC survey (see Appendix). The basic form of the HETC survey is a self-administered questionnaire of six general questions developed by the authors, 147 binary (yes/no) survey items, and six open items for each question to allow respondents to provide additional information [17], [35]. Prior to the administration of the HETC, think-aloud protocols were conducted. Three students who were offered \$15 Panera Bread gift-cards each were asked to review and complete the HETC by talking out loud while they completed the survey. This helped with the observation of any issues of usability that may be part of the survey [9].

There are two versions of the HETC: one for faculty, and the other for students. The student version of the HETC provides an example of the foundational questions used in both survey types. Foundational questions asked participants the ‘what?’ of content, the ‘how?’ of modes of transaction, and the ‘how?’ of evaluation (see Appendix). Eash’s [17] component (c) content, is addressed by question 6. Component (d) modes of transaction, is addressed by questions 1, 2, 3, and 4. Component (e) evaluation, is addressed by question 5. Question 3 on learning environments (d_{iv}) was not explicitly covered in the literature. However, this question was developed to gain additional knowledge, drawing from experiences.

The faculty HETC is like the HETC for students except for two differences. One difference of the two surveys is the demographic information of interest. Student demographic information included age, current academic level, and industry experience. Faculty demographic information included: how they were taught construction ethics, highest academic degree achieved, current position in the department, administrative positions held, course areas taught, experience in academe and industry, and if and how they received formal ethics training.

How we wrote questions for participants varied slightly. As an example, a question on content for the faculty survey asks, “which topics serve as the subject matter for construction ethics

education in your construction course(s) or program?”, whereas the student survey asks, “which topics were the subject matter for construction ethics education in your classes?”

Administration of the HETC

The HETC was administered to faculty and students at five (5) different program types that related to construction. Invitations were sent to select construction programs for convenience as the HETC was administered during the pilot phase of the study. Faculty representatives (including department chairs) were asked to complete the survey or to forward survey to faculty who are responsible for ethics teaching in their program. Representatives and they were also asked to administer the survey to students. Table 2 provides a summary of each of the programs and each program has been identified by a letter (A-E).

Table 2.

Summary Data of Participants based on Program

ID	Program Type by Name	Accreditation Type	Where Ethics Taught in Curriculum	Student Surveys Returned	Faculty Surveys Returned
A	Building Science	ACCE	Course in the philosophy department	55	3
B	Construction Engineering	ABET	Module in a class	16	1
C	Civil Engineering	ABET	Module in a class	50	1
D	Construction Management	ACCE	Technology/engineering ethics course	11	1
E	Construction Operations & Management	ACCE	Across the curriculum	42	2
Totals				174	8

The HETC was administered to faculty via an online survey method described by Dillman [36] that allows faculty to complete the survey at their leisure, providing them the opportunity to return to the survey if incomplete. Faculty familiar with how ethics was taught in the curriculum, of the same construction and engineering programs of surveyed students completed the faculty form of the HETC. Details of faculty respondents are provided in Table 3.

Students received a handwritten, pen-paper survey. Smalls, Matusovich & McCord [37] found that students tend to prefer this technique for real-time data collection. Student surveys were completed by 174 construction students in participating programs in various senior level construction classes pertaining to professional and legal issues, risk management and construction safety, construction project management, contracting business, or thesis (capstone). Table 4. provides further details on student respondents.

Table 3.

Faculty Respondent Data

	Program A			Program B	Program C	Program D	Program E	
Respondent #	<u>1</u>	<u>2</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>
Taught full course on ethics	No	No	No	No	No	No	No	No
Taught course(s) that include ethics	Yes, Construction Safety; Construction Management	Yes	Yes, Construction Law; Contracting Business	Yes, Introduction to the Construction Engineering and Management Profession	Yes, Professional & Legal Issues (In Civil Engineering)	Yes	Yes, Research methods in management	Yes, Project Management; Planning & Scheduling
Highest academic degree	Master's	Doctorate	Doctorate	Doctorate	Master's	Doctorate	Doctorate	Master's
Current faculty position	Associate Professor	Full Professor	Associate Professor	Professor of Practice	Professor of Practice	Assistant Professor	Full Professor	Instructor/Lecturer
Academic experience (years)	14	22	26	16	4	2	20	2
Industry experience (years)	20	9	18	12	10	5	0	20

Table 4.

Student Respondent Data

Program ID	Mean Age	Gender (%)		Industry Experience (%)						Academic Level (%)			
		Male	Female	None	Up to 4 Months	5-8 Months	9-12 Months	> 12 Months	Did Not Specify	Freshmen	Sophomore	Junior	Senior
A (n=55)	22	94.5	5.5	7.3	18.2	34.5	20.0	20.0	0.0	0.0	0.0	0.0	100.0
B (n=16)	22	93.7	6.3	18.75	0.0	25	37.5	18.75	0.0	0.0	0.0	6.3	93.7
C (n=50)	22	80.0	20.0	36.0	28.0	16.0	14.0	4.0	2.0	0.0	0.0	24.0	76.0
D (n=11)	25	100.0	0.0	0.0	18.2	18.2	18.2	36.4	9.0	0.0	0.0	27.3	72.7
E (n=42)	22	98.0	2.0	7.1	7.1	4.8	14.3	66.7	0.0	2.4	7.1	9.5	81.0
Totals	22	91.0	9.0	16.0	17.0	20.0	18.0	28.0	1.0	1.0	2.0	11.0	86.0

Analysis and Key Findings

Data was assessed using descriptive data analysis [17]. Student and faculty responses are the aggregate recollection of all participating construction programs. Responses represent the recollection of how students remember being taught ethics, and how faculty recall or understand how ethics is taught in their construction program. Highlighted below are responses by students (*s*) and faculty (*f*) that are recalled most frequently.

Question 1, Curriculum Setting (d_i) - Most often, participants recall ethics being taught throughout the curriculum ($s=31\%$; $f=67\%$). Other curricula settings often recalled were dedicated courses on ethics ($s=11\%$), non-ethics courses where ethics was a full module ($s=13\%$; $f=17\%$), and a philosophy ethics course ($s=19\%$), see *Figure 3*. In addition to the combined recollection of these techniques, students identified ethics instruction being taught in a business ethics course and engineering/technology-based course, whereas faculty did not. ‘Other’ settings recalled by students (2%) include a statement that, ‘we have to take a business ethics course, but not construction ethics, every now-and-then, ethics-related issues are addressed in random classes.’ Another setting recalled by faculty included the coverage of ethics in “a global leadership course in the college of engineering.”

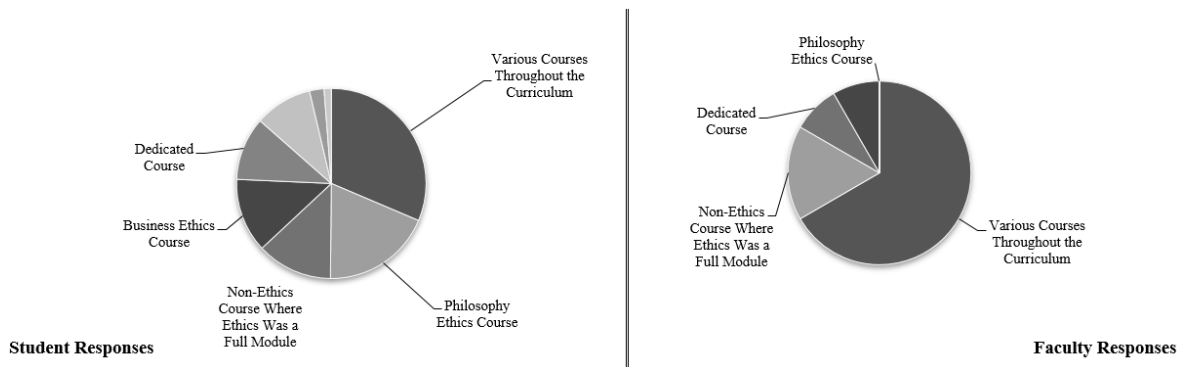


Figure 3. Summary of responses regarding curriculum setting

Question 2, Media (d_{ii}) - Often recalled was the general use of the Internet ($s=13\%$; $f=21\%$), and the use of YouTube videos ($s=15\%$; $f=18\%$), movies/films ($s=10\%$; $f=14\%$), and journal articles ($s=11\%$; $f=11\%$), see *Figure 4*. Less recalled media types included magazines, textbooks, construction websites, social media, audio recordings, and blogs. Faculty did not recall use of audio recordings, blogs, social media, or interactive video. The faculty survey did not include news articles as a media source due to an error; however, students ($s=14\%$) recalled the use of news articles as a medium. ‘Other’ media recalled by faculty ($f=14\%$) included the use of materials from professional association websites “ASCE, NSPE, NAE-online ethics center,” and online lecture videos by ethics professionals. Student responses to ‘other’ ($s=2\%$) were left blank.

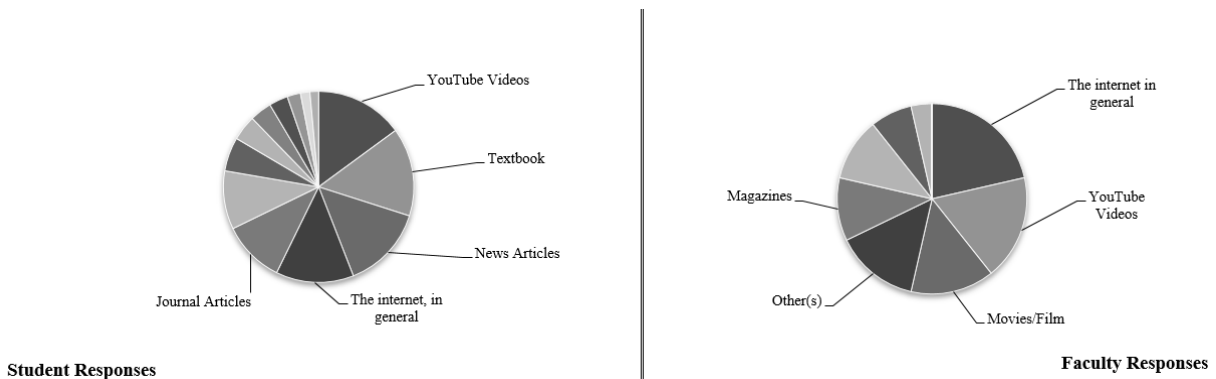


Figure 4. Summary of responses regarding media

Question 3, Learning Environment (d_{iv}) - Most often recalled learning environment is the classroom or a lecture hall ($s=58\%$; $f=44\%$). Another learning environment often recalled included construction site visits ($s=15\%$; $f=22\%$), see Figure 5. Other learning environments recalled include visits to construction companies' offices, online without visual and audio media, online via recorded and live lectures, in conference rooms, and outdoors in general. Not recalled by faculty were online via live lecture, and online via recorded lecture learning environments. Faculty responses to other (6%) were relevant to teaching styles (d_{iii}) with the response 'guest speakers.'

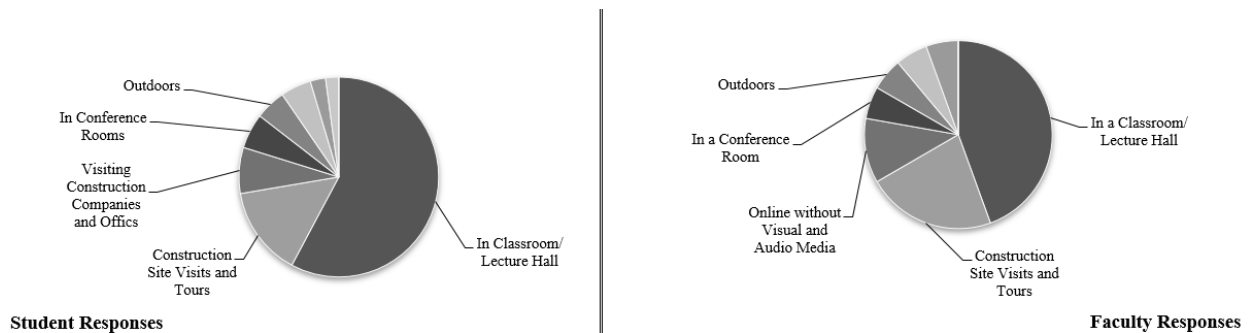


Figure 5. Summary of responses regarding learning environment

Question 4, Teaching Styles (d_{iii}) - Results indicate that the teaching style most often recalled included presentation by a single professor ($s=22\%$; $f=17\%$). Other teaching styles often recalled were the use of case studies ($s=12\%$; $f=17\%$), the use of presentations by an individual speaking about their own personal experiences ($s=13\%$; $f=14\%$), presentations by working professionals ($s=12\%$; $f=14\%$), and peer discussions ($s=13\%$; $f=12\%$), see Figure 6. Other recalled teaching styles by students and faculty include in-class games, role-playing, online modules, videos on construction ethics, project-problem based learning, think-pair-share, and panel discussions with guest or faculty member. Students also recalled performing interviews with industry professionals, using decision trees, and use of skits, whereas faculty did not. Other teaching styles reported by faculty (5%) include the requirement of students to read related material.

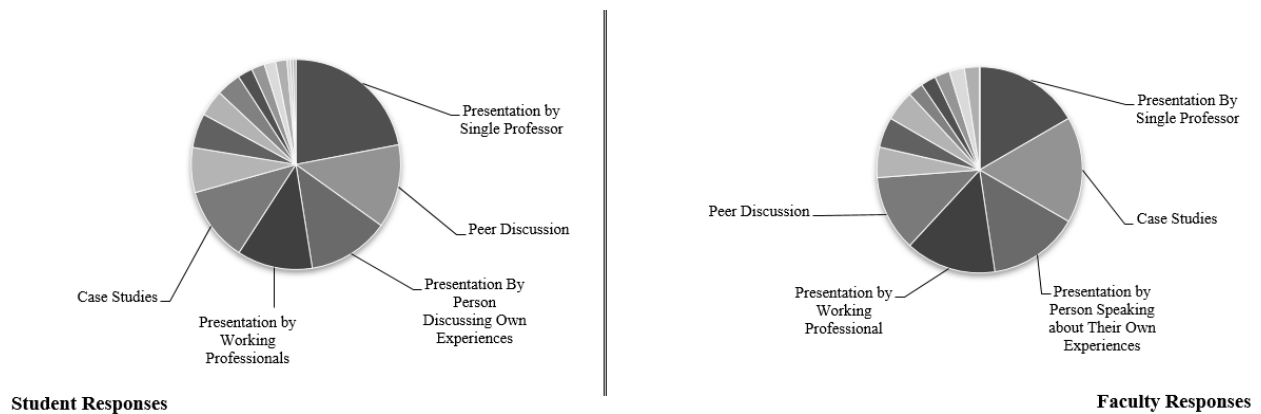


Figure 6. Summary of responses regarding teaching styles

Question 5, Evaluation (e) - Results indicate that test and quizzes ($s=24\%$; $f=18\%$), written assignments and reports ($s=22\%$; $f=18\%$), participation in discussions ($s=13\%$; $f=19\%$), and attendance in class when ethics is taught ($s=14\%$; $f=15\%$) were often recalled as a means of evaluating ethical competency, see Figure 7. Also recalled by students and faculty was the use of student presentations, interviews, group projects, and individual projects. Students recalled the use of student blog posts, social media posts, activity logs, journals, and progress meetings as methods of evaluation; however, faculty did not recall using these techniques for evaluation. The student response of 'other' (1%), included 'none', or they did not recall being evaluated for ethics competency.

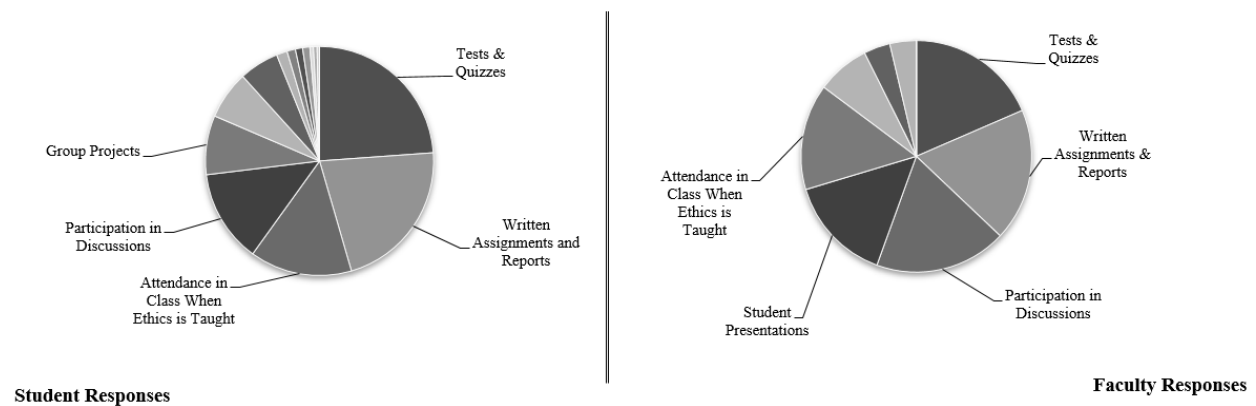


Figure 7. Summary of responses regarding evaluation

Question 6, Content (c) - We found that topics recalled the most by both faculty and students were ethics theory/moral philosophy ($s=3\%$; $f=4\%$), honesty and integrity ($s=3\%$; $f=6\%$), and safety ($s=3\%$; $f=4\%$) see Figure 8. Whistleblowing, bid-shopping, front-end loading, minority discrimination, occupational health, construction law and legal systems, conflicts of interest, human resources (as related to ethics), employer obligations, negligence, and harassment were also highly recalled by faculty and students. There were topics that had a low recollection by students (<2%), and no recollection by faculty. These topics included cover pricing, fictitious invoices, delay recovery, absenteeism, internal fraud, benevolence, and the federal acquisition

regulation. Of all topics, approximately one-third (33%) of them were not identified as topics covered in construction curricula by any faculty member.

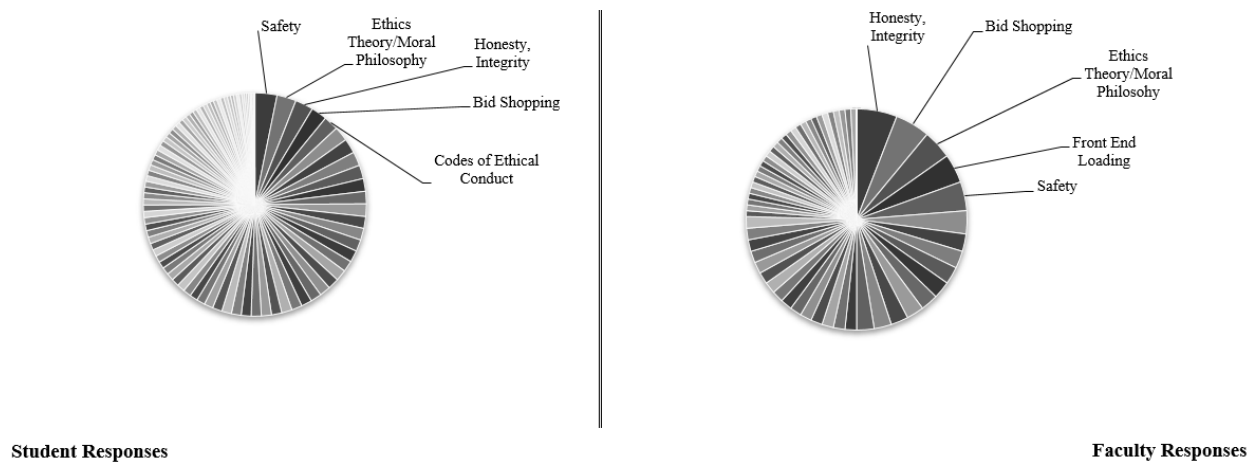


Figure 8. Summary of responses regarding content

Discussion

Based on our findings, there is a range of pedagogical techniques and content available to construction ethics educators, many of which are already in use. In comparing our qualitative and quantitative strands, we found that the qualitative strand helped significantly in developing the HETC quantitative survey instrument. By comparing results, we also found gaps in current construction ethics education literature.

Ethics education literature provides suggestions and discussions on various pedagogical techniques that can be used as modes of transaction. However, the subcomponent on *learning environment* (d_{iv}) was not discussed in construction ethics education literature. In addition, responses to the HETC revealed that learning environments such as online learning environments, construction site visits and tours, visits to construction company offices, and even the use of outdoors in general are used to teach ethics in construction programs.

Evaluation (e) is another area where gaps were found. Results from the HETC survey results have expanded knowledge on ethics evaluation, moving beyond evaluation of student portfolios, case review analysis, and use of the defining issues test. Examples of evaluation techniques not covered in current construction ethics education literature include the evaluation of student participation in discussions, written assignments, student presentations, attendance in class when ethics is taught, and group and individual projects.

The results of the literature review, a review of curriculum guides, and HETC survey do not allow us to suggest that this study is exhaustive. A supplemental review of ABET and ACCE accreditation documents provided to us by participating programs were reviewed to fill gaps of our study. Regarding component (c), specific content that was not part of the HETC survey included professional codes of ethics used by the Construction Management Association of America (CMAA) and the American Society of Civil Engineers (ASCE). Additional content not

covered in the survey included: abuse of cost-plus jobs, falsification of experience, ethical issues of Guaranteed Maximum Price (GMP) proposals, bribing inspectors, personal ethics, pay-when-paid clauses (unfair contract terms with subcontractors), markups, ethics in jobsite accounting, bond claims, warranties and consumer protection statutes, and ethics in violating contract terms.

Regarding subcomponent (d_i) curriculum setting, permitting students to enroll in a management course on ethical leadership was found in accreditation documents. PowerPoint presentations and student-developed ethics videos were found to be media (d_{ii}) used in construction ethics education. An evaluation (e) technique not covered is the evaluation of student-directed video group presentations.

Conclusion

Worldwide, the construction industry is infamous for poor ethical performance and construction education has been charged with teaching ethics to improve ethical decision-making of future construction professionals. However, ethics education is not seen as a primary interest in many construction programs, and construction ethics educators are left to their own means to teach ethics without resource(s) of construction-specific pedagogical techniques for construction ethics education. Therefore, the purpose of this study was to move toward the provision of a resource(s) for construction ethics education.

We were able to expand the knowledge of construction ethics education by exploring various pedagogical techniques used and by exposing gaps in academic literature by using both qualitative and quantitative techniques for this study. The mixed methods approach undertaken in this study was essential to answer each of the research questions. To understand how literature and curriculum guides operationalize Eash's [17] components on ethics education (RQ₁), the qualitative strand of this study allowed us to gain an initial understanding of how ethics is taught in construction programs. We found techniques that were used in other disciplines, and techniques employed in construction education. The qualitative strand also helped us develop a survey on how ethics is taught in construction (HETC). The qualitative strand also helped us to purposefully select a sample of participating programs to administer the HETC survey.

Using the HETC developed from the qualitative strand, we were able to complete a pilot investigation into the content and pedagogical techniques used in construction programs to teach ethics (RQ₂). The HETC administration allowed us to gain a deeper understanding of how ethics is being taught in construction education. Specifically, we found that there are a variety of pedagogical techniques used and content being taught in participant construction programs and have found that there are ethics content areas that aren't covered in construction curriculum.

Performing an additional document review of accreditation documents allowed us to fill in gaps that were not covered in the main qualitative and quantitative strands of this study, even though this is atypical of explanatory sequential design. The findings of both strands contribute to a framework for construction ethics education. Construction educators who aren't well-versed in teaching ethics should utilize this work as a resource to assist and inspire the improvement of construction ethics education.

Future Work

There is a need to revise the HETC survey to include gaps found in the accreditation documents provided by the participating construction programs. This will account for missing HETC data and will assist participant recollection in future HETC administrations. The survey should be administered to a larger random sample in order to generalize this finding. This will provide a general understanding of construction ethics education and may reveal a framework for best practices when combined with a student evaluation of ethical competencies.

As this study focuses on curricular experiences, research into the impact of personal and co-curricular experiences that add to ethics education of construction students is needed, as one student discussed how they learned ethics through various extra-curricular experiences. Having this information may provide other contributing factors to student ethical competencies and may guide curriculum decision-making in construction programs.

As this study focused primarily on Eash's [16] components of modes of transaction, content, and evaluation, we believe that a more in-depth study is necessary to address the components of aims and objectives and assumptions about the learner and society.

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Appendix

How Ethics is Taught in Construction Education

1. How were you taught ethics during your undergraduate career? (Select all that apply.)

- Via a dedicated construction ethics course
- Via a non-ethics course where ethics was a full module
- Via a philosophy ethics course
- Via a business ethics course
- In various courses throughout the curriculum
- Via an engineering/technology-based ethics course
- Do not recall receiving any ethics education (If selected **END** here.)
- Other (Please provide)_____

2. What form(s) of media were used for construction ethics instruction in your class? (Select all that apply.)

- YouTube videos
- Movies/Film
- Audio recordings
- Textbook
- Magazines
- News articles
- Journal articles
- Blogs
- Social media
- Construction websites
- The internet, in general
- Interactive video/Interactive websites
- Other (please list):

3. What learning environment(s) were used for ethics education in your construction program? (Select all that apply.)

- In a classroom/lecture hall
- In a conference room
- Outdoors
- Online, via live lecture
- Online, via recorded lecture
- Online, without visual and audio media
- Construction site visits and tours
- Visits to construction companies and offices
- Other (please list):

4. What teaching style(s) were used in your program for construction ethics education? (Select all that apply.)

- Presentation by single professor
- Presentation by person speaking about own (personal) experiences
- Presentation by working professional of the construction industry
- Panel discussions with guest or faculty
- Peer discussion
- Think-pair share (Considered a topic by alone, and then grouped to discuss or develop an answer.)
- Case studies

- Project/problem-based learning
- Videos on construction ethics
- Skits (student or instructor initiated)
- In-class games
- Role-playing
- Online modules
- Decision trees
- Student performed interviews with industry professionals
- Other (please list):

5. How were you evaluated for your understanding of ethical concepts? (Select all that apply.)

- Tests & quizzes
- Written assignments & reports
- Student presentations
- Student blog posts
- Student social media posts (As required by course)
- Activity logs
- Journals
- Interviews
- Progress meetings with instructor during course
- Group projects
- Individual projects
- Participation in discussions
- Attendance in classes when ethics was taught
- Other (please list):

6. What topics were the subject matter for construction ethics education in your classes? (Select all that apply.)

- Ethics Theory/Moral Philosophy
- Bid Shopping
- Bid Rigging
- Price Fixing
- Bid Peddling
- Cover Pricing
- Price Gouging
- Bid Withdrawal
- Front End Loading
- Fictitious Invoices
- Hidden fees and Commissions
- Over-Claiming Expenses
- Delay Recovery
- Payment Games
- Change Order Games
- Corner Cutting
- Project Abandonment
- Absenteeism
- Use of Inferior Material/Equipment
- Use of unqualified subcontractors/suppliers
- Privileged Information
- Minority Discrimination
- Gender Discrimination
- Occupational Health
- Safety
- Safe Products
- Use of Specialist Knowledge to Mislead Client
- Work Schedule Games
- Licensure (Importance and Legality)
- Sustainability and the Environment
- Global Warming
- Construction and Pollution
- Recycling
- Waste Dumping
- Triple Bottom Line of Business
- Water Use
- Energy Efficiency
- Codes of Ethical Conduct/Practice
- Construction Law, Legal Systems
- Modification of Testing Lab Results
- Improper Inspections
- Collusion
- Use of Child Labor
- Use of Company Resources for Personal Gain
- Illegal Migrant Work
- Internal Employee Fraud
- Unfair Labor Practice
- Unfair Contract Terms with Subcontractors
- Unfair Competition
- Owner: Abuse of Professional Services
- Owner: Bid Acceptance Post Bid Close
- Owner: Rejection of Low Qualified Bid
- Conflicts of Interest
- Non-Transparency
- Political Lobbying
- Reciprocity
- Greed/Self-Centrism
- Trade Secrets
- Alternative Dispute Resolution
- Human Resources
- Employer Obligations
- Honesty, Integrity
- Negligence
- Corporate Social Responsibility
- Falsification of Documents
- Building Codes /Regulations
- Multi-Culturalism
- Benevolence
- Public Welfare
- Waste of Public Resources
- Owner's Duty to Act in Good Faith
- Harassment (Sexual, Disability, Age, Race, Gender, Gender Identity, Religious)
- Rumors
- Inappropriate Jokes
- Asset Misappropriation
- Theft
- Embezzlement
- Compliance with Law
- Federal Antitrust Laws
- Federal Acquisition Regulation
- Construction Quality Assurance Act
- Blackmail
- Bribery
- Kickbacks
- Coercion & Threats
- Client Entertaining
- Whistleblowing
- Maintaining Ethical Standards
- Ethical Corporate Culture
- Quality Driven Agenda
- Trust Based Partnering
- 'Uberrimae Fidei' (Utmost Good Faith)
- Other_____